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Blogging: A multimodal perspective

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This paper documents how children embed multimodality in their journal entries using blogs. Multimodality is the combination of semiotic modes that may include spoken language(s), written language(s), static or moving images and music. Each of them generally offers opportunities for the construction of meaning. In this research, a case study approach was employed to gain an in-depth understanding of multimodality and meaning-making. The data is collected using classroom observations, textual analysis of similar journal topics posted by the participants, and informal interviews, or, online responses to the comments posted by the teacher, to the pupils in their entries which take the form of blog posts. Findings of this investigation suggest a need to redesign learning to allow everyone to cope with multimodality as a new form of literacy.

Keywords: multimodality, blogging, journal entries, semiotic modes, engagement

Introduction

The ubiquity of digital technology has transformed the way people work, learn, play and even communicate. While previously a text comprises mostly printed words, the definition has since then been extended to include several dimensions which moves away from the notion that language is the dominant mode in meaning-making work. Hence, in view of this, the study attempts to account for the burgeoning variety of text forms associated with information and multimedia technologies by investigating multimodality in the journal entries of children.

Research Focus

The aim of this paper is to investigate how multimodality is represented in the journal entries of children. However, for this research, only the conjunction of images and texts were analysed as these are the representational modes that are often used by children (Sutherland-Smith, 2002).

Bearing in mind that children receive information multimodally (Bearne, 2003), the paper sought to argue for a shift towards the new literacy pedagogy by understanding the following questions:

- How do children make use of multimodality to add an additional layer of meanings in their journal entries?
- What do the images and text mean to them?

Theoretical Framework

For the analysis, two conceptual frameworks were used. The first drew on distinctions offered by the American philosopher, Charles Sanders Peirce's model, between icons, indexes (indices) and symbols. To illustrate these concepts briefly, consider any pictorial image of a rabbit. According to Peirce (1955), this picture would be an icon if it mimetically represents a rabbit. However, if the image refers to the idea of the white rabbit, as purity, then it would be regarded as an index. On the other hand, if the image of the rabbit represents a company's trademark, then it would be considered as a symbol. In all, the three categories posited by Peirce are not separate or distinct because they "represent the world simultaneously in various degrees" (Danesi, 1994). Hence, knowledge of this classification provides a language to talk about the various types of visual representation.

Additionally, since all images are polysemic, open to endless interpretations, thus, a linguistic message has to be associated with the image. Hence, for a framework to describe children's interpretation of images and text, the distinctions presented by Roland Barthes, a French philosopher, linguist and educator were used. According to Barthes (1977), the relationships between text and image could be bifurcated as anchorage and relay. In anchorage, the text elaborates the image by directing the reader through the signifieds of the image. Nonetheless, it is possible for the image to elaborate the text such that the image forms an illustration of it. Meanwhile, in relay, the text and image are in a complementary relationship and they are "fragments of a more general syntagm" (Kress & van Leeuwen, 1996) such as in comic strips and films. Of the two, "anchorage is most frequent function of the linguistic message" (Barthes, 1977). Nevertheless, in meaning-making, any permutations of image-text relation could exist depending on the semiotic choices that best fit the message.

Literature review

Kress (2000) found that students used different kinds of representational resources, to write their Science report. When they were instructed to explain a plant cell that they had observed, they communicated their ideas visually and linguistically through the 'orchestration of semiotic modes' (Kress & van Leeuwen, 2001) with each mode contributing to the overall meaning. In another study, Hull and Nelson (2005) argued that the expressive power of multimodality resides in the semiotic relationships between and among different modes. While different semiotic modes attempt to encode similar content, they might not convey similar meanings for, each mode perform "different communicative work" (Jewitt, 2009) in a multimodal ensemble. In view of the subjectivity involved in multimodality, Bearne (2009) created a framework to analyse multimodal texts using analytic categories such as image, language, sound, gaze and movement. From the three examples that she studied, she found that the seven-year-old children used a combination of modes to express themselves. While the analysis were done separately for image, sound, gaze and movement, it was acknowledged that different modes work together to make meanings (Kress, 2003) as children think 'multidimensionally' (Bearne, 2005). Clearly, had language alone been used to gauge the rhetorical success of the text in this study, much learning would have been lost in making meanings.

Methodology

Research design and instrument

For this research, a case study approach was employed. Before embarking on the study, permission was sought from the school principal, and the intent of the study was explained. To comply with ethical principles (Cohen & Manion, 1994), the participants were informed that their journal entries would be collated for research purposes. They were assured that their confidentiality would be protected and that pseudonyms would be used in reporting the research data, to remain anonymous. The data are collected using field notes based on her classroom observations, textual analysis of seven similar journal topics posted by the participants, informal interviews.

Participants

The participants were three ten-year-old children in the same class. These pupils were chosen because they are regular contributors to the journal entries. Besides, each of them represents the low, middle and high proficiency group of pupils from a cohort of 240 ten-year-old children in a school.

Research Procedure

In the first few sessions, the pupils were given topics which are close to their experiences so that they would not feel daunted to write. After all the journal entries for the day have been posted onto the blogs, the teacher highlighted three interesting entries, asking each of the selected children to justify to the other pupils why he or she has included a certain image in the post. She then intervened in their meaning-making works to create greater semiotic awareness which are central to multimodal learning and development (Jewitt, 2008b). Before the children posted their entries, she showed them examples of how particular meanings could be constructed through images and text to communicate a specific idea, for three consecutive sessions. Subsequent journalling sessions ensued with the teacher initiating the topic, along with several guiding questions placed on the whiteboard, to assist the less proficient pupils in expressing their thoughts in the blogs.

Discussion of findings

From the selected journal entries, the three children combine modes to communicate meanings with rhetorical force. They express themselves visually using Peircian's 'icon', 'index', 'symbol' or by blending any of them together in the linguistic mode. However, analysis of the data shows that these children make use of multimodality differently in their journal entries, albeit given similar topic. It could be due to their awareness of the 'potential affordances' (Kress, 2003) of what a certain mode can or cannot do.

The children employed different semiotic choices, with the visual mode, being the dominant ones, to create particular meanings as in Table 1.

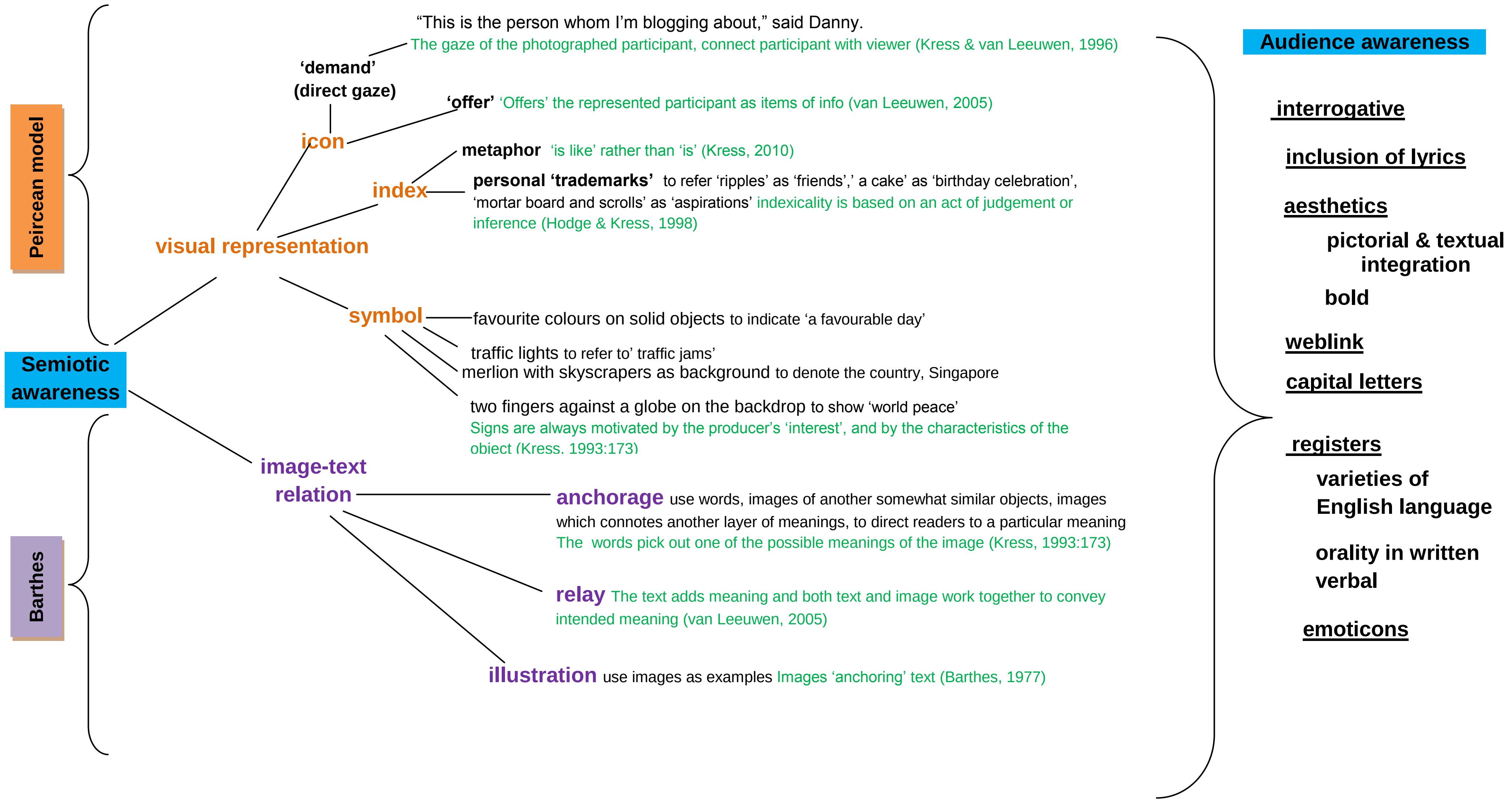
Primary data (Selected journal topics)	Codes (Inference/ Abstraction)				Discovery memos
	Modes/Pupils	**Eileen**	**Ben**	**Danny**	**Eileen, Ben & Danny**
1. What colour is Thursday?	Visual representation	Index	index	symbol	1) The three children use different modes in similar journal entries to create particular meanings. 2) They employ different visual representation modes but have common understanding of image-text relations as they make meanings. 3) Multimodal meaning-making enables linguistically at-risk children to express themselves well using other modes than written language 4) Children tend to be skeptical of employing visual images as form of language representation.
	Image-text relation	anchorage	anchorage	anchorage	
2. My favourite song	Visual representation	icon [‘offer’ image]	icon [‘demand’ image]	icon [‘demand’ image]	
	Image-text relation	relay	relay	relay	
3. A historical figure in Singapore	Visual representation	icon [‘offer’ image]	icon [‘demand’ image]	icon [‘demand’ image] symbol	
	Image-text relation	relay	relay	relay	
4. Just a little raindrop	Visual representation	symbol	icon	icon & index	
	Image-text relation	relay	anchorage	anchorage	
5. If I had three wishes..	Visual representation	symbol, index	icon & index	icon, index	
	Image-text relation	anchorage	anchorage	anchorage	
6. Images & text	Visual representation	icon	icon	icon	
	Image-text relation	illustration	illustration	relay	
7. A picture story	Visual representation	icon	index	icon, index & symbol	
	Image-text relation	NONE	relay	NONE	

Table 1: Summary of semiotic choices made by Eileen, Ben & Danny

Secondly, although the children made different semiotic choices in their visual representation, they interpret the image-text relations in a similar way. (Refer to Figure 1)

Third, even if the semiotic choices vary according to particular meanings, all three children demonstrated authorial intent in some of their entries. This certainly shows that they have some sense of inter-semiotic awareness. However, the level of explicitness varies perhaps due to their experience in multimodal communication. In the entry, 'Images & text', Eileen employed mostly linguistic structures in standard English language. She used pronomial references, 'I' and 'you', and, added interrogatives to engage the readers. She even inserted emoticons to show them her contentment apart from using words to express her feelings. On the other hand, Ben aims to interact with his audience using a less formal variety of English language, consciously changing to orality in his written language to establish casualness, which is typical of bloggers. The fact that he applies 'bold' typefaces on all his entries suggests that he understood the visual affordances of written language and how it fits the needs of his reader

Figure 1: Tree diagram drawn from analysis of the journal entries of Eileen, Ben & Danny



In sum, analysis of the journal entries suggest that children who have less control over linguistic structures perform well in constructing meanings in other semiotic modes, such as visual images. Hence, limiting assessment to written language may hinder the success of this group of children. To ensure that they are fairly assessed and all children are given the opportunity to acquire various forms of literacies, I would argue for a re-thinking of literacy pedagogy.

Implications for language pedagogy

In rethinking literacy pedagogy, it is necessary to consider how children can be taught to make semiotic choices that best fit their intended message. To begin with, the affordances of different modes and how they could work together or separately, in meaning-making, should be made explicit to them. For example, understanding what a visual image could offer that a text might not be able to do, or, knowing the impact a film might have, on a reader that might not be possible by reading a text. Having said that, teaching children to solely recognise representational demands are insufficient, to help them use 'language' meaningfully. There should be some guidelines to indicate their level of achievement in constructing meanings using various modes (Burke & Hammet, 2009).

While tracking progress in multimodal text is not the norm, it is crucial in order to shift towards new literacies. In the light of this, teachers need to develop their professional capital on multimodality. In essence, they need to work with one another closely to define a set of indicators for several dimensions of texts, which comprise visual, sound, voice, intonation, stance, gesture and movement. According to Vincent (2006), a tool is required to monitor the achievements of students who have adopted these alternative pathways to literacy. Arguably, it could be challenging to create such rubrics which takes into account the multimodal aspects of language because as Kress and van Leeuwen (2001) pointed out, each mode has its own grammar and syntax. Therefore, to develop indicators which succinctly demonstrate a child's multimodal progression, teachers have to understand the grammar behind each semiotic mode thoroughly.

In all instances, teachers need to acknowledge and appropriate for themselves the demands of new literacy practices. They should be prepared to adopt the roles of a resource manager, co-constructor of knowledge and a design consultant (Larson and Marsh, 2005) so that they could effectively facilitate learning in the multimodal, electronic space. On hindsight, if the national curricular and assessment mode continues to demand language as a primary system, then most teachers may not even want to invest time thinking about a 'language' which attends to other semiotic modes, than the written mode (Moriarty, 1994). However, resistance to transform literacy pedagogy would place schools at a disadvantage because "new literacies, whether intentionally or unintentionally impact literacy instruction in classrooms" (Leu, Kinzer, Coiro & Cammack, 2004).

Limitations

The findings may not be able to access designs that children use in a more dynamic kind of representational mode. While there are other modes such as moving images, which might allow them to make meanings, this study is limited to static visual images. Hence, future research might want to look into ways in which children combine modes, forming what Kress (2003) termed as 'transformation' (a reshaping of resources within a mode), 'transduction' (a shift of semiotic materials across modes) and 'synaesthesia' (the qualitatively new forms of meaning which occur through transformation and transduction) to obtain a richer understanding of multimodality and meaning-making works.

Conclusion

Throughout the paper, the multimodal character of literacy among children was discussed. Following the points of discussion, it may be claimed that the images and text worked together for an intended purpose in meaning-making. However, they may or may not be explicitly expressed even though the children have a sense of semiotic awareness. Conclusively, making meanings through multiple modes presents a need to redesign learning to allow everyone to cope with multimodality as a new form of literacy.

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Age-related differences in ICT access and confidence among pre-service teachers

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The Australian Government's Digital Education Revolution is directed at school education but, because teacher preparation is a significant factor in its success, there are implications for teacher education in Australian higher education. A national project, *Teaching Teachers for the Future*, has been funded to support change in teacher preparation programs based on the construct of Technological Pedagogical Content Knowledge (TPACK), which describes teachers' complex combination of knowledge of content, pedagogy, and technology. Knowledge of information and communication technology is a necessary, but not sufficient, foundation for TPACK. This paper presents data about ICT access and confidence reported by teacher education students in a regional university. Key findings included that teacher candidates had access to and confidence for using common forms of ICT but more limited access to and confidence for using less common forms, and that there were few significant differences in ICT access and confidence according to age.

Keywords: teacher education, TPACK, ICT integration, digital generation

Background

Australian school education is in the throes of a government-sponsored *revolution*. The change of government in 2007 was followed by a series of initiatives collectively known as the *Digital Education Revolution* (DER) (DEEWR, 2008). This continued, and intensified, the commitment of successive Australian governments to broad goals for information and communication technology (ICT) in education, namely that young people should complete their schooling with relevant knowledge and skills for using ICT, and that ICT should be used to improve student learning across the curriculum (Toomey, 2001). Achievement of these goals depends upon multiple conditions, most importantly students in schools having access to sufficient current ICT for learning about and with ICT, curriculum being adapted to incorporate greater use of ICT, and teachers being adequately prepared to work with ICT in their classrooms.

Early phases of the DER included promises of funding to schools to achieve a computer to student ratio of 1:1 for years 9 to 12 by 2011, and improved broadband Internet connections to schools. Despite some challenges in implementation this aspect of the DER has substantially increased access to ICT in schools. At the same time the first phase of the Australian Curriculum (http://acara.edu.au) is being implemented for English, Mathematics, Science and History with other subjects to follow. ICT competence is included as one of seven general capabilities to be addressed across the National curriculum, indicating some progress on the second of the three conditions mentioned above.

The DER has been guided by a roadmap (AICTEC, 2009) that recognized that "educators require the pedagogical knowledge, confidence, skills, resources and support to creatively and effectively use online tools and systems to engage students" (p. 6). The roadmap noted that there would be need to provide professional learning opportunities for existing teachers and to ensure that graduate teacher standards include the use of ICT in teaching. An *ICT Innovation Fund* was established and applications were invited for funding of projects in the areas of improving capability of pre-service teachers, enhancing capacity of in-service teachers, and driving innovation through leadership (DEEWR, 2010a). A group established through the Australian Council of Deans of Education (ACDE) submitted a successful proposal in the pre-service area which attracted funding of $7.8 million for an unprecedented national project, *Teaching Teachers for the Future* (TTF) (ALTC, 2010). TTF involves all Australian Higher Education Institutions (HEIs) that have a teacher preparation program, together with the Australian Learning and Teaching Council (ALTC), Education Services Australia (ESA), the Australian Institute for Teaching and School Leadership (AITSL), and the Australian Council for Computers in Education (ACCE). As submitted, the project was to be led by ALTC but changes to ALTC in early 2011 resulted in ESA assuming the role of lead partner.

The TTF project has three major components that are intended to delineate standards for ICT capabilities of graduating teachers; develop resources to support teacher preparation to meet these standards; and revitalize teacher preparation programs to prepare teachers for integrating ICT in the new national curriculum. The first component is being led by AITSL and ACCE with input from the other partners and the second is being undertaken by ESA, again with input from other partners as appropriate. The third, and by far the largest, component is directly involving the 37 HEIs offering teacher preparation in a process of reviewing and revitalising the ways in which new teachers are prepared to work with ICT. This work is being supported by direct funding to the HEIs to engage personnel who are highly accomplished in teaching with ICT and the development of a National Support Network (NSN) to facilitate the sharing of relevant practice among HEIs. The NSN is intended to continue to function beyond the life of the TTF project which ends in June 2012.

All three components of the TTF project will affect teacher preparation programs in HEIs. Clarification of how ICT capability is demonstrated in the AITSL standards for graduates will affect curriculum and assessment for teacher preparation programs and the resources being developed by ESA will affect how certain elements of such courses are offered. However, the most direct and immediate effect will be through the third component as courses are progressively examined for their contribution to developing ICT capability and appropriately adjusted. This paper addresses some background to course revision by examining some pre-existing factors that may influence the changes that will be required.

Technological Pedagogical Content Knowledge

The teacher preparation component of TTF has adopted Technological Pedagogical Content Knowledge (TPACK) (Mishra & Koehler, 2006) as its underpinning conceptual framework and will draw upon previous work (Albion, Jamieson-Proctor, & Finger, 2010; Jamieson-Proctor, Finger, & Albion, 2010) in developing its evaluation strategy. Koehler, Mishra and Yahya (2007, p. 741) have argued that:

> intelligent pedagogical uses of technology require the development of a complex, situated form of knowledge [called] Technological Pedagogical Content Knowledge (TPCK). At the heart of

> TPCK is the dynamic, transactional relationship between content, pedagogy and technology. Good teaching with technology requires understanding the mutually reinforcing relationships between all three elements taken together to develop appropriate, context specific strategies and representations.

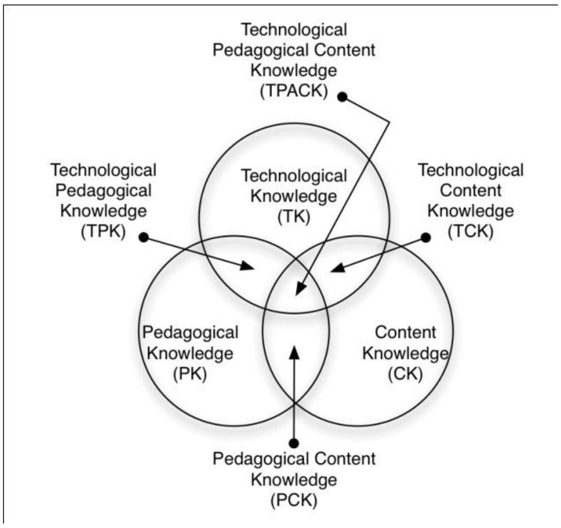

Figure 1: TPACK Conceptualization (After Mishra & Koehler, 2006)

According to Mishra and Koehler (2006) TPACK encapsulates knowledge of content, pedagogy, and technology, as well as an understanding of the complex interaction between these three main knowledge sets. They argue that teachers who have this level of understanding are characterized by the creative, flexible, and adaptive ways in which they navigate the affordances, constraints, and interactions within and among the TPACK framework elements.

More recently, Graham (2011) has examined the theoretical underpinnings of TPACK and has identified areas that require further development to ensure adequately shared understanding among researchers and practitioners. One issue that he identified was whether the areas of intersection should be understood as *integrative*, representing a combination of the intersecting kinds of knowledge, or *transformative*, representing a new synthesised form of knowledge that is more than the sum of its parts. Graham notes that although the descriptions offered by Mishra and Koehler (2006) imply a transformative understanding the conventional diagram is generally understood as integrative.

A further issue identified by Graham (2011) is with the understanding of *technology* in the TPACK model. Mishra and Koehler (2006) included older technologies such as the pencil and chalkboard, implying that technological knowledge and TPACK would be required for every teaching situation. Graham refers to work from Cox (2008) who distinguished between *transparent* and *emerging* technologies, with the former being familiar technologies in ubiquitous use (pencil, chalkboard, etc.) and the latter referring to being the newer, less familiar and mostly digital technologies being introduced. This is a useful distinction in relation to how knowledge of transparent technologies may be subsumed into pedagogical and content knowledge.

The TPACK framework almost suggests a new form of literacy for teachers, a literacy that emphasizes an active role for the teacher as a producer, a designer, which is very different from the traditional static idea of teachers as consumers or users of technology. Further, the TPACK model implies a ‘system’ which is in a constant state of flux and this system requires teachers to make thoughtful decisions related to content, pedagogy and technology within their unique teaching contexts. Teachers therefore need to be able to problem solve and think creatively about the interactions described by the TPACK framework in order to maintain the equilibrium of the overall system.

It might be argued that good learning outcomes for school students ensue from a teacher's ability to maintain the equilibrium that is the TPACK system in 21st century classrooms. It might be argued further that teacher education programs that compartmentalise the three knowledge bases described by the framework (technology, pedagogy & content) and attempt to develop them separately from or in parallel with each other, undersell the value to be gained from using an integrated approach that requires the teachers in training to "think to learn and thereby learn to think" (Sternberg, 1999, p. 7) in relation to transforming pedagogy and content with technology.

Clearly, the conceptualization of the TPACK framework as a system suggests strongly that no one element is more or less important than the others but that they are interdependent. In previous decades it was sometimes assumed that it would be sufficient to graduate technology-competent new teachers and expect them to apply their skills in the classroom. That is no longer sufficient. Australia is progressing towards an understanding of the necessary skills for teachers to make them 'TPACK ready' for their professions and, as a first step, most Australian States and Territories have developed standards for teachers, including standards which refer to ICT. For example, the ten professional standards developed by the Queensland College of Teachers (2009) refer to ICT capabilities, along with references to pedagogical content knowledge. However, there is still much to be done to ensure that teacher educators and teacher education programs are ready and able to assist their students, soon to be teachers, to develop the new TPACK literacy that they will require in order to be able to facilitate and inspire student learning and creativity; design and develop digital-age learning experiences and assessments; model digital-age work and learning; promote and model digital citizenship and responsibility; and engage in professional growth and leadership (International Society for Technology in Education, 2008).

Generational change and the DER

One of the prevailing myths of our age is that there is a generational gap related to ICT such that the rising generations are 'digital natives' in contrast to their elders who are 'digital immigrants' (Prensky, 2001). Researchers report that students are "media literate" (Dodge, et al., 2008) and suggest that the solution to increased use of ICT in education is for educators to harness the skills of their technologically competent students (Harris & Rea, 2009). When teachers' use of ICT in classrooms appears limited, proponents of the digital generation gap are inclined to explain it in terms of the generational difference between teacher and student. In that view, a solution to the problem lies in generational change so that new teachers will use the new technologies. However, recent research has questioned the existence of the generational gap in relation to ICT (Margaryan, Littlejohn, & Vojt, 2011; Salajan, Schönwetter, & Cleghorn, 2010).

Australian university undergraduate cohorts, including those in teacher preparation programs, are not uniformly drawn from the new generation of school leavers. Most cohorts now include a variable, but sometimes substantial, proportion of mature students seeking career change opportunities. Of students studying for a Bachelors degree in Australian universities during 2009, 24% were aged 25 or older including 15% who were older than 30 years (DEEWR, 2010b). A survey of final year teacher education students found 45% were aged 25 or older and 10% were aged 40 or older (DEST, 2006). The presence of mature students in teacher preparation programs has many potential benefits but it makes any hope that a generational change in graduates entering the teaching profession will result in any desired changes in the uptake of ICT by teachers questionable.

Preparing teachers for the DER

If the Australian Digital Education Revolution is to be successful in achieving its goals, it will be necessary to ensure that newly graduating teachers are well prepared to make effective use of ICT in their future practice. For the reasons noted above, relying upon generational change is unlikely to provide a solution. Hence, it is important that teacher preparation programs respond to the need by adapting their curriculum and pedagogy. The *Teaching Teachers for the Future* project is intended to catalyse those changes.

The adoption of TPACK as the conceptual framework for TTF signals a clear understanding that the future of ICT in education cannot be based simply upon enhancing teachers' ICT capabilities whether through generational change or preparation programs. In the TTF project, as in professional practice, technology, pedagogy and content (curriculum) will be interlinked to create the complex professional knowledge that is

TPACK. However, as is evident in the TPACK model, the knowledge in the intersections of the domains does not exist independently of the knowledge characteristic of each domain. It is not possible to teach content or technology without demonstrating pedagogy in the process and neither can technology be learned effectively without using it, which necessarily involves dealing with content and learning something about pedagogy as a side effect of the process. There will be a continuing requirement for specialized knowledge of content (curriculum), pedagogy and technology but it is important to recognize that knowledge is interlinked across the domains, is developed in combination, and may be rearranged and applied in different combinations.

In the case of technology knowledge, it will be important that graduates have skills for the fluent use of a variety of ICT hardware and software and have the capability to learn more as the need arises and as technology continues to evolve. Teacher preparation programs seeking to enhance graduates' ICT capabilities will benefit from availability of data about students' access to ICT and existing capabilities with current and evolving software applications to inform their provisions so that programs neither needlessly replicate prior experiences nor assume too much as a foundation on which to build. This paper reports such data for a sample of students in the teacher preparation programs at a regional Australian university. It will seek to provide answers to the following research questions:

1. What levels of access do teacher candidates have to ICT hardware and services?
2. What levels of confidence do teacher candidates report for use of a variety of ICT applications?
3. What, if any, differences are found for responses of teacher candidates from different age groups (generations) or other identifiable groups?

Method

The data reported in this paper were collected as part of a larger study conducted as an extension of previous work on auditing the TPACK confidence of teacher preparation candidates (Albion, Jamieson-Proctor, et al., 2010; Jamieson-Proctor, et al., 2010). The instrument used was adapted from that used in the previous study and reported in those papers with the addition of an item about access to ICT based on one originally reported by Kennedy et al. (2009) and adapted for use elsewhere (Albion, Loch, Mula, & Maroulis, 2010).

The questionnaire was administered online using LimeSurvey® (http://www.limesurvey.org/) with email invitations sent to 3200 students enrolled in teacher preparation programs at two participating universities in Queensland. One of the universities is located in a largely urban area and the other is classified as a regional university. The survey software supported anonymous tracking of responses so that reminders could be sent to students who had not responded. Two rounds of reminders were sent during the October-November 2010 period in which the survey was active. Data were downloaded and transferred to PASW Statistics 18 for analysis.

Results

The questionnaire recorded a total of 891 responses (28%) from the 3200 invitations sent to students at the two universities. Some students exited the questionnaire without completing it and, because the data were collected to guide internal university operations as well as for research, the final question sought student consent to use the data for research, further reducing the data available for analysis. This paper reports on data from 450 completed questionnaires that included research consent received from the 2170 invited students (21% response) at the regional university.

Table 1 presents data for gender and age of survey respondents. As is common in teacher preparation programs, the vast majority of respondents were female (86%). This proportion is somewhat higher than the 80% reported from a national study of final year teacher education students (DEST, 2006). Slightly more than half (58%) of the respondents reported being aged 30 years or older, confirming that the teachers in preparation at this regional university could not be presumed to be members of the 'digital natives generation'. This proportion is higher than the approximately 30% reported from a national study of final year teacher education students

(DEST, 2006) but is representative of the teacher preparation enrolment at the study university.

Table 1: Percentage distribution of respondents by gender and age (N = 450)

	< 20	20-29	30-39	40-49	>=50	Total
Female	7.3	29.3	28.9	16.7	4.0	86.2
Male	1.6	4.2	3.6	4.4	0.0	13.8
Total	8.9	33.6	32.4	21.1	4.0	100.0

The regional university delivers its teacher preparation programs on three campuses as well as fully online. Responses to the questionnaire represented all four locations, with 27% reporting that they were studying at the main campus located in a provincial city, 9% at the smaller regional campus, 12% at the newer outer-metropolitan campus, and 52% studying predominantly online. Respondents were distributed across all years of the four-year teacher preparation program with 35% in first year, 23% in second year, 26% in third year, and 16% in fourth year. In respect of these general demographic variables the respondents appear to be representative of the population of the teacher preparation program more broadly.

Table 2: Percentage of respondents reporting different levels of access to types of ICT (N = 450)

	Access exclusively for my own use	Access any time I need it, shared with other people	Limited or inconvenient access	No access	Not sure	χ^2 statistics for differences by age (df = 16)		
						χ^2	*p*	V
Desktop computer	40.2	37.6	8.2	13.3	0.7	15.66	.477	.093
Portable computer	68.4	14.4	3.6	13.1	0.4	27.20	.039	.123
MP3 player	54.4	10.2	5.1	28.4	1.8	64.32	< .001	.189
Video MP3 player	29.3	6.4	6.7	54.2	3.3	37.90	.002	.145
iPod Touch	13.8	5.1	4.7	74.2	2.2	19.51	.243	.104
Digital still camera	69.3	21.6	2.0	6.2	0.9	29.46	.021	.128
Digital video camera	34.2	20.0	10.0	34.0	1.8	25.34	.064	.119
Mobile phone	75.8	4.7	3.3	14.9	1.3	19.04	.267	.103
Smart phone	24.2	1.8	3.1	67.8	3.1	20.18	.212	.106
Portable data storage	92.4	3.6	0.4	2.9	0.7	15.58	.482	.093
Video game console	30.0	34.2	6.2	28.2	1.3	36.34	.003	.142
Web cam	53.8	15.1	4.9	23.8	2.4	18.12	.317	.100
Printer	65.6	31.1	2.4	0.4	0.4	33.55	.006	.137
Scanner	57.3	28.9	6.9	6.4	0.4	24.58	.078	.117
eBook reader	3.8	2.9	4.0	85.6	3.8	16.14	.443	.095
iPad	2.2	2.2	2.2	90.0	3.3	22.92	.116	.113
Dial-up Internet	6.4	4.2	4.4	80.9	4.0	37.03	.002	.143
Broadband Internet	63.8	31.8	2.0	2.2	0.2	39.22	.001	.148

Participants were asked to indicate their levels of access to different types of ICT. Where appropriate, to assist interpretation, the items included examples such as “iPhone, Android, Blackberry” for smartphones or “Kindle, Kobo, iPad” for eBook reader. Table 2 reports these data as percentages of responses in each category for all respondents.

When the data for desktop and portable computer access were examined together, just 2 respondents (0.4%) reported no access to either and 5 respondents (1%) reported that they had no access or only limited or inconvenient access to a computer. In all, 278 respondents (62%) reported that they had exclusive or convenient shared access to both desktop and portable computers. In regard to Internet access, just 8 respondents (1.8%) reported limited, inconvenient or no access to either dial-up or broadband connections and only 11 respondents (2.5%) with dial-up access did not also have convenient access to broadband. Of the 440 respondents (2.2%) who reported some level of broadband access, 202 (46%) reported that the quality of the service they accessed, in speed and data capacity, was acceptable with most reporting speeds of 512 kbps or better and data capacity of at least 5 GB per month or speeds and data volume they considered acceptable for their purposes.

These high levels of access to basic forms of ICT contrast with more limited access to newer forms of ICT such as eBook readers (86% no access), basic MP3 players (28% no access) and MP3 players able to play video (54% no access) that might have application for access to study material. Although a small proportion of these students may be equipped to take advantage of study materials packaged for mobile access, many or most are not and this should be considered as a factor in future development of instructional materials.

The responses were further examined using cross-tabulation with age and statistics from the associated chi-squared tests are also reported in Table 2. Numbers of responses and degrees of freedom did not vary and are not reported in the columns. Cramer's V is included as a measure of effect size. The chi-squared tests found significant differences by age ($p < .05$) for MP3 players (with and without video playing capability), video game consoles, printers, Internet connections (dial-up and broadband), digital cameras, and portable computers. All of the effect sizes as measured by Cramer's V are small (< .2) and, other than for the MP3 players, game consoles, and portable computers, where there was a clear pattern of higher levels of access among younger respondents, the patterns of different access levels by age were unclear. There were some indications that the differences for printers and Internet connections might be related to higher levels of exclusive access among older respondents but there were also higher numbers of older respondents who reported being unsure of their access to those forms of ICT. On the basis of these results, other than for a small subset of devices (MP3 players, games consoles) typically associated with the younger generation and portable computers, there appears to be limited evidence of a significant generational gap in access to ICT among these teachers in preparation.

Table 3: Percentage distribution and means of confidence for ICT applications (N = 450)

	No confidence (1)	Some confidence (2)	Confident (3)	Very confident (4)	Mean	SD	ANOVA statistics for differences by age		
							F	***p***	**η^2**
Word Processing	0.2	5.3	31.3	63.1	3.57	0.61	3.04	.017	.027
Desktop Publishing	12.4	31.8	32.7	23.1	2.66	0.97	1.79	.130	.016
Presentation Software	4.0	15.3	38.0	42.7	3.19	0.84	3.62	.006	.032
Spreadsheets	16.0	30.7	30.4	22.9	2.60	1.01	3.55	.007	.031
Databases	41.8	36.7	16.9	4.7	1.84	0.87	0.64	.636	.006
Graphics creation and/or editing	26.0	44.2	20.7	9.1	2.13	0.90	1.99	.094	.018
Digital image capture	3.1	20.9	37.6	38.4	3.11	0.84	4.23	.002	.037
Multimedia Development and Authoring	50.0	34.2	12.4	3.3	1.69	0.82	2.96	.020	.026
Visual Thinking / Concept Mapping Software	57.1	29.3	10.9	2.7	1.59	0.79	1.37	.243	.012
Digital Video Editing	36.2	36.7	17.3	9.8	2.01	0.96	4.23	.002	.037
Email	0.4	3.6	26.0	70.0	3.66	0.57	1.07	.372	.010
Web Browsers	1.6	8.4	28.9	61.1	3.50	0.72	1.30	.271	.012

Web Searching	0.4	2.9	26.4	70.2	3.66	0.56	1.29	.273	.011
Web Page Development	50.4	32.0	12.9	4.7	1.72	0.86	1.13	.344	.010
Web 2.0 and Social Networking	9.1	20.0	29.3	41.6	3.03	0.99	16.60	< .001	.130
Web 2.0 and Creativity	34.9	35.8	20.4	8.9	2.03	0.95	7.63	< .001	.064
Reading eBooks	29.3	34.2	22.9	13.6	2.21	1.01	3.67	.006	.032
Online learning management systems	10.7	27.6	37.8	24.0	2.75	0.94	7.38	< .001	.062
Online publishing	21.1	41.1	24.7	13.1	2.30	0.95	6.45	< .001	.055
Create reusable learning objects	26.2	39.1	23.8	10.9	2.19	0.95	3.16	.014	.028
Access repositories of reusable learning objects	28.4	35.8	22.9	12.9	2.20	1.00	2.71	.030	.024

Participants were asked to rate their confidence for using various types of ICT applications. To assist with clarifying meaning, examples of applications were provided for each item but they are omitted from the table for reasons of space. Responses were recorded on a 4-point scale from ‘No confidence’ to ‘Very confident’ and means and standard deviations were calculated by scoring the points from 1 to 4. Table 3 reports these data as percentages of responses in each category together with means and standard deviations.

Results indicated that the students were confident to very confident with common applications such as word processing, email, and web browsing. However, most respondents were not confident with less commonly used or more complex ICT applications such as spreadsheets, databases, multimedia development, web page development, and video editing. These results are consistent with the finding reported in the earlier study (Jamieson-Proctor, et al., 2010) which reported that final year students tended to be confident in only a limited range of ICT applications, such as word processing, email and web browsing. Similarly, many were not confident in using applications that might be used to enhance learning and teaching, such as accessing repositories of learning objects, online publishing, and visual thinking software.

The results were examined using ANOVA for differences by age group and the relevant statistics are also reported in Table 3. Numbers of responses and degrees of freedom were consistent at 450 and (4, 445) across all items. Eta squared (η^2) is included as an estimate of effect size. Analysis using ANOVA found significant differences ($p < .05$) by age group for 13 of the 21 application categories as shown in Table 3. Post hoc analysis using Tukey HSD revealed that the significant differences in means were related to respondents in the 40 to 49 years age group and, less often, the 30 to 39 years group, reporting lower levels of confidence than those in the 20 to 39 years and less than 20 years age groups. In all cases the effect sizes given by η^2 were small (< .2). Although the effect sizes are small, the pattern of results suggests that, in addition to the whole population of teachers in preparation having limited confidence with newer ICT applications, there may be some specific differences related to age that should be considered in the design and implementation of teacher education programs.

A further ANOVA was used to investigate any relationship between confidence with ICT applications and progression in the teacher preparation program. Significant differences were found for presentation software ($F(3,425) = 16.24$, $p < .001$, $\eta^2 = .103$), visual thinking and concept mapping ($F(3,425) = 5.42$, $p = .001$, $\eta^2 = .037$), and accessing learning object repositories ($F(3,425) = 11.87$, $p < .001$, $\eta^2 = .077$). In each case students in later years of the program reported higher mean levels of confidence. For presentation software and access to learning object repositories there was a pattern of growth from year to year whereas for visual thinking software there was a more pronounced increase for respondents in their fourth year.

Discussion

The analysis presented in this paper was intended to address three key questions related to levels of access to ICT hardware and services, confidence for using ICT applications, and related differences by age or year of study. Most of the teachers in preparation who responded to the questionnaire have convenient access to basic ICT hardware and services and are confident in working with common ICT applications. However, their experience of increasingly common forms of ICT and software applications appears to be more limited. Many reported having little or no access to devices such as MP3 players, especially those with capability to view video, digital video cameras, smart phones or similar devices such as the iPod Touch, or eBook readers. Similarly, low levels of confidence were recorded for some ICT applications, especially those that are in less common use or are more complex, such as authoring multimedia or web pages.

Analysis revealed some areas in which there were significant differences by age group for access to different forms of ICT and confidence in using some applications. However, the effect sizes were small. Although it would not be appropriate to assume age-related differences as a basis for program planning, it would be important to recognize that such differences in access, related experience, and confidence do exist between and within age groups and to ensure that any teacher preparation program offers opportunities for access that will assist students to extend their experience of ICT and build their confidence with a wider range of applications. There is limited evidence of growth in confidence with some ICT applications from year to year within the program but there remains ample scope for further development of opportunities.

When considered alongside broader trends in ICT and its adoption in Australian society these findings have implications for the design and implementation of teacher preparation programs. ICT, both hardware and software, continues to develop quickly and the uptake by households is widespread. Among Australian households with children the proportion with Internet connected computers grew from 20% to 86% between 1998 and 2009 (ABS, 2011). In 2009 31% of children owned a mobile phone with the proportion varying from 2% for 5-8 year olds to 76% among 12-14 year olds (ABS, 2011). Although only 4% of children had used their mobile phone to access the Internet, that proportion can be expected to increase rapidly as Internet-connected smartphones become more common. Similar trends exist for other forms of ICT. The implication is that the ICT capabilities required by teachers will be a moving target and teacher preparation programs need to respond by ensuring that graduates have had opportunities to develop skills and confidence for working with newer forms of ICT that are likely to be increasingly familiar to the children they will be teaching and to continue learning about new forms of ICT beyond graduation. It will not be sufficient to rely upon the skills that teacher candidates possess on entry or to address only the forms of ICT that are most commonly available during their program of study.

The *Teaching Teachers for the Future* project is directed toward the development of graduating teachers' TPACK, which, as indicated in Figure 1, is a complex construct comprising the intersection of different knowledge domains. Given that complexity, the successful development of TPACK will not be accomplished by developing separate strands of content, pedagogical and technological knowledge and expecting those to be appropriately melded in the future practice of graduates. As noted above, it is not possible to teach content without demonstrating pedagogy nor to learn technology without using it with content and observing pedagogy in the process. Nevertheless, data such as presented in this paper, about the current access of teacher candidates to ICT and their confidence for using them, provide an important foundation for guiding the development of teacher preparation programs.

An important element of the TTF project is the auditing of teacher preparation programs to determine how ICT is integrated and presented in various elements of the program. The information from the audit is intended to provide a basis for planning appropriate changes that will enhance the ICT capabilities of graduates. In doing so it will be important to ensure that teacher preparation programs include ample opportunities for students to experience working with a variety of ICT devices and applications using content from the curriculum areas in a variety of pedagogical modes. No doubt such opportunities already exist in some sections of the programs and it will be important to identify, recognize, and preserve existing effective elements. It will be equally necessary to identify what opportunities are missing and to provide those in ways that model the effective application of TPACK and provide both models for students to emulate and the experience from which to build their own TPACK. If *technology* in TPACK is understood in the way advocated by Cox (2008) with an emphasis placed on *emerging* ICT, then it will be important to ensure that programs are designed so that they can continue to evolve by offering students opportunities to work with new ICT both in curriculum areas, for development of TCK, and in pedagogy, for development of TPK. This requirement will challenge teacher preparation programs to find the means to support and encourage teacher educators to work at the intersections of new ICT with both content and pedagogy.

In the case of the regional university in which this study was located, the audit of subjects in the program is considering how ICT is used to help students understand the concepts in a course, how it is used to contribute to course delivery and assessment, and the degree to which the ICT pedagogy used in the course is made explicit to the students. The latter is important for ensuring that graduates develop appropriate insights into how and why they might use ICT in their own classrooms. The results of the audit, being facilitated by the experts funded by the TTF project, will be used as the basis for discussion about how courses might be revised to contribute more effectively to the development of graduates' ICT capability. Initial results of the audit have been encouraging. Possibly as a consequence of teacher preparation courses having been offered online in recent years, academics responsible for designing and implementing courses demonstrate willingness to consider new approaches and courses are already incorporating ICT in ways that facilitate development of relevant capabilities in graduates. Data such as that reported in this paper will be used to inform decisions about the relative ease with which students may be able to participate in activities requiring access to specific forms of ICT, and about the need to include opportunities for some or all students to develop experience with specific ICT.

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Learning Object Evaluation Metrics Based on Learning Styles Theory

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This poster presents evaluation metrics to assess learning objects in terms of their compatibility with different learning styles. The metrics allow learning objects to be ranked based on their effectiveness with different types of students which, in turn, can facilitate designing and searching for learning objects that meet the learner's requirements and preferences.

Keywords: learning object, learning style, evaluation metrics.

Introduction

Learning objects can be defined as "any entity, digital or non-digital, which can be used, re-used or referenced during technology supported learning" (LTSC, 2002). Lecture slides, simulations and textbooks can all be examples of learning objects.

Finding learning objects that meet students' preferences is one of the major problems that may prevent students from using learning objects (Sanz-Rodríguez, Dodero, & Sánchez-Alonso, 2010). This poster proposes evaluation metrics to ensure the compatibility of learning objects with different learning styles. The metrics can be used to guide the instructional design process to ensure that the learning materials provide equal experience for students with different learning styles. The metrics can also be used in learning object repositories to rank the materials based on their compatibility with different learning styles.

Theoretical Background

A learning style is "a particular way in which an individual learns" (Pritchard, 2009). There are different models to describe learning styles. The Felder–Silverman Learning Style Model (Felder & Silverman, 1988) is a famous example which was developed to describe learning styles in four dimensions.

The first dimension concerns information perception. This dimension distinguishes between *sensing* learners who prefer concrete information and facts, and *intuitive* learners who prefer abstract concepts and theories. Sensing learners tend to link the learning material to the real world and prefer to solve problems using well-established methods. In contrast, intuitive learners tend to look for possibilities and try to find innovative methods of solving problems.

The second dimension is associated with information processing. It distinguishes between *active* and *reflective* learners. Active learners prefer to try something out to see how it works while reflective learners prefer to think something through before making an attempt. Intuitive learners spend more time observing how other people perform a task while active learners tend to practically experiment to understand the new information.

The third dimension describes the way people prefer to receive information. *Visual* learners prefer to use visual media, such as images, diagrams, and animations, to represent information. In contrast, *verbal* learners prefer information in a written or spoken form.

The fourth dimension is associated with information organization. *Sequential* learners prefer to progress in a logical, step-by-step approach, moving from the parts to the whole. *Global* learners prefer to see the big picture before going into the details, using a more holistic approach, without following a sequential path.

Learning Object Evaluation Metrics

The proposed metrics are classified on a number of scales, described below. Each scale represents one dimension of the learning style model. The content of the learning objects should be designed to support the metrics provided in each scale.

Level of Abstraction

This scale evaluates learning objects based on the type of information that they present. The content of the learning object can be either completely abstract, with no link to the real world, or it can be facts, consisting of concrete concepts. To make sure that the content meets the needs of the different learning styles, there should be a balance between the levels of abstraction used in the learning objects. This scale suggests evaluation metrics such as the use of *real world examples* and *analogies*, *facts*, *step-by-step procedures*, and *experimental results*. In contrast, for those who prefer abstract concepts over facts, the leaning objects may contain *mathematical formulas*, *program codes*, *theories*, *puzzles* or *innovative ideas*.

Medium of Presentation

This scale evaluates learning object based on the medium of presentation of the learning object content. The content should be presented visually, using pictures, diagrams or animations. Further, for each visual medium, enough textual or spoken explanations should be provided to support verbal learners. This scale could then use evaluation metrics such as the use of *pictures*, *charts*, *diagrams*, *animations*, *videos* and the use of *text*, *detail* and *audio*.

Interactivity Level

This scale evaluates learning object based on the level of interactivity supported by the learning object. The learning object can support high levels of interaction with the learners by providing features such as *interactive simulations*, *self-assessment exercises* and *discussions*. To support learners with low preference toward interactivity, the learning object may contain *exercises with model answers*, *reflections* and *ratings* of the learning objects.

Sequencing and Structure

This scale evaluates learning objects based on organization of the content of the material. Balance should be kept between sequential and global organization of information. Sequential support can be achieved by providing *outline* and *overview* components of the learning object. To support global learners, information related to *prerequisite knowledge* and *comparison* with other learning objects should be provided.

Conclusions and Future Work

This poster presented evaluation metrics to assess the compatibility of learning objects with different learning styles. The metrics can be used by instructional designers and teachers to ensure that the learning material provides an equal experience for students with different learning styles. It can also be used in e-learning systems to recommend appropriate learning objects for learners. In the future, these metrics will be integrated into the design of a new learning object repository to help improve the quality of learning objects during the authoring process.

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An Investigation into the Learning Styles and Self-Regulated Learning Strategies for Computer Science Students

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Student-centred educational paradigms place a high level of responsibility on learners to control and self-regulate their personal learning processes. In these new educational paradigms, it is essential to understand students' preferences and the self-regulated learning strategies they use in order to enhance the learning process. This paper examines the different learning styles and self-regulated learning strategies used by students in a core computer science course. An Index of Learning Styles and a Self-Regulated Learning Strategies Questionnaire were administered to second year students studying programming languages concepts and paradigms. Results show that aspects of students' preferred learning styles had a significant impact on academic performance in the midterm examination. Further, consideration of the self-regulated learning strategies used by students provides evidence that metacognitive strategies were the least popular strategies among students. This suggests that students are not aware of important self-regulated learning strategies and may benefit from educational interventions focusing on these strategies. These results have implications for future teaching of the course, and are being used to guide the development of an online collaborative learning objects repository that aims to improve self-directed student learning.

Keywords: learning styles, self-regulated learning, computer science education

Introduction

The recommended educational paradigm has shifted from being teacher-centred to being more student-centred, with each student taking greater responsibility for his or her own learning process (Berglund, et al., 2009). Since every student has different learning preferences, it is important that course material is presented in such a way that no student is unfairly disadvantaged. To ensure an equal experience for all students, it is necessary to understand the learning preferences and strategies of the students being taught. Adopting a specific teaching method without considering the diverse needs of the group being taught can result in an inefficient learning outcome for some students (Pritchard, 2009). Thus, when presenting learning material to students, it is important that all student learning styles are supported. Further, the interaction between the learners and the learning material should be taken into consideration to improve the quality of the learning material over time.

Researchers have only recently started investigating educational aspects to improve the learning and teaching of computer science (Haden, Fincher, & Petre, 2004). In computer science courses, very few students share the same learning styles as their instructors (de Raadt & Simon, 2011). Thus, instructors cannot wholly rely on their own learning styles when developing learning material for their students. However, studies that investigate the learning styles of students in computer science courses are limited (de Raadt & Simon, 2011). Further, these studies focus only on students' learning styles, isolated from other aspects of student-centred educational paradigms, such as the cognitive and social aspects of teaching and learning. Education theories that combine cognitive and social aspects of learning can help provide a framework leading to a greater understanding of students' preferences and introducing a new direction for research and design of learning material in computer science education (Ben-Ari, 2004; Machanick, 2007).

This paper describes the diversity and influence of learning styles and self-regulated learning strategies for students enrolled in the core computer science course entitled "Programming Languages and Paradigms" at The University of Newcastle. This provides a case study for computer science education, and is being used to aid the development of an online collaborative learning object repository that assists students by evaluating their preferred learning style and directing them to the materials that they should find most useful. The aim of the study is to provide a baseline to assist the design and allow the evaluation of the effectiveness of a new online collaborative learning objects repository. This study is guided by the following questions:

1. What aspects of learning styles can be found in a typical computer science course?
2. What is the degree of use of different self-regulated learning strategies by students in the course?
3. What is the influence of students' learning styles on their academic performance in the course?
4. What self-regulated learning strategies have the most influence and need more focus?
5. How can the results of this study be combined with contemporary education paradigms to provide a framework for building a collaborative learning object repository to improve the next iteration of the course?

Theoretical Background

Different students perceive and process information in different ways (Shaw & Marlow, 1999). A student's preferred learning style is one of the main individual differences that effects how the student approaches new knowledge. Another important factor is the student's use of various self-regulated learning strategies. This section provides a brief introduction to learning style theory and self-regulated learning, and relates the theories to education in computer science.

Learning Style Theory

Learning is the process by which individuals acquire new knowledge. Each individual is different, so every student approaches the learning environment in a different way. A learning style is "the characteristic cognitive, affective and psychological behaviours that serve as relatively stable indicators of how learners perceive, interact with and respond to the learning environment." (Keefe, 1988). Learning styles are not fixed, and learners can adopt a different learning style depending on the subject matter and current learning environment (Pritchard, 2009). However, students do typically have one learning style that is preferred over others and can be motivated by learning material compatible with this preference (Larkin & Budny, 2005). Knowledge of their preferred learning styles can be used to help guide students to choose the best learning strategies, and allow teachers to modify their instructional strategies to provide the greatest opportunity for all students to learn.

This paper uses the Felder-Silverman Learning Style model (Felder & Silverman, 1988), a popular model to identify learning styles in science and engineering education. It is used for both traditional and technology-supported learning, and consists of the following four dimensions:

Perception (Sensing or Intuitive) describes the ways in which learners tend to perceive information. Sensing learners prefer to learn facts, are comfortable with details, and tend to solve problems using well-established methods. Intuitive learners prefer abstract concepts, theories, and mathematical formulas, and seek innovation and new ideas when solving problems.

Input (Visual or Verbal) distinguishes between learners based on their preferred medium for the presentation of information. Visual learners prefer to learn using visual medium of presentations, such as pictures, charts, and diagrams. Verbal learners prefer spoken or written materials. Both types of learners benefit when material is delivered using a combination of visual, verbal, and written forms (Mills, Ayre, Hands, & Carden, 2010).

Processing (Active or Reflective) evaluates learners based on the way they process information. Active learners prefer to learn material by using it, whereas reflective learners prefer to think about how things work before actually trying them out. Active learners are typically more comfortable working in groups than reflective learners.

Understanding (Sequential or Global) looks at how users understand new information. Sequential learners like to follow a step-by-step linear approach that focuses on the connections between the different parts of the learning material. Global learners prefer to grasp the full picture before narrowing into the details.

Self-Regulated Learning

In student-centred educational paradigms, it is essential for learners to control and regulate their individual learning processes (Chen, 2002). Self-regulated learning is an educational theory influenced by constructivism theory (Ben-Ari, 1998) and social learning (Bandura, 2001). Self-regulated learners are characterized by their ability to be "metacognitively, motivationally, and behaviourally active participants in their own learning process" (Zimmerman, 1986). Metacognition refers to an individual's awareness and control of the cognition process and includes processes such as goal setting, planning and self-evaluation used to control and monitor the individual's learning process (Pintrich, 1999). While there are various models of self-regulated learning (Curry, 1983), they all share some main assumptions (Pintrich, 2004). Firstly, the learner is considered to be an active participant in the learning process rather than a passive receiver of knowledge. Secondly, it is possible for the learner to control, monitor and self-regulate some of the learning process. Finally, the learner has a goal and the learning process can be evaluated to determine whether the current learning process will reach that goal, or whether a change is required. Learners can improve their learning strategies through a variety of different techniques. These techniques fall into the following categories (Pintrich & De Groot, 1990):

Cognitive learning strategies are methods used by the learner to deal with the actual learning material. Elaboration methods, such as summarizing, paraphrasing and relating new information to existing knowledge is one cognitive strategy that has a positive impact on the academic performance of students (Pintrich & De Groot, 1990). Other examples are organisational strategies, which involve creating hierarchies of presented information to make it easier for the learner to connect related concepts, and critical thinking, which evaluates the creditability of the learning material and attempts to apply the concepts under study to new situations.

Metacognitive learning strategies are based around the learner's knowledge and self-regulation of their own cognition through planning and monitoring of their cognitive learning activities (Pintrich, 1999). Planning involves setting goals and generating questions to guide study and make the learning process easier. Monitoring strategies include self-assessment to verify the learner's understanding of the material.

Resource management strategies require the learners to take control of their learning environment. This includes management of time and study environment. Another important aspect is the management of who to include in the study environment; being able to seek help and learn from peers are important characteristics of a self-regulated learner (Ryan & Pintrich, 1997).

Computer Science Education

Teaching and learning of computer science concepts are challenging tasks for both teachers and students (Ben-Ari, 1998). Computer science involves studying dynamic and abstract concepts that are difficult for students to understand using traditional teaching and learning methods. Further, computer science is a rapidly changing area, which is driven by newly emerging technologies rather than the pedagogy (Holmboe, McIver, & George, 2001). "Only recently have CS educators begun to explore important issues and methodologies in computer science teaching" (Haden, et al., 2004). Computer science education research is still in its infancy and there are many initiatives to apply different learning theories to improve computer science education.

In the last few years, student-centred approaches to learning have received some attention in computer science education. These approaches focus on the role of the learners to discover and construct knowledge through active participation in the learning process. This new view of learning is related to some extent to the theory of constructivism (von Glasersfeld, 1997). Constructivism theory has particularly influenced mathematics and science education, and in the last few years computer science education research has investigated the role of constructivism as a theoretical basis of computer science education (Ben-Ari, 1998).There have been a number of educational approaches and software proposals based on the theory of constructivism. Problem-based learning, in particular, is a technique based on constructivism that has been found useful in computer science education. However, constructivism accounts only for cognitive aspects of learning and neglects, to some extent, the social dimension of learning. Cognitive-based models are not enough to describe the learning process (Machanick, 2007), so new models are required for computer science education. In particular, there is a need for models that include the social aspects of learning.

There have been some previous studies to investigate the learning styles of computer science students. Thomas et al. (2002) investigated the learning styles of students enrolled in an introductory programming course. The majority of students in the study were assessed as sensing, visual, reflective and sequential. The result of the study indicated that, in the exam portion of the course, significant differences were detected in students' performance between reflective and active learners in favour of reflective learners, and between verbal and visual learners in favour of verbal learners. One interesting result of the study was that although the majority of students were visual learners, verbal learners had the highest performance in the course. This result is consistent with the results reported in (Chamillard & Karolick, 1999) and (Allert, 2004). In a recent study, de Raadt and Simon (2011) stated that there is a scarcity of research in the exploration of learning styles in computer science education. Motivated by this, they conducted a study to investigate students' learning styles, again in an introductory programming course. The study found that the majority of students preferred practical applications and concrete information connected to reality and were comfortable with details. They prefer to learn using simulation and case studies. The study concluded that learning materials do not have to cover all possible learning styles but "at least provide one usable thing for each student" (de Raadt & Simon, 2011).

The existing studies of learning styles in computer science education have investigated aspects of learning styles independently of other pedagogical factors, such as the strategies used by students when presented with learning material. While the results are interesting, they do not suggest how they can be integrated with other contemporary learning theories to improve the learning process. Further, the studies mentioned do not indicate the strength of the students' learning style preferences, making it difficult to determine which aspects of learning styles require greater focus. Self-regulated learning models can explain not only cognitive aspects of learning but social aspects as well. Thus, an investigation into the learning styles and self-regulated learning strategies of students can be combined to help provide a framework upon which educational interventions can be built. This study presents an investigation into the learning styles and self-regulated learning strategies of computer science students to assist with the design of a collaborative learning object repository for use in future iterations of the course, and to provide a baseline to test the effectiveness of the new system.

Research Method

The purpose of this study was to evaluate the learning styles and self-regulated learning techniques used by computer science students as a necessary step towards the improvement of teaching and learning methods of a computer science course. This required the collection and analysis of data from computer science and software engineering students. In this section we describe the participants used in the study, the data collected from them, and how the data has been analysed.

Participants

Participants were 38 students enrolled in the "Programming Languages and Paradigms" course taught at the University of Newcastle, Australia, in the first semester of 2011. This is a compulsory second year course for undergraduate students enrolled in the computer science and software engineering programs. The course covers the theory behind the design and implementation of programming languages, recognised as an integral part of any computer science or software engineering degree (IEEE/ACM, 2005). The course follows a traditional teaching method consisting of weekly lectures and workshops. The instructor covers the theoretical concepts of the course in the lectures using PowerPoint slides that have been prepared based on cumulative experience from teaching the course for the last few years. The workshops provide hands-on exercises to show students how the concepts covered in the lectures are applied in practice. Interaction between students and instructors outside of the formal face-to-face sessions is supported through the Blackboard learning management system. Students have to complete three individual practical assignments throughout the course, as well as written midterm and final exams. This study uses the midterm exam as a way to measure students' performance in the course.

Data Collection Instruments

Data was collected from participants immediately before they sat the midterm examination for the course. The Index of Learning Styles (Felder & Soloman, 1997) was used to identify each student's learning style according to the Felder-Silverman model. This was followed by a questionnaire based on the Motivated Strategies for Learning Questionnaire (Pintrich, Smith, Garcia, & McKeachie, 1991) to evaluate the self-regulated learning strategies used by the participants.

The Index of Learning Style comprises 44 items that present the participant with a situation and two possible options, asking the participant to choose the option that best represents him or her. There is a total of 11 items for each of the four dimensions of the Felder-Silverman model; these rank participants as either sensing or intuitive, visual or verbal, active or reflective, and sequential or global learners. The self-regulated learning strategies questionnaire consists of 30 items that ask the participant to indicate the extent to which a certain statement applies to the participant using a seven-point Likert scale ranging from “Very true of me” to “Not at all true of me”. The questionnaire determines the extent to which the participant utilizes the six self-regulated learning strategies of elaboration; organization; critical thinking; metacognition; peer learning and help seeking; and e-learning resource management. Students’ academic performance was measured using the midterm exam scores. The exam is a traditional paper-based assessment in which students have to respond to different questions that cover a number of modules studied in the course.

Data Analysis

Descriptive analysis was conducted using the mean, standard deviation, and charts to examine the study variables. A correlation analysis between the study variables was then performed using Pearson’s product moment correlation coefficient. Finally independent samples t-tests were used to investigate the difference in midterm exam scores between students with different learning styles.

Results

This section describes the analysis of the data collected for this study. The results for the various learning styles used by the students are presented first, followed by an investigation of the relationships between the reported self-regulated learning strategies.

Student Learning Styles

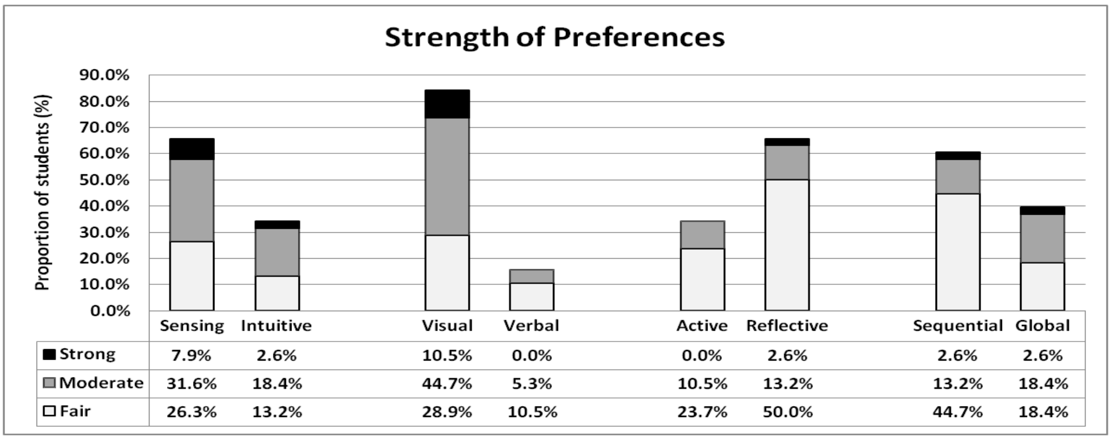

Figure 1: Distribution of students based on the strength of their learning style preferences.

The columns in Figure 1 show the students’ learning styles in the four dimensions of the Felder-Silverman Learning Styles model. In the perception dimension (sensing/intuitive), the majority of students (65.8%) were sensing learners, while 34.2% were intuitive learners. The input dimension (visual/verbal) showed an even greater one-way preference with 84.2% of students being identified as visual learners, and only 15.8% as verbal learners. In the processing dimension (active/reflective), 65.8% were reflective learners and 34.2% were active learners. Finally, in the understating dimension (sequential/global), the proportions of sequential and global learners were 60.5% and 39.5% respectively.

A deeper analysis, also depicted in Figure 1, examined the strength of a student’s learning style preference. Each dimension was subdivided into three levels: fair, moderate and strong. In the perception dimension (sensing/intuitive), 26.3% had a fair preference towards a sensing learning style and 13.2% had a fair preference towards an intuitive learning style. Together, this means that 39.5% of students were fairly balanced between the two learning styles. Of the remaining students, 39.5% had a moderate or strong preference towards a sensing learning style and 21.0% had a moderate or strong preference towards an intuitive learning style.

In the input dimension (visual/verbal), visual learners were dominant with 55.2% of students having either a moderate or strong preference towards using visual representations of the learning material. In contrast, only 5.3% of students had a moderate preference, and no students had a strong preference, towards a verbal learning style. In the processing dimension (active/reflective), the majority of students (73.7%) had a fairly balanced preference between the two learning styles, though reflective learning was more popular. Finally, in the understating dimension (sequential/global), while the majority of students were sequential learners, 63.1% had a fairly balanced preference between the two learning styles.

A correlation analysis to measure the relationship between learning style and academic performance is provided in Table 1, and t-tests that provide further insight are presented in Table 2. Two students were excluded from this part of the study because they did not complete the midterm examination. The correlation analysis shows that only the perception dimension had a significant impact on the students' results in the examination, with the t-tests confirming that sensing students (M=47.16, SD=15.50) were significantly outperformed by intuitive students (M=60.27, SD=14.94), t (34) = 2.364, $p < 0.05$.

Table 1: Correlation between learning style dimensions and midterm exam results (N=36).

Dimension	Pearson Correlation (r)	Significance (2-tailed) (p)
Perception (Sensing/Intuitive)	-0.349	0.037*
Input (Visual/Verbal)	-0.078	0.650
Processing (Active/Reflective)	-0.053	0.760
Understanding (Sequential/Global)	0.170	0.323
* Correlation is significant at the 0.05 level (2-tailed).		

Table 2: Mean comparison between different learning styles in midterm exam results.

Descriptive Statistics for exam results (Max=80)				Independent T-test		
Learning Style	**N**	**Mean**	**SD**	**t**	**df**	**Sig.**
Sensing	25	47.16	15.491	-2.364	34	.024*
Intuitive	11	60.27	14.940			
Visual	31	50.42	15.461	-.679	34	.501
Verbal	5	55.80	22.410			
Active	13	50.54	18.338	-.171	34	.865
Reflective	23	51.52	15.465			
Sequential	22	52.68	16.811	.694	34	.493
Global	14	48.79	15.788			
* Correlation is significant at the 0.05 level (2-tailed).						

In the other learning style dimensions, visual learners (*M*=50.42, *SD*=15.46) had slightly lower performance than verbal learners (*M*=55.80, *SD*=22.41), reflective learners (*M*=51.52, *SD*=15.47) slightly outperformed active learners (*M*=50.54, *SD*=18.33) and sequential learners (*M*=52.68, *SD*=16.81) did better than global learners (*M*=48.79, *SD*=15.79). However, in all of these dimensions, the difference was not statistically significant.

Student Self-Regulated Learning Strategies

Student's reported use of self-regulated learning is summarized in Table 3.

Table 3: Students' use of self-regulated learning strategies (N=38)

Self-Regulated Learning Strategies	Mean (Max=7)	Std. Deviation
Elaboration Strategies	4.55	0.91
Organizational Strategies	3.94	1.26
Critical Thinking Strategies	4.32	1.20
Metacognitive Strategies	3.92	0.90
Peer Learning and Help Seeking Strategies	4.02	1.53
E-Learning Resource Management Strategies	4.45	1.10

Students show a moderate use of each of the self-regulated learning strategies with elaboration and e-learning resource management strategies being the most popular. In contrast, metacognitive and organizational strategies were the least popular among the students.

Table 4: Correlation matrix of self-regulated learning strategies (N=38)

		1	2	3	4	5	6
1. Elaboration Strategies	Pearson Correlation (r)		.722**	.297*	.428**	.247	.286*
	Sig. (1-tailed)		.000	.035	.004	.067	.041
2. Organizational Strategies	Pearson Correlation (r)	.722**		.134	.472**	.158	.180
	Sig. (1-tailed)	.000		.210	.001	.172	.140
3. Critical Thinking Strategies	Pearson Correlation (r)	.297*	.134		.477**	.084	.291*
	Sig. (1-tailed)	.035	.210		.001	.308	.038
4. Metacognitive Strategies	Pearson Correlation (r)	.428**	.472**	.477**		-.067	.151
	Sig. (1-tailed)	.004	.001	.001		.345	.183

5. Peer Learning and Help Seeking	Pearson Correlation (r)	.247	.158	.084	-.067		.214
	Sig. (1-tailed)	.067	.172	.308	.345		.098
6. E-Learning Resource Management	Pearson Correlation (r)	.286*	.180	.291*	.151	.214	
	Sig. (1-tailed)	.041	.140	.038	.183	.098	
** Correlation is significant at the 0.01 level (1-tailed). * Correlation is significant at the 0.05 level (1-tailed).							

Table 4 presents the correlation matrix between the self-regulated learning variables used in this study. Results reveal a significant positive relationship between elaboration strategies and organizational strategies (r=0.72, p<0.01). This indicates that, as use of elaboration strategies increases, so too does the use of organizational strategies. There is also a highly significant positive relationship between metacognitive strategies and critical thinking strategies (r=0.48, p<0.01) and between metacognitive strategies and elaboration strategies (r=0.43, p<0.01) and between metacognitive strategies and organizational strategies (r=0.47, p<0.01).

Discussion

This section discusses implications of the results presented in the previous section.

Student Learning Styles

The majority of students in the study (65.8%) were sensing learners, with 39.5% having a moderate or strong preference to that learning style. However, 21.0% of students have a moderate or strong preference to intuitive learning over sensing learning. This suggests that there is a need for learning material for both types of learners, but the greater emphasis should be placed on reducing abstraction to better meet the requirements of the sensing learners, especially when it is seen that intuitive learners performed significantly better on the midterm examination.

In contrast, only 5.3% of students had more than a fair preference to a verbal learning style over visual learning. This suggests that there is less need for more verbal learning material than for more diagrams and visualizations. Results of the midterm examination, where verbal learners slightly outperformed visual learners, further support this idea.

In the processing dimension 73.7% of students have only a fair preference to either active or reflective learning, with the majority preferring reflective learning. Therefore, the learning material should be balanced to meet the requirements of both learning styles. This could be achieved by incorporating some interactive simulations and self-assessment questions with customized feedback as well as giving time for students to reflect on their learning experience.

Similarly, most students in the study are sequential learners, with 63.1% of students having only a fair preference to either sequential or global learning. Still, while not statistically significant, global learners performed slightly worse on the midterm exam than sequential learners. Thus it may be possible to improve the performance of global learners by offering more of a “big picture” view of the course. This could be achieved, for example, by comparing the concepts under study with other related concepts and applying them to different situations to show how the concepts interconnect.

Overall, the results indicate that increasing support for sensing and visual learners will have the greatest benefit for the course. Interactive animations provide one possible technique to achieve this. Such animations engage students visually and reduce the level of abstraction in the concepts under study (Naps, et al., 2003). Dynamic questions with immediate feedback allow students to monitor their understanding as they interact with the animation (Malmi, et al., 2004).

Student Self-Regulated Learning Strategies

Students' use of self-regulated learning strategies was moderate. Correlation analysis showed that metacognitive strategies were significantly correlated with elaboration, organizational and critical thinking strategies, indicating that students who use more metacognitive learning strategies are more likely to be aware of the cognitive strategies as well. However, metacognitive strategies were the least popular of the self-regulated learning strategies included in this study. This indicates that students may benefit from further education of possible self-regulated learning strategies which could be achieved by introducing interventions such as new educational software that encourages the use of different self-regulated learning techniques.

Conclusions and Future Work

This paper presented the results of an investigation into students' learning styles and their use of different self-regulated learning strategies in a core computer science course. The main aim of the study was to understand students' preferences and the self-regulated learning strategies they use. The results show a diversity of learning styles among students, with the majority showing a preference towards the visual and sensing learning styles. The influence of students' learning styles on their academic achievement in the course was also discussed, as were some recommendations to make the course more compatible with different learning styles. Intuitive learners, who represent only 34.2 % of the course cohort, significantly outperformed the 65.8 % of students who have a sensing learning style. This is consistent with the observation that most instructors use a teaching method that suits intuitive learners (Layman, Cornwell, & Williams, 2006), suggesting that the teaching strategies being used are not optimal for the majority of learners in the course.

The study included an analysis of the self-regulated learning strategies used by students, and it was discovered that metacognitive strategies, which were the least used by the students, were significantly correlated with many of the other strategies. The results of this study can be combined with the contemporary educational paradigms to provide a framework for improving the teaching of the next iteration of the "Programming Language and Paradigms" course as a pilot course representing computer science.

Based on this work, an online collaborative learning object repository is under development. This provides an environment for students to interact and share different learning objects to support traditional computer science teaching. The system contains a learning style assessment module to allow students to identify their preferred learning styles. Based on the result, students are provided with recommended strategies to follow throughout the course. The students' learning styles are also used by the system to automatically recommend learning objects that are most compatible with each individual student's preferences. New learning objects can be created inside the system through the use of a special template that helps ensure that aspects of different learning styles are taken into consideration.

As well as recommending the most compatible learning objects, the online collaborative system also aims to increase students' awareness of different self-regulated learning strategies. To help increase individual cognitive learning strategies, a collaborative filtering technique provides students the opportunity to rate and comment on existing learning objects. This allows the student to reflect on his or her learning experience, and the feedback enriches the repository for other users. Metacognitive strategies are also supported by the system, with the generation of self-assessment exercises allowing students to better monitor their knowledge of the concepts being studied.

While still in an early stage of development, the new online collaborative learning object repository will be fully operational by the end of the year. The system will be used in conjunction with the traditional teaching of "Programming Languages and Paradigms" in the first semester of 2012. Results of the 2012 course will then be compared to the results presented in this study to help evaluate the new teaching approach. It is hoped that the support offered by the new system will improve equality of teaching for computer science students, by offering the best strategies and objects for their different learning styles.

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The potential role of collaborative learning in enhancing e-learning systems: evidence from Saudi Arabia

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Despite the considerable potential for e-learning to help bring about improved learning outcomes, particularly for female students and students who need to rely on distance learning, feedback from current users of e-learning systems in the Kingdom of Saudi Arabia (KSA) suggests a relatively low level of satisfaction. This study adopts a mixed-methods approach to investigate the underlying reasons for this situation. The results indicate that students are not unhappy with the information technology infrastructure or with other technical aspects. However, many students report a low level of interaction between them and their fellow students. When such interactions do occur, an overwhelming majority of students indicate that they find such interactions. Together, these findings suggest that greater student interaction, which could be fostered through the use of collaborative learning, is likely to be both popular with students and beneficial to their learning outcomes.

Keywords: e-learning, collaborative learning, Saudi Arabia.

Introduction and background

According to the Communications and Information Technology Commission (CITC), the Kingdom of Saudi Arabia (KSA) is one of the fastest growing countries in the world in terms of e-learning. CITC data shows an explosive growth in the number of internet users generally, from a mere 200,000 in 2000 to 4.8 million in 2006 (CITC 2010). The number of students enrolled in institutions of higher education has also increased significantly in recent years. As a result, many of these institutions have turned to e-learning systems as a means to help broaden and enhance access to their courses and subjects (Al Saif 2005). Reflecting this trend, a growing number of research studies have been conducted on e-learning in KSA. Many of these studies have focused on identifying the key factors that differentiate online education from face-to-face learning, analysing the advantages and disadvantages of online courses, investigating factors that facilitate or hinder the adoption of e-learning, or developing strategies to achieve a suitable online learning environment (Alshehri 2005). To date, however, relatively little attention has been paid to the issue of assessing the e-learning environments that have been set up in the country, especially from the viewpoint of student users.

This paper is part of a research project that has been conducted in response to this gap in the literature. The overall project's aim is to evaluate existing e-learning environments in KSA on the basis of a range of criteria and dimensions (Alkhalaf, Nguyen & Drew 2010). A key purpose of the present paper is to focus more narrowly on student perceptions and feedback regarding these e-learning environments. It turns out that the level of satisfaction among student users is rather low. In the paper we also investigate some factors which may account for this disappointing result. Our findings suggest that one possible method to enhance existing e-learning environments may be to promote greater use of collaborative learning, which has the potential to make e-learning both more popular with the students and more effective in terms of learning outcomes.

Interest in e-learning has grown rapidly during the past decade or so in KSA, for at least several reasons (Albalawi 2007). First, the demand for higher education has far outstripped supply, such that institutions are faced with overcrowding and insufficient facilities and human resources for the delivery of traditional-style education to all of the nation's qualified applicants for admission. This has occurred despite the fact that in the five years to 2009, growth in the higher education system had seen the opening of one university every three months and five colleges every month, and the award of 800 scholarships every month to students going abroad for further studies (Al-Shehri 2010). According to Al-Khalifa (2010), "thousands of students are over-enrolled … and are simply given the course materials and sent home to study on their own." E-learning has been suggested as a means to overcome the continuing limitations.

Second, KSA is a large country in terms of geographical area, with a significant number of communities being isolated from major population centres. E-learning offers the potential to deliver educational services to remote locations, thereby reducing disparities across the various regions and areas. Third, in KSA's higher education, men and women receive their instruction in separate classes, for cultural and religious reasons (Mirza 2007, 2008). This puts further strains on the limited facilities and human resources available. In particular, there is a considerable shortage of female lecturers (Al-Khalifa 2010). It has been observed, accordingly, that women are often among the strongest supporters of e-learning, and may have the most to gain from further growth in e-learning (Bates 2009).

In 2008 the KSA Ministry of Higher Education established a National Centre of E-learning & Distance Learning to promote and facilitate the spread of e-learning systems in Saudi universities. For a description of how various e-learning environments have been set up throughout the country, in the universities as well as the technical education and vocational training sector, see Al-Khalifa (2010) and Al-Jarf (2007). The latter also provided an analysis of the challenges facing providers of these e-learning environments. In keeping with the rapid expansion in e-learning infrastructure and usage, the number of studies focusing on Saudi experiences with e-learning has also grown. According to a survey by Weber (2010), the total number of peer-reviewed studies of e-learning in KSA published during the period 2000-2010 was over 150, making the country the second highest producer of such studies in the Middle East and North Africa region.

Despite this voluminous literature, the number of studies that focused on assessments or feedback from students who have actually used the existing systems has been rather small. For example, Ali, *et al.* (2003) were more interested in factors which influence students' preferences for online courses vs. conventional classes than in the feedback from students who have taken online courses. Similarly, Alenezi, *et al.* (2010) focused mainly on the determinants of students' decision to accept or reject e-learning, rather than their experiences once they have decided to accept. In this paper, we contribute toward addressing this relative gap in the literature by studying the requirements, preferences, as well as experiences of students who have used e-learning systems in KSA.

Methods

The research underlying this paper involved a mixed-methods approach. Informed by the findings of previous studies of e-learning in KSA, a series of interviews were conducted to obtain qualitative information. Based on this information, as well as a review of related studies involving user satisfaction surveys, a questionnaire instrument was then designed and used to collect quantitative ratings.

Four faculty members from King Saud University and two from Qassim University were selected at random for the interviews. The only requirement was that they had conducted teaching with some use of e-learning technology. The questionnaire instrument consisted of 21 questions, which had been developed after a review of a large number of recent surveys of user perceptions and satisfaction in the ICT, IS and e-learning fields, including Mansour & Mupinga (2007), Gable, Sedera & Chan (2008), Wang, Tang & Tang (2001), Wang & Liao (2007) and Wang, Wang & Shee (2007). Questionnaire forms were distributed to 130 undergraduate students at the same two universities as above, again at random, with the only proviso that the recipient had taken a course which used e-learning technology. 88 sets of responses were returned, but only 77 sets contained usable responses.

Findings

Qualitative findings from interviews

The findings from the interviews were qualitative. Due to space limitations, they cannot be described in detail here. It is nevertheless important to acknowledge that they helped the authors to gain a better understanding of the e-learning situation in KSA, especially the use (or non-use) of collaborative-learning tools and methods, and students' general attitudes about e-learning. In turn, this knowledge facilitated the development of the questions to be included in the survey instrument.

Quantitative findings from questionnaire survey

Table 1 presents a numerical summary of the responses obtained from the 77 participants in the questionnaire survey. The answers to each question are coded according to a five-point Likert scale, where typically 1 indicates the least, and 5 the most, favourable rating from an e-learning point of view. The first 7 questions relate to the respondent's personal preferences, requirements and acceptance of e-learning as an alternative mode of learning. The average ratings on these questions are mostly between 3.0 (indicating a neutral stance) and 4.0 (indicating a favourable stance).

For example, in response to Question A1, the average rating is 3.47, suggesting that students were generally confident and comfortable with using the relevant technology required for e-learning. Similarly, the mean response to Question A2 is 3.53, indicating that students had a moderate amount of trust in the information that was presented through e-learning. The mean response to Question A3 is quite high (4.21), suggesting considerable enthusiasm for audio and video material, and pointing to an area where e-learning technology clearly has the potential to make a positive contribution. The mean rating for Question A4 is also favourable (3.94), confirming that students found it useful to be able to download and/or print learning materials for ready access.

Question A5 is of direct relevance to our purposes, as it asks participants to indicate the extent to which they would prefer if the lecturer used e-learning technology, including collaboration tool. Students' responses are rather lukewarm: the average rating is only 2.88, which is slightly less than neutral. In the context of answers provided to other questions as well as to this one, we interpret this rating as indicating that where students already had access to lecturers on a face-to-face basis, they did not have any strong desire for increased use of e-learning technology. This result is consistent with previous findings (e.g., Ali, *et al*. 2003).

By contrast, students provided highly affirmative responses when asked whether e-learning offers opportunity for women to attend online classes instead of mixed classes (Question A6), giving this question one of the highest mean ratings (4.58) in the survey. It is clear that, on the whole, respondents recognised the important role that e-learning can play in helping women to overcome possible obstacles to higher education. This is consistent with the suggestions from some previous authors that the biggest winners from greater use of e-learning in KSA are likely to be women (see references provided above).

It is interesting to compare the moderately favourable responses (mean = 3.57) to Question A7, which asks the extent to which students *accepted* the use of e-learning instead of face-to-face classes, with the rating of only 2.88 obtained for Question A5 (discussed above). Taken together, these responses suggest that although students with access to face-to-face classes did not particularly wish to see greater use of e-learning technology, they did recognise the essential role of e-learning in the current KSA context, e.g., to meet the requirements of a rapidly growing education system and to address the needs of female students as well as students in remote areas.

The next 5 questions are related to various aspects of the existing e-learning setup. Question B1 is the most general, asking students to provide an overall rating on the current use of e-learning in KSA. The answers are generally negative, yielding a mean rating of only 2.22, the lowest of all mean ratings in Table 1. (Recall that in this context, a rating of 2 would indicate an assessment of “poor“.) In view of the vast amounts of resources that have been invested in developing e-learning systems in the Kingdom over recent years, such negative assessments must be seen as disappointing. However, they are consistent with the suggestion made by some previous authors (e.g., Bates 2007) that e-learning in KSA is like the road system there: the infrastructure is already in place and is generally good, but usage of the infrastructure remains poor.

Table 1: Summary of responses to survey questions

Questions		Mean	SD
Personal preferences and acceptance of eLearning			
A1	How confident are you in the use of e-learning technology?	3.47	1.10
A2	How much do you trust the information which is presented through e-learning technology?	3.53	0.86
A3	To what extent does the quality of audio and video material help you to obtain a high level of e-learning?	4.21	0.92
A4	How important is it for you to be able to download and / or print e-learning materials?	3.94	1.08
A5	I would prefer if the lecturer used e-learning technology, including collaboration tools.	2.88	1.23
A6	Does e-learning offer opportunity for women to attend online classes instead of mixed classes?	4.58	0.89
A7	To what extent do you accept the use of e-learning instead of face-to-face classes?	3.57	0.93
Aspects of e-learning including technical issues			
B1	How do you rate the use of e-learning in Saudi Arabia's universities?	2.22	0.98
B2	How do you rate the response time of your e-learning system ('browser speed')?	3.36	1.08
B3	How would you rate the level of availability (ease of access) of e-learning during peak usage times?	3.36	1.77
B4	How would you rate the importance of the e-learning technology infrastructure (software and hardware) in this class?	4.22	1.02
B5	The information or functionality that you need is easy to find (system is easy to navigate).	2.61	0.97
Interaction and collaboration			

C1	Are you able to interact with the lecturer during class, using the available e-learning technology?	3.37	1.15
C2	How would you rate the level of interaction with your classmates or other students during use of the e-learning system?	2.82	0.98
C3	Does this course require that you collaborate with other students in the class (e.g. group project)?	3.21	1.97
C4	Do you feel the need to collaborate (discuss or informally interact) with other students in this class?	3.86	1.77
C5	How would you rate the usefulness of interaction with your classmates or other students during use of the e-learning system?	4.60	0.97
C6	How do you rate the ease of using collaborative e-learning in this course?	3.36	0.85
C7	Does the technology provide facilities for collaboration?	4.21	1.5
C8	If you are using the technology to interact with classmates (individuals or in groups) please rate the ease of use of this technology.	3.47	0.84
C9	The design of the collaboration tools (chatroom, discussion board, etc) is suitable for my needs.	3.87	0.98

Responses to Questions B2 to B5 generally support the above interpretation. The mean ratings for B2 and B3 (both 3.36) indicate that browser speed, system response time, etc. were not a problem for students, even during peak usage times. Responses to Question B4 (mean = 4.22) confirm that students saw both software and hardware infrastructure as highly important. This finding has implications for designers and advocates of e-learning systems, as does the fact that answers to Question B5 (about the ease of navigating e-learning systems) are generally negative (mean = 2.61). To the extent that dissatisfaction with current systems could be reduced via changes in information technology systems, it appears that the most useful of such changes are likely to be on the “soft”, rather than the “hard”, side.
The last 9 questions in Table 1 focus on the interaction and collaboration between users of the current e-learning systems. For brevity, we shall now discuss overall patterns in the responses to these questions, highlighting individual questions only where they are of special interest. In general, the ratings obtained for Questions C1 to C9 are quite positive, ranging mostly from 3.36 to 3.87. On the lower side, there are two exceptions to this general observation. Question C2 asks the respondent to rate the level of interaction with their classmates or other students during use of their e-learning system, whilst Question C3 asks if the relevant course requires students to collaborate with each other. The average responses (2.82 and 3.21, respectively) are close to neutral, but they mask the fact that the distributions of the relevant ratings are bi-modal: a sizable group of the respondents had not been required to collaborate (C3), and therefore it is not surprising that their ratings for Question C2 are lower than ratings from students who had been required to do so. As we shall see below, how these bi-modal distributions relate to each other may hold significant implications for academics as well as designers of e-learning systems.

On the upper side, a clear exception is Question C5, which is about students’ assessment of the usefulness of interaction with their fellow students. The mean rating for this question (4.60) is the highest of all questions included in the survey. This overwhelmingly positive response suggests that a relatively efficacious (“low-hanging fruit”) approach to improving students’ satisfaction would be to facilitate and encourage greater interaction and collaboration among themselves. It has long been accepted that a collaborative approach to learning offers many distinct advantages (see below). The current results suggest that those advantages apply strongly in the case of e-learning in KSA at the present time.

If universities were to decide to make a shift toward collaborative learning, it would be highly feasible to carry out this shift from an infrastructure point of view: at 4.21, the mean rating for Question C7 is higher than most, indicating that the existing technology already provided adequate facilities for student interaction and collaboration. This result is consistent with the average rating for Question C9, which indicates a favourable

(3.87) assessment of the current design of collaboration tools, such as chat rooms, discussion boards, etc.

Differences in responses by male and female students

It is evident from the above discussion that in KSA female students have requirements and expectations regarding e-learning that may be quite different from those of male students. Accordingly, Table 2 compares and contrasts the responses from male and female participants. The last two columns present summary results from applying the non-parametric Mann-Whitney test to corresponding ratings from these two groups.

It turns out that the answers from women differ significantly (at the 10% significance level) from men's responses to only three questions. In response to Question A1 and C6, the ratings from women are systematically lower than from men, indicating that female students tend to feel less confident and comfortable with using e-learning technology in general and with collaboration-enabling technology in particular. Nevertheless, they are more receptive than men to the possibility of greater use of e-learning technology by current lecturers (Question A5). Taken together, these results suggest that although women might be less likely to perceive themselves as proficient with the technologies involved, they tend to see greater net benefits arising from a hypothetical increase in the use by faculty members of e-learning technology.

Differences in responses by students who were required, and students who were not required, to collaborate

Table 3 presents a comparison between ratings from students who were not required by their e-learning course to collaborate with fellow students and ratings from students who were required to do so. Mann-Whitney test results indicate that the ratings from the latter group are significantly higher than ratings from the former with regard to a number of questions. Of these, Questions C4 and C2 are probably the least surprising inclusions: in courses where students were required to collaborate, one would indeed expect that they felt a greater need to do so (overlapping perhaps with a sense of compulsion), and that they ended up collaborating more than if there had been no such requirement.

Table 2: Differences in responses by male and female students

Questions (abbreviated)		Males		Females		Mann-Whitney	
		N1	Mean	N2	Mean	Z	Prob.
A1	Confident in the use of e-learning technology?	51	3.61	17	3.06	-1.89	0.06
A2	Trust information presented through e-learning?	48	3.50	14	3.64	-0.46	0.64
A3	Quality of audio and video material help you?	56	4.27	16	4.00	-1.07	0.28
A4	Important to download & print materials?	48	3.94	14	3.93	-0.48	0.63
A5	Prefer if lecturer used e-learning technology.	45	2.73	12	3.42	-1.69	0.09
A6	e-Learning offers opportunity for women to attend?	45	4.71	15	4.20	-1.61	0.11
A7	Do you accept e-learning instead of face-to-face?	53	3.58	16	3.50	-0.20	0.84
B1	How do you rate the use of e-learning in Saudi Arabia's universities?	48	2.21	12	2.25	-0.25	0.80
B2	Rate response time ('browser speed')?	48	3.35	13	3.38	-0.24	0.81
B3	Rate availability during peak usage times?	36	3.33	9	3.44	-0.18	0.85
B4	Rate importance of technology infrastructure (software and hardware)?	44	4.27	10	4.00	-0.93	0.35
B5	System is easy to navigate?	53	2.55	16	2.81	-1.37	0.17
C1	Able to interact with lecturer during class, using the available e-learning technology?	49	3.39	16	3.31	-0.41	0.68

C2	Rate level of interaction with classmates or other students during use of the e-learning system?	51	2.75	14	3.07	-1.06	0.29
C3	Rate usefulness of interaction with classmates or other students during use of system?	39	4.56	11	4.73	-0.11	0.92
C4	Does this course require that you collaborate with other students in the class (e.g. group project)?	50	3.06	16	3.69	-0.98	0.33
C5	Do you feel the need to collaborate with other students?	54	3.70	17	4.35	-1.11	0.27
C6	Rate the ease of using collaborative e-learning?	43	3.49	16	3.00	-1.93	0.05
C7	Does the technology provide facilities for collaboration?	46	4.13	11	1.45	-0.64	0.52
C8	If you are using the technology to interact with classmates please rate ease of use of this technology	48	3.50	14	3.36	-0.54	0.59
C9	Design of collaboration tools (chatroom, discussion board, etc) is suitable for my needs	47	3.81	13	4.08	-0.71	0.48

Of greater interest is that ratings for Question A5 from the latter group (required to collaborate) are significantly higher than those from the former, suggesting that as students were required to collaborate with each other, such interaction tended to spill over to greater acceptance of usage by the *lecturers* of e-learning technology. It is also interesting to note that students who were required to collaborate gave significantly lower ratings for Question A4, suggesting that they might find information sharing and peer-group discussion to be more useful than strict adherence to class material, which tended to be far more important to students who studied by themselves.

Two other results reported in Table 3 are also of considerable interest, despite being not statistically significant (at the 10% level). First, responses to Question B1 suggest that students who were required to collaborate in their e-learning course might have a rather more favourable view of e-learning overall: their average rating is 2.41 compared with 2.14 for the group not required to collaborate -- the difference would have been significant at the 30% level. Second, 14 of the students who were not required to collaborate *did so anyway*: as their mean rating for Question C3 (4.93) shows, these 14 students were nearly unanimous in reporting that the experience was very useful to them (recall that 5 is the highest possible rating).

Table 3: Impact of requirement to collaborate

Questions (abbreviated)		**Not required to collaborate**		**Required to collaborate**		**Mann-Whitney**	
		N1	**Mean**	**N2**	**Mean**	**Z**	**Prob**
A1	Confident in the use of e-learning technology?	24	3.79	32	3.16	-2.04	0.04
A2	Trust information presented through e-learning?	20	3.55	31	3.52	-0.05	0.96
A3	Quality of audio and video material help you?	27	4.41	32	4.03	-1.58	0.11
A4	Important to download & print materials?	22	4.23	30	3.73	-1.88	0.06
A5	Prefer if lecturer used e-learning technology.	20	2.50	30	3.13	-1.97	0.05
A6	e-Learning offers opportunity for women to attend?	20	4.60	30	4.57	-0.58	0.56
A7	Do you accept e-learning instead of face-to-face?	26	3.65	32	3.44	-0.65	0.52
B1	How do you rate the use of e-learning in Saudi Arabia's universities?	22	2.14	29	2.41	-1.04	0.30
B2	Rate response time ('browser speed')?	23	3.48	29	3.14	-0.94	0.35
B3	Rate availability during peak usage times?	13	3.77	25	2.96	-1.35	0.18

B4	Rate importance of technology infrastructure (software and hardware)?	20	4.25	24	4.38	-0.08	0.94
B5	System is easy to navigate?	25	2.68	31	2.58	-0.42	0.68
C1	Able to interact with lecturer during class, using the available e-learning technology?	22	3.09	32	3.41	-1.12	0.26
C2	Rate level of interaction with classmates or other students during use of the e-learning system?	22	2.36	31	3.03	-2.25	0.03
C3	Rate usefulness of interaction with classmates or other students during use of system?	14	4.93	28	4.46	-1.48	0.14
C4	Does this course require that you collaborate with other students in the class (e.g. group project)?	28	1.00	35	5.00		
C5	Do you feel the need to collaborate with other students?	28	2.64	34	4.85	-4.73	0.00
C6	Rate the ease of using collaborative e-learning?	20	3.50	31	3.19	-1.04	0.30
C7	Does the technology provide facilities for collaboration?	22	3.91	27	4.48	-1.15	0.25
C8	If you are using the technology to interact with classmates please rate ease of use of this technology	21	3.33	31	3.55	-0.86	0.39
C9	Design of collaboration tools (chatroom, discussion board, etc) is suitable for my needs	19	4.16	30	3.87	-1.04	0.30

Implications: potential role of collaborative learning

A natural implication of the above findings would seem to be that e-learning courses in KSA should encourage, or indeed should even require, students to collaborate. Thus the collaborative (or cooperative) learning approach may be able to play an important role in enhancing the effectiveness of current e-learning environments. This learning approach has long been the subject of much study by educational researchers and designers (e.g., Slavin 1980, 1983a, 1983b, Hooper 1992, Koschmann 1996, Okamoto 2003, Tomsic & Suthers 2006, Dewiyanti, *et al.* 2007, Liaw & Huang 2007, Cattafi & Metzner 2007).

Collaborative e-learning offers many advantages. The process itself tends to increase interaction and create a sense of belonging. Collaborative e-learning environments may allow students, especially those who are shy in face-to-face situations, to participate in online discussions and meetings, offer and receive critiques, negotiate, and build consensus. This advantage may be of special significance in KSA, where face-to-face interactions between male and female learners are often not an option.

Of course, conflict between individuals can also occur, and a poorly designed or poorly run e-learning environment may allow some negative, undesirable interactions to develop. Therefore, care must be taken in developing and moderating the relevant environment.

In the current context, where many Saudi universities have already put in place their own e-learning environments, the process of increasing the emphasis on collaborative learning can be implemented through a series of coordinated, institution-wide measures, as illustrated in Figure 1. As envisaged, there would be a project (upper left hand side of Figure 1) aimed at coordinating efforts to enhance the existing e-learning environment, and possibly another project (lower left hand side) aimed at enhancing the learning management system (LMS) if this is required.

The e-learning improvement project's key activities would be:

1. to redefine/amend principles, policies and tasks associated with the current e-learning environment in order to re-orient it more toward collaborative learning;
2. to provide training and technical support to faculty staff as they revise their teaching materials and methods; and
3. to redefine/amend principles, policies and tasks of the LMS.

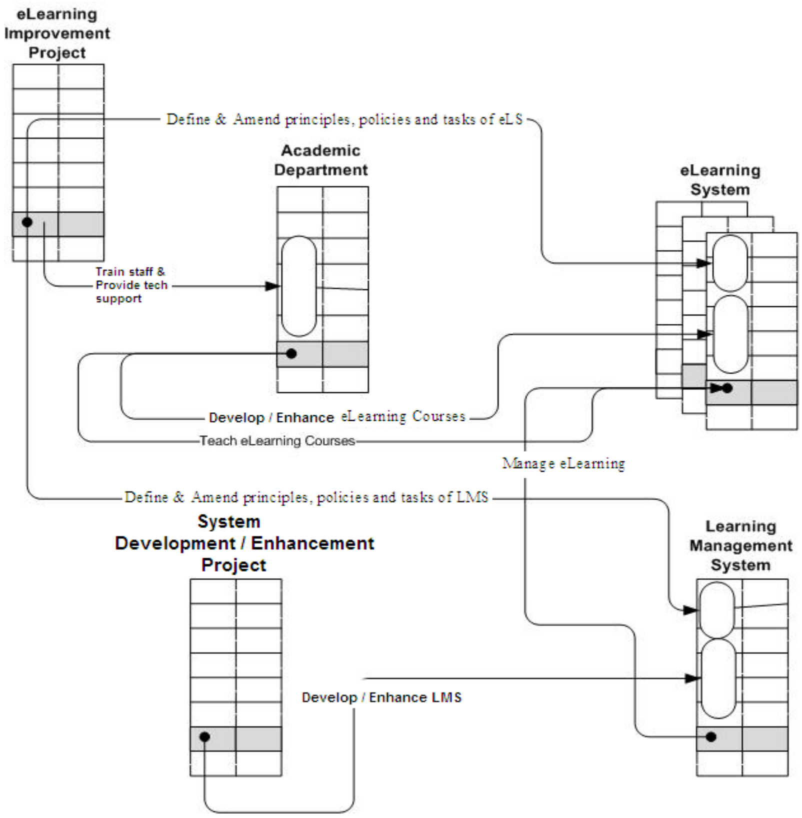

Figure 1: Proposed measures to enhance existing e-learning environments

Conclusion

Responses from students at two major Saudi Arabian universities suggest that existing e-learning systems in the country are rated rather unfavorably by student users. This has occurred despite massive investments having been made in terms of infrastructure, hardware and software, and despite the fact that students are generally satisfied with technical issues, such as browser speeds and system availability during peak usage times. There are reasons to believe that student satisfaction levels may be increased if they are encouraged (or indeed required) to interact more with their classmates and colleagues while using e-learning systems.

At present student dissatisfaction does not stem from a lack of available technology: indeed, students are satisfied with the design of available collaboration tools (e.g. chatrooms and discussion boards). However, it appears that course designs have not made sufficient use of such collaboration tools. Almost half of the responding students report that they are not required to collaborate with other students. Students who are required to collaborate (e.g. group projects) tend to report more positive responses to e-learning experiences. Efforts to encourage student interaction, even to the extent of requiring students to complete compulsory collaborative tasks, are thus likely to enhance Saudi Arabian students' e-learning experiences.

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The creative graduate: cultivating and assessing creativity with eportfolios

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Changing demands for graduate capabilities lead to changing directions for undergraduate assessment. 'Creativity' is a widely promoted graduate capability that relates to many others, such as independent learning and innovative problem-solving. Assessment practices need to become more focused on the evaluation of generic capabilities, additional to assessment of discipline-specific knowledge. This has implications for the content, design and modes of assessment. Assessment as learning promotes an approach in which the learning activity and assessment task are one and the same, and authentic assessment design incorporating group work, problem-based, online and portfolio assessment enable the development of generic capabilities to be embedded in the discipline. The paper explores creativity as a graduate capability, the creative potential of digital media, and how changing directions in assessment practice could support the assessment of creativity, with a focus on using eportfolios in assessment.

Keywords: creativity, assessment, eportfolios, graduate capabilities, digital literacy

The creative graduate

Creativity is increasingly represented in higher education aspiration statements as an attribute that graduates require to successfully engage in contemporary and future professional life. Several other generic capabilities seem intrinsic to creative behavior such as independent learning, critical thinking, innovative problem solving and information and digital literacy, but how are these to be embedded into curriculum and assessment practice? Portfolios have been widely used in 'creative' disciplines in higher education, and are beginning to be more prevalent in disciplines where evidence of meeting professional standards across a range of capabilities is critical. The emergence of technologies to support eportfolios allows not only the aggregating of material in a wide range of formats, but also the embedding of peer review and selective sharing via social networks. Eportfolios have the potential to provide a platform for holistic development and assessment of a range of graduate capabilities related to creativity.

The importance of creativity as a graduate attribute

The cultivation of creativity, not as an arts-related addendum to school curricula, but as an educational approach in itself has been seized upon by educationalists and cultural commentators such as Robinson (2000), Florida

(2002) and Pink (2005) who maintain that apart from any individual humanist benefit, new millennium economic imperatives demand the development of a greater capacity for creativity, among other dispositions such as empathy and collegiality. Robinson (2010) makes a compelling argument for the dismantling of educational paradigms that were developed to suit an industrial age economy, and a great deal of effort has been expended in the UK in particular in renewing curriculum to accommodate a more creative approach. Higher education too has been paying attention to the development of 'creative' graduate attributes such as innovative problem-solving, creative leadership and interdisciplinary practice.

Some transformative learning theorists suggest that a radical critique of the form and function of education is required, which must urgently engender new visions to deal with complex global problems (Miles, 2002; O'Sullivan, 1999; 2003; O'Sullivan & Morrell, 2002). This recalls Barnett's “being-for-uncertainty”, a quality that graduates need to develop to manage the 'supercomplexity' that is characteristic of the contemporary world, which is characterised by “certain kinds of disposition. Among such dispositions are carefulness, thoughtfulness, humility, criticality, receptiveness, resilience, courage and stillness.” (Barnett, 2004, p.258).

Industry agrees with these views, asserting that university graduates need a range of generic capabilities. A 2010 global study of CEOs by IBM found that creativity was believed to be the most crucial factor for a company's future success (IBM, 2010), and the Business Council of Australia (2006) identified the importance of creativity among other related capabilities, and cited employer concerns that graduate skills are lacking in these areas. Amabile (1998) has long suggested that industry would benefit by providing opportunities for employees to exercise their creativity, and suggests that the qualities required for creativity in business are expertise, creative thinking skills and motivation.

What does it look like?

Creativity is now increasingly promoted as a desirable learning outcome in different disciplines, and more generically as a graduate capability in higher education, so how can it be characterised in this context?

Conceptions of creativity as differentiated between ‘high’ (large-C) and ‘ordinary’ or ‘democratic’ (small-c” have emerged in recent decades, to support the idea that creativity is not the domain of only the brilliant and eminent, but is achievable by everyone (Csikszentmihalyi, 1996; Craft, 2001). These ideas have more recently been characterised as second-generation (McWilliam & Dawson, 2008), emphasising the social/cultural context and universal and collaborative nature of creativity in contrast to more traditional, first-generation, conceptions of creativity as mysterious, individual, and dependent on inspiration and aptitude The second-generation focus emphasises a personal, practical and socially-oriented creativity, and “locates the creative enterprise in the processes and products of collaborative and purposeful activity” (McWilliam & Dawson, 2008, p.633). While popular conceptions may continue to reflect first-generation notions it is the second-generation focus on creative capacity building that provides a more useful platform in the educational context (McWilliam & Dawson, 2009), and is a better fit with the professionally-oriented attributes articulated in higher education aspiration statements and industry skill-set statements.

Recent research suggests that creativity is best characterised as behaviour in a context, rather than as a skill or a capability, demonstrated by output or product, and that it may be more appropriately defined as a disposition (Ivcevic, 2009). Behaviour characterising a creative disposition encompasses a range of abilities and attitudes, including taking risks, making connections between disparate fields of knowledge, and being a motivated and independent learner. Such attributes could themselves be considered in the realm of dispositions rather than quantifiable skills or capabilities, incorporating the affective as well as the cognitive dimension of learning. For instance, some of the cognitive characteristics of creative behaviour that have been identified by Tardif and Sternberg (Sternberg, 1988) in their review of creativity research are: articulate and fluent, good imagination, flexible and skilled decision-maker, copes well with novelty, and finds order in chaos.

Creativity in curriculum

Academic and student conceptions

Investigating both academic and student attitudes to creativity in higher education, Jackson et al (2006) came across a range of understandings and definitions that were complex and frequently contradictory. Some students and teachers maintain a lingering attachment to romantic and individualist aspects of creativity, and are sceptical that it can be taught. Australian research has also shown that academic teachers often have understandings about creativity that combine first- and second-generation conceptions (McWilliam and Dawson, 2009). However, both academics and students believe that creative teaching can enable students to be creative in learning activities and outcomes. Students identified dialogic modes, where students' current understandings or beliefs are addressed, as supportive of creativity, while they felt strongly that prevailing modes of assessment (such as examinations) were generally inhibitive for creativity. Students also expressed frustration at a perceived conflict between being creative and conforming to 'academic' expectations (Oliver et al, 2006).

Academic conceptions across disciplines represented generic features of creativity such as: originality, use of imagination, exploration and risk-taking, making sense of complexity, and story-telling, and many academics believed that development of creativity was important, even though creativity was rarely explicit in learning outcomes or assessment criteria (Jackson & Shaw, 2006).

Creative teaching/creative learning

To accommodate these features of creativity in curriculum requires the setting of appropriate tasks in an appropriately flexible environment to both promote and support creative responses, and to allow risk-taking and mistake-making in a safe environment. Studies of school teachers have reported that while teachers apparently believe that most of their students have the potential for creativity, those students who display creative behavioural characteristics (such as playfulness, argumentativeness, independence) tend to be perceived by teachers as non-conformist and disruptive (Craft, 2001; Aljughaiman & Mowrer-Reynolds, 2005). It is not surprising then that students arrive in tertiary education with these behaviours repressed, and creative learning is unlikely to occur without a context in which creative behaviour is not only acceptable but supported and rewarded.

Sternberg (1996) has suggested that creativity is best taught through the teacher as a role model for creative practice. This is supported by Jackson et al (2006), who found that both academics and students believe that there is a close correspondence between creative teaching and the opportunity for creative learning. Teachers therefore need opportunities for innovating their own practice in a safe environment to enhance their self-perception as creative practitioners.

Assessment of creativity, even in creative disciplines, has tended to focus on assessment of product, whereas aspects of creativity such as process, person and place are all deemed to be critical to creative development (De la Harpe et al, 2009). The Studio Teaching Project (ALTC) has identified a range of identifiers in these different dimensions for the assessment of creativity, and has developed a holistic assessment model to support this.. The foci of this model are:

- Outcome dimensions: Product, process and person
- Knowledge and skills: underpinning and core
- Reflective and professional practice – acting like a [creative practitioner]

This model, represented in Figure 1, could be adapted to be more widely applicable across disciplines.

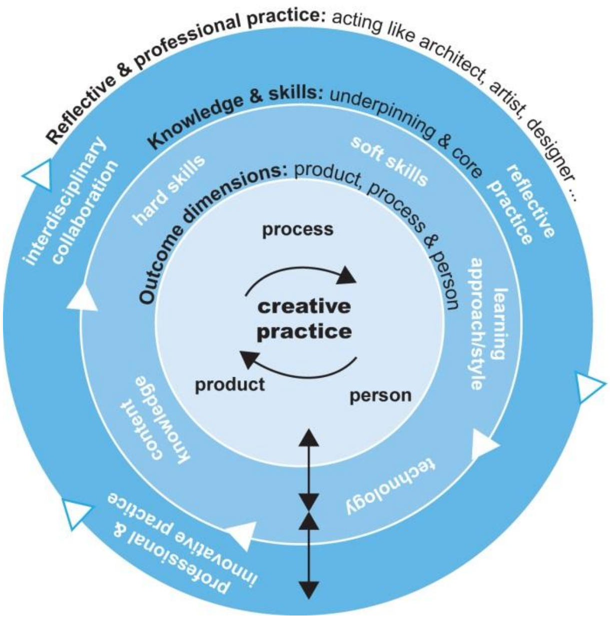

Figure 1. Model for holistic assessment in studio-based disciplines (adapted from De la Harpe et al, 2009, p47)

Assessing creativity with portfolios

The reflective aspects of this model are essential to provide the evidence for the ‘process’ and ‘person’ outcome dimensions, and the portfolio is an ideal assessment mode for these broader dimensions. Portfolios support the aggregation of selected pieces of evidence to demonstrate learning outcomes and achievements. To leverage the learning benefits of portfolio assessment, this usually includes a reflective dimension, where the learner analyses and evaluates their own learning processes.

Portfolios have the potential to support the development, demonstration and valid assessment of a wide range of personal, professional and academic capabilities, both inside and outside the study program, and develop good professional practice in the documentation and presentation of activities and artefacts. By allowing a degree of control over learning pathways and strategies, portfolio assessment promotes learner self-direction and motivation, and therefore engagement in learning activities. Because of the ability to aggregate different types of output, portfolios have been widely used in ‘creative’ disciplines, but are applicable to any discipline where the learning outcomes may require a range of types of evidence to be presented (Baume, 2001).

As Krause (2006) indicated “portfolios are a useful vehicle for facilitating critical reflection on one’s learning and for compiling and demonstrating evidence of learning and skill development” (p.1) as they catch and preserve the evidence of learning. This critical reflection is imperative for higher education in supporting the development of graduate attributes. Provision of evidence of these capabilities often is driven by the student toward the end of the learning cycle as students gather evidence for resumes or CVs for accreditation to associations and professional institutions.

This reflection on learning is important for students as they exit higher education and seek employment in their respective disciplines. Reflective practice and self-assessment of learning is critical for remembering, conceptualising and analysing constructed knowledge after time. As Strampel and Oliver (2007) inferred, “reflection is a way of thinking; it is a form of contemplation that determines how one comes to act on new understandings” (p.980). Portfolios are useful tools for this conceptualising of practice in assessment. They encourage and facilitate student reflection while they compile and develop evidence of learning throughout the learning process and at the completion. Utilizing digital platforms for this reflection can further enhance the learning process, including ongoing thinking and reflection and action on reflection (Schön, 1987).

Creativity and digital media

Digital literacy

Digital literacy is another capability emerging as a critical skill for graduates to function as global professionals in many fields. Prensky’s (2001) notion that ‘digital native’ students are well-versed in technology use in contrast to their ‘digital immigrant’ teachers has largely been discredited by subsequent research (Kennedy et al, 2008), who found that students are not homogeneous in their use of technology, which tends to be ad hoc and opportunistic. Students need support from their learning environment to not only learn how to use online learning systems, but also to identify, set up and evaluate a range of tools and networks and thereby apply digital production and networking skills to their study and work. While teachers may integrate and manage course elements in a learning management system (LMS), and that has great benefits for learners, practice for students in using a range of media, publishing and networking tools is likely to be more relevant to their professional lives.

Digital literacy inevitably overlaps with information literacy as students have available to them a morass of online information of varying quality and validity, and need to develop the skills to navigate, evaluate, select and contribute to online information. Matthew Allen (2009) refers to ‘knowledge networking’ as a new paradigm in professional and scholarly practice, and has developed strategies and identified available web applications to support teachers and students in higher education to develop the digital literacies required (Allen, 2011).

Technology can provide a platform for teachers to model and scaffold creative activities and outputs. Individual teachers may not be able to develop expertise in all the available technologies, but they need to be able to demonstrate a facility with an open and collaborative way of working, including the ability to learn on one’s feet when confronted with unfamiliar technology. This is an area where students and teachers could profitably learn from each other.

Creative digital tools

Digital media provide a plethora of opportunities for the design, development and presentation of creative work – the tools for creative production have arguably never been so accessible, with almost every student in Australian universities having access to a digital still or video camera, a desktop and/or laptop computer with image, audio and video editing capability, and high-speed internet access to a huge range of productivity software and publication platforms. The social orientation of Web 2.0 tools is highly supportive of the development of communication and networking skills. These are powerful resources for teachers and learners in the development of the broad range of capabilities intrinsic to creativity. What is required is the scaffolding for learners to produce, critique and publish work relevant to their field of study, in a way that will leverage this potential.

If key characteristics of creative behaviour are being able to take risks, step outside of one's comfort zone, and to think both divergently and convergently around different domains of knowledge, this is a meta-capability beyond the scope of any particular communication or publication tool. From this perspective, the design and scaffolding of the learning activity is of primary importance, and is where the creativity of the teacher has the most impact.

In the E-Learning and Social Networking Handbook, Mason and Rennie (2008) map a list of student learning needs and examples of related learning activity to a range of emerging technologies. The list does not specify that any of these learning needs or activities are related to learning creativity, or learning creatively. Yet it is not difficult to envisage how they may be employed to that end - the critical element is the creative focus being present in the intention of the teacher, the understanding of the learner, the design of the learning activity and the assessment of the learning outcomes. For example, see Table 1.

Table 1. (from Mason & Rennie, 2008, p.49)

Student learning need	Example of student activity	Extended/emerging technology
Developing understanding	Linking information from different sources	e-portfolios, Mashups
Linking theory to practice	Learning by doing	IMS tutorials, Screencasting
Practising articulation of ideas	Reflective journal	Blogs, Podcasts
Practising teamwork	Group projects	Social bookmarking, Wikis

Some of the Web 2.0 tools discussed by Mason and Rennie are: blogs, wikis, podcasts, e-portfolios, social networking, social bookmarking, photo sharing, Second Life, online forums, video messaging, e-books, instant messaging, Skype, games, mashups, mobile learning, RSS feeds and YouTube. Many others are available at: http://www.go2web20.net/.

Assessing with eportfolios

> "[Eportfolios] have the potential for transforming … curricula through the linking of practice-oriented learning and the development of graduate attributes" (Housego & Parker, 2009, p.409)

One of the benefits of a portfolio mode of assessment is that it scaffolds the compilation of evidence and artefacts in a range of media, which is then compiled into a presentation format, or formats, for a variety of purposes. An eportfolio approach provides additional affordances, in that it not only aggregates artefacts produced in digital form using technologies such as those listed above, but that it is integrated into online networking and communication tools to allow a wide range of connectivity and presentation options. The dimensions of practice, learning and research that can be aggregated and organised, and the range of purposes for which an eportfolio can be used is illustrated in Figure 2.

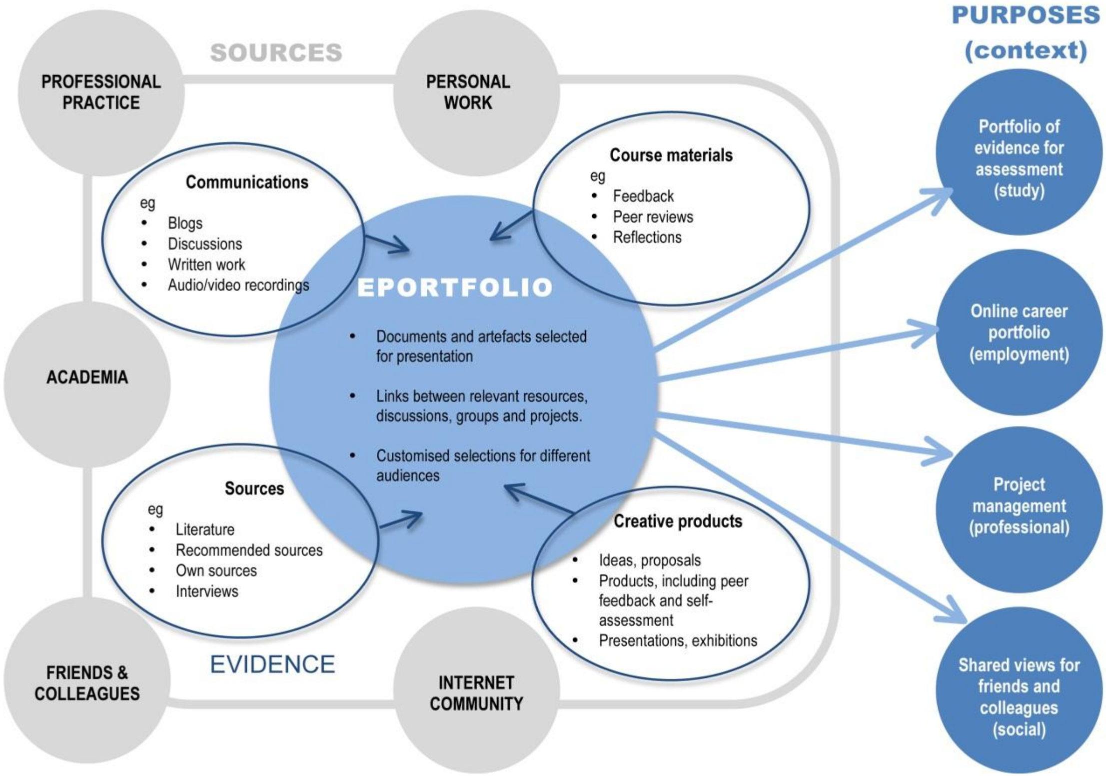

Figure 2. Model for eportfolio practice

As a pedagogical tool, eportfolios differ from more traditional folios of practice. In the 21st century, as Web 2.0 tools develop, eportfolios have the potential to address the lack of integration across existing programs because they can be used across teaching programs and contain all electronic documents related to learning from assessment tasks, tests, feedback and student work samples. As eportfolios are goal driven, students are self-directed and ownership of the portfolio helps students take responsibility for their own learning, and for publishing and disseminating their own content. For an example of how this could work to integrate student learning with professional practice, see the Scenario below.

Scenario

Alice Lee is an environmental engineering student, in her second year. The curriculum for her program includes many authentic activities and assessments to ensure that she develops broad professional skills alongside her discipline-based knowledge. With the new eportfolio assessment mode, it is her responsibility to see what skills she needs to develop and what assessment tasks she can complete to achieve the required outcomes.

Looking at her assessments so far, she has been doing well in evaluations of her achievements in creative problem-solving and self-directed learning. To demonstrate these capabilities she proposed an innovative solution for minimising pollution from fish-farming, and independently conducted a research project on the feasibility of her proposal. She now needs to do some team-work to gather evidence on her ability to lead and work within a team. A group project will also allow her to get peer feedback on her oral and written communication, and to demonstrate her ability to give and receive feedback.

Alice knows that her creative approach to projects is one of her strengths, but that it can be challenging to other team members. She selects a problem-based team project where her creative abilities will shine, and she hopes that through her leadership she will be able to help other team members develop their own creative abilities – being able to see problems from multiple perspectives, make connections between fields of knowledge, and take risks in proposing and testing possible solutions.

The curriculum materials include a project work template that is helpful in suggesting ways that the group can work to maximise creativity in their outcomes, as well as practice several other generic skills. The first strategy is for members to use a role-play activity to critique their own perspectives, and to develop some shared understandings of the problem, as well as awareness of the range of possible perspectives. One of the group members suggests that they use a social media network as they work on this – it allows them to easily publish their own thoughts, comment on others, and introduce any internet and other sources that they find. They will also be able to extract content from here to publish in the final eportfolio presentation. Alice finds this challenging as she has tended to be a solo worker, but knows that it will give her the opportunity to develop important digital literacy skills.

The team decides that their final presentation will be a website, which will allow them to aggregate a variety of media to show their project outcomes, and then easily publish to the internet for future use such as employment portfolios …

… It is four years later, and Alice is now employed at a regional council as environmental engineer. The course work she completed on her own as well as the group projects have been valuable in securing her career as through the eportfolio she was able to easily select and present the relevant work, and show evidence of the broad range of skills she developed. She's really happy, now that she's working away from the city, that she also learned so much about online networking and communication, and regularly runs workshops for other council employees on using digital tools.

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The transformative potential of eportfolios

Transformation suggests a significant perspective change, which could apply personally to the learner and the teacher, as well as to the curriculum design and the teaching situation.

Intrinsic to transformative learning is the learner's experience of a disorienting dilemma which propels them into a cycle of critical reflection and dialogue, provoking them to question assumptions and 'try on' new perspectives (Mezirow, 1991). There are several aspects of eportfolio use that learners may find confronting or disorienting, including the development of efficacy with the relevant technologies, the incorporation of self- and peer-assessment into the learning process, and a more-or-less public enactment of the reflective cycle. For the transformative potential of eportfolio assessment to be realised this process must be scaffolded and supported – the simple provision of the technology is not sufficient. Effective assessment through eportfolios encourages critical reflection as students gather digital artefacts and evidence to demonstrate the development of their knowledge, skills and competencies. Eportfolios can further this gathering approach for folios by acting as an official record of a student's work. As (Housego & Parker, 2009) inferred, eportfolios "enable students to integrate their experiences at the University and make a substantial contribution to their personal development" (p.409).

The engagement of teachers in the practices and technologies of eportfolio use is important if they are to model creative practice, and this may be as confronting and transformative for teachers as it is for learners. Teachers are likely to be already engaged to some degree in development of their own portfolio of work, research and personal activities, and that this could be the basis for the development of their own eportfolio practice. This academic development process likewise needs to be supported and scaffolded, ideally through a community of practice where they are able to participate in critical reflection and dialogue with peers.

Hughes (2008) has asserted that eportfolios could be characterised as transformative technology in that using these in assessment requires a change to traditional assessment practices, and to learner and teacher roles in assessment: "Adopting eportfolios as genre and practice requires us to engage with our learners in meaningful individual and collaborative activities, it requires us to cultivate dialogic cultures which make connections beyond the immediate and it demands that we interrogate notions of authorship and audience" (p.439). Such questions of identity, communication and expression are intrinsic to conceptions of creativity as socially-mediated behaviour. Eportfolio assessment is able to focus on both cultivating and providing evidence of creative identity and voice, by scaffolding process and supporting evaluation across developmental dimensions (see Figure 2).

Krause (2005) indicated that while eportfolios have the potential to transform pedagogy; this potential cannot be realised without real curriculum change. Leveraging the use of technology for curriculum transformation is a complex process, explored by the JISC project 'Transforming curriculum delivery through technology: Stories of challenge, benefit and change' (2011). One critical finding of this study, which involved 16 institutions, was the importance of involving learners themselves in curriculum change:

> "The empowerment of learners through technology-enabled innovations is arguably the most far-reaching outcome from the programme. Work by the projects both enhanced learning and placed learners at the heart of curriculum change. Tools and processes to help learners make sense of the curriculum and adopt increasingly more active roles in its development and delivery"
> (JISC, 2011, p.9)

Key points relating to this were that "small but crucial interventions can result in transformative effects" and "greater learner empowerment requires an increased focus on digital literacy skills". (JISC, ibid, p.9)

Their 'Achieving transformation' graphic, representing some of the findings of this project, can be found at: http://www.jisc.ac.uk/media/documents/programmes/curriculumdelivery/Achieving_Transformation_figure.pdf

Eportfolios and graduate capabilities

Many characteristics intrinsic to creative behaviour are reflected in graduate capabilities that could be evidenced by eportfolio For instance the University of New South Wales (UNSW) Graduate Capabilities statement aspires to graduates as scholars who are: "understanding of the discipline in its interdisciplinary context, rigorous in their analysis, critique and reflection, digitally literate, able to apply their knowledge and skills to solving problems, are information literate and capable of independent and collaborative enquiry" (UNSW). This globally-focused UNSW graduate should be a leader in their field who demonstrates a life-long learning approach to professionalism and demonstrates creativity and innovation. These capabilities lend themselves to the objectives of an eportfolio, where students collect evidence in an authentic context, generating artefacts that demonstrate their problem solving skills and constructed learning through reflection, critique and analysis.

Designing eportfolio assessment

As educative spaces, eportfolios enable both a self-directed and an individualised approach to learning that can promote life-long capabilities in a program of study. As students develop the appropriate skills to self regulate their learning and become responsible for their learning beyond the walls of the classroom, they can engage both individually and collaboratively in the eportfolio. For educators seeking to develop personalised learning spaces or environments in their assessment, eportfolios have enabled this transition and opportunity. Hughes (2008) suggested the four cognitive skills required for self directed students in an eportfolio are 'collect, select, reflect, connect'. To support these skills to develop and be reflective in students' assessment, Krause's (2006) eight initiatives for successful integration of an eportfolio assessment in a program include:

4. Start small; plan the implementation slowly and clearly by integrating the concept of a portfolio into the course with some electronic components.
5. Build a program led approach to support and build a new culture in assessment, this takes time. Eportfolios have the potential to transform pedagogy; they cannot be implemented without real curriculum change.
6. Develop a strong resources plan for technical rollout, if possible participate in a pilot project and spend time developing technical proficiency among the team.
7. Collaborate with staff among the program and course structure, implementing a whole course rather an individual place the concept to the portfolio in a stronger position in the students mindset.
8. Align the learning outcomes to the eportfolio, defining the purpose of the portfolio with students and staff clearly.
9. Make the eportfolio a sustainable assessment tool rather than another add-on, ePortfolios can be used to track and gather resources f students from year 1 onwards.
10. Establish clear professional development and skill based workshops and support through initial face-to-face meeting.
11. Prepare the evaluation to support enhancement, exclusion and improvements early and throughout the course

and use of the eportfolio.

As these initiatives preface, time is imperative in the successful integration of this form of assessment. Like other forms of transformational technologies, they cannot be 'added-on'. Time to establish an eportfolio for assessment in a course or program is needed to learn the appropriate skills needed for both student and staff implementation, the required technical proficiency for both staff and students and the ability to critically reflect and select work for assessment. One of the challenges of this assessment practice is the time to 'reflect, collect, write, and respond to their feedback'. Eportfolios have the potential to provide ways for students to use feedback from assessment and utilise it to support their future learning.

Further development in assessment of creativity with eportfolios

This paper has briefly explored how changing directions in assessment practice could support the assessment of creativity, with a focus on using eportfolios for assessment. A study is being done with UNSW academics who are currently using eportfolios for assessment, to investigate how they are being used and perceptions of the effectiveness of this approach. A wider research project is in development to explore how technologies can support the development and assessment of creativity, and will report on academic and student perceptions and experience in a range of disciplines. This will build on findings from several recent projects that have explored case studies and developed support materials in the areas of both teaching in creative disciplines and online teaching and assessment. Australian projects include ALTC supported projects: Australian ePortfolio Project (2009), Studio Teaching Project (2009), Assessing Creativity: Strategies and Tools to Support Teaching and Learning in Architecture and Design (due 2011) and Matthew Allen's Learning in Networks of Knowledge (LINK) project (2011). UK JISC projects include: 'Effective Practice with e-Portfolios' (2008), 'Effective Assessment in a Digital Age' (2010) and 'Transforming Curriculum Delivery through Technology' (2011) projects. These will be invaluable resources in defining the potential and scope of eportfolios in particular, and the digital environment in general, for assessing creativity.

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Affective Encounters and Spatial Engagements: Pedagogies of Desire in e-Learning

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How do students engage in e-learning environments? What are the affective encounters and spatial engagements of students in these environments? These questions are considered by viewing affectivity and spatial engagements in terms of hybridity of the subject-object (human-material) embrace to consider not only people but also the vitality of objects and their materiality. Two poststructuralist transdisciplinary practice-focused frameworks are used: 1) the material semiotic lens of Actor-Network Theory (ANT) (Latour, 2005; Law, 2008a, 2008b) which accents material agency, and 2) Non-Representational Theory (Thrift 2008) which draws on Deleuzean notions (Deleuze & Guattari 1988) to consider affectivity as "charged" (Navaro-Yashin, 2009) intensities. This paper draws on student data from a larger ethnographic study of four fully online postgraduate subjects at an Australian university to trace participant e-learning experiences. By exploring the salience of student affective encounters and spatial engagements through three contrasting vignettes, I open up questions to address 'pedagogies of desire' (Zembylas, 2007a, 2007b, 2007c) to explore how subjectivities and desires are (per)formed in a *'more than human way'* and how places of (e-)learning are "*affectively charged"* (Leander, Phillips & Taylor, 2010, p. 336, original emphasis). These insights can open up new ways to (re)think e-learning design and pedagogy, in theory and in practice.

Keywords: Spatialities, spaces, place, engagement, affect, e-learning, Actor-Network Theory, Material Semiotics, Non-Representational Theory, Pedagogies of desire

Opening encounters

How do students engage in e-learning and e-teaching environments? What are the affective encounters and spatial engagements of learners in these environments? These questions are the focus of this paper drawing upon a larger ethnographic doctoral study exploring e-learning and e-teaching spatiality and identity intersections in an Australian higher education context. Understanding affective spatial engagements of various e-learning environments beyond design *in theory* demands exploring participant experiences in *actual practices* across various locales (Ellis & Goodyear, 2010). Much of the literature on e-learning tends to bypass the affective and emotion realms, tending towards more instrumental and measurement influenced study designs. The few studies dealing with affect and emotion in e-learning have tended to relegate these to the psychological realm (O'Regan, 2003), and more recently to the physiological (Shen, Wang & Shen, 2009). In contrast, this paper considers the affordances of viewing affectivity and emotion through the material semiotic lens of Actor-Network Theory (ANT) that takes in the materialising processes of the world, as well as the lens of Non-Representational Theory (Thrift 2008) to consider them as "charged" intensities (Navaro-Yashin, 2009), to move them beyond purely psychological states that locate them solely within an individual. By drawing on

ANT, which accents material agency where material objects, like human subjects, take on different enactments in different locales and practices, and by drawing on NRT, affective intensities and spatial engagements across various e-learning practices are 'traced'. By exploring the salience of these affective encounters and spatial engagements through their various sociomaterial practices (as hybrid arrangements of people, objects, texts, etc.), we can come to see how subjectivities and desires are (per)formed. Insights gleaned can inform educational design and pedagogy in theory and in practice. With this aim, firstly, the theoretical underpinnings and definitional ground of this study are discussed; followed by the study's design. Then, three vignettes are discussed; followed finally, by some implications for encouraging encounters in e-learning.

Definitional and framework encounters

The theories used in this paper are both poststructuralist combining the material semiotics of Actor-Network Theory (Latour, 2005; Law, 2004, 2008a, 2008b) with Non-Representational Theory (1997, 1999, 2008) that invokes the work of Deleuze (Deleuze & Guattari, 1988; Massumi, 2002a, 2002b; Thrift, 2006, 2008). Both are process-based ontologies that accent practice. ANT and NRT are both situated in a performative world idiom (as distinct from a representational idiom of a *world out there*) where the world *emerges in relation* with/to every*thing*; nothing exists independently of their relations. Both of these lenses 'perform' realities which see them as emergent in practices. Hence, their underpinnings are a performative relationality (Cooper 2005) where everything emerges *in-relations*. In addition, hybridity of the subject-object is embraced, and entities not only emerge through practices, but through arrangements of people, materials, spatialities, and so on. ANT's focus is on "How the materials of the world (social, technical, documentary, natural, human, animal) get themselves done" (Law, 2008b, p.632). However, ANT in its material semiotic emphasis misses the richness of affectivity and emotion. As Mutch (2002: 483) has it, "actor-network perspectives fail to escape … from the level of process"; and lacking an "ontology of depth" (Mutch 2002: 486), they fail to recognize "the relationship of persons with society" (Mutch 2002: 487). "ANT has a flat view of human agents, reducing them to effects and denying the embodied, emotional nature of human existence" (Mutch 2002: 487). NRT, in contrast, aims to 'capture' the affective and embrace human imagination and inventiveness, which can be 'lost' in ANT. NRT tips ANT's apparent flat ontology towards a more human-centred positioning whilst still accenting material practice. As Thrift (2008, p.276) comments, "I take the presence of objects to be particularly important because they provide new means of linkage … new folds, if you like". The strength of NRT seeks to consider the "more-than-human, more-than-textual, multisensual worlds" (Lorimer, 2005, p.83), where the focus is on life's "expression in shared experiences, everyday routines, fleeting encounters, precognitive triggers, practical skills, affective intensities, enduring urges, unexceptional interactions and sensuous dispositions" (Lorimer, 2005, p.84). ANT and NRT both *embrace the more than human* (Lorimer, 2005; Whatmore, 2006) and complement the other, allowing the material and human imagination to be accented, in their hybridity.

Consequently, taking on a performative relational worldview means that "identity may be conceived as an ongoing process of hybridity, in which one's sense of self is continuously made and remade" (Massey, 2005: 10). Subjectivities, spatialities and materialities emerge as a result of the relations between entities – material, spatial and human (Massey, 2005, p.10; Crang & Thrift 2000) – altogether hybrid. Subjectivities are not essentialised and seen as residing within an individual. Rather, we can talk of extending the boundaries of our skin (Haraway, 2006). Likewise from this worldview, space/place (Massey, 2005; Murdoch, 2006) become dynamic and emergent, rather than merely static bounded entities (e.g. Al-Mahmood, 2006, 2008a, 2008b; Al-Mahmood et al., 2006; Burbules, 2004a, 2004b; Hubbard, Kitchin & Valentine, 2004; Kitchin, 1998).

Significantly then, how are affect and emotion addressed from this performative relational stance? The term emotion often involves interpreting how one feels about an experience (Zembylas, 2007b). Whilst there is "no stable definition of affect" (Thrift 2008, 175), Thrift (2008, p.116), suggests that affect "is not simply emotion, nor is it reducible to the affections or perceptions of an individual subject". He takes on a Deleuzean interpretation where "affects are not feelings, they are becomings" (Deleuze, 1995, p.137 cited in Thrift, 2008, p. 175) that go beyond "the inner world or interiority of the human subject" (Navaro-Yashin, 2009, p.12). Affect and emotion then are performative and relational rather than residing in individuals alone. In seeing affectivity and emotion through a sociomaterial lens, they extend beyond purely human subjectivities — embracing energies and sensations that are "discharged through objects and spaces" (Navaro-Yashin 2009: 12). They are intensities, sensations or energies that can be discharged through objects and spaces "making it possible to read many other things, such as space and the environment, as affective" (Navaro-Yashin 2009: 12) in line with Massumi's (2002a) focus on sensation and affectivity and embodiment. It is the realm of affective encounters and spatial engagements of e-learning that I aim to explore towards understanding *Pedagogies of Desire*

(Zembylas, 2007a, 2007b, 2007c) that highlight how subjectivities and desires are (per)formed in a *'more than human way'* and how places of (e-)learning are "*affectively charged"* (Leander, Phillips & Taylor, 2010, p. 336, original emphasis). I aim to open up spaces for e-learning "sensescapes" (Büscher & Urry 2009) to explore how "being-in-place" (Malpas, 1999, 2008a, 2008b) and affectivity are (per)formed. Armed with these sensibilities, I outline the study's design next.

Methodology and method encounters

I have worked the "methodological frontiers" and have crossed boundaries (Brownlee & Irwin, 2011; Goodyear, 2011; Markauskaite, 2011) in the methodological choices (Markauskaite, Freebody & Irwin, 2011) adopted. I have drawn on transdisciplinary approaches from ANT and NRT, traversing the discipline boundaries of Human Geography, Education, Visuality, and Philosophy. Goodyear (2011) alludes to the valuable insights and contribution that ANT and NRT can potentially make to "educational research futures", as "ANT encourages us to open our minds to possible redistribution of work amongst humans, digital and physical actants" to address educational learning complexity (Goodyear, 2011, p. 263). He highlights the attraction "to the insights that flow from thinking about educational systems (a) in terms of relationships that are simultaneously material and semiotic and (b) as depending upon the ongoing 'performance' of their constituent elements" (Goodyear, 2011, p. 262, footnote 6). This requires "ecologies of interweaving physical, digital and human resources" (Goodyear, 2011, p. 258). My aim in choosing this small scale study is in line with Goodyear's (2011) prediction that educational research will move away from *golden standard* large scale studies and hypothesised studies towards smaller scale design studies to inform rich design patterns (Goodyear, 2005) for interpreting and producing effective (e-)learning environments (Goodyear, 2011, p. 260).

This study involved a multi-sited ethnography (Leander & McKim, 2003; Marcus, 1998) of four fully online postgraduate subjects in an Australian university. Ethnography was chosen to facilitate prolonged and immersive exploration of participant e-learning engagements. Physical ethnography (Marcus, 1998) and virtual ethnography (Hine, 2000, 2005) were used to gather and observe the minutiae of participants' everyday practices across physical and digital spaces. Participants were invited to participate in the study, and methods to deal with physical and digital (im)mobilities (Büscher & Urry's, 2009; Büscher, Urry & Witchger, 2011; Sheller & Urry, 2006) to capture various actors across physical and digital spaces were used. These methods included participant interviews, participant observation, photographic data, and participant reflections across physical and digital spaces over a period of 6-10 months. Data were collected from 24 participants — 19 online postgraduate learners, and 5 teaching staff (2 females and 3 males) with a range of ages and teaching experiences. Daily scheduled observation diaries of the online subject sites were kept, and participants were invited to keep reflections and provide images of their various learning locales. Various movements, or 'travels", as Büscher and Urry (2009, pp. 101-102) suggest of people, ideas, technologies, etc., were explored. A wealth of detailed data were amassed, and whilst the aim was to add to the world through ANT and NRT lenses, glimpses into human, spatial and artefact interactions were 'traced' (Markaskuite, 2011, p. 244), whilst attempting to 'capture' and '(re)present' the sensuous textures of the fleeting, the sensory, the affective, and the spatial ambiences. The three contrasting student vignettes chosen (a la Al-Mahmood, 2006, 2008a, 2008b; Thrift, 2006) were based on detailed thematic analysis of face-to-face in-depth interviews/conversations (each ranging from 1.5-2 hours each), as well as on photographic data and student reflections.

Affective encounters and spatial engagements

In the three vignettes that follow, I explore (dis)connections, (dis)locations, and (dis)mantlings, tracing passions, desires, disconcertments of being *no-where*, *in-between*, *in transit*, *in hope, in anticipation*. I consider how spatialities and materialities (per)form e-learning as they hold/disrupt and (dis)connect various boundaries of physical and digital spaces. I explore (dis)engagements in terms of private/public, presence/absence, visibility/invisibility, and isolation/connectivity (Burbules, 2004a, 2004b, 2006a, 2006b; Enriquez, 2009) to show the multiplicities of technological effects that *affect* bodies and subjectivities as borders and boundaries shift. Indeed, "We live in a world of compartments and borders which may be more fluid and elastic, easier to cross than in the past, but they are out there all the same, impacting upon the minutiae of our daily life practices, identities and affiliations"(Newman, 2006, p. 183).

Vignette 1 ~ (Dis)Connections: Sink or swim …?

I introduce, Lillian, an international Chinese student in her early twenties studying and living in Australia. She is a softly spoken, poetically expressive international student who has majored in English Literature. The descriptions that follow show how she conceives and *'does'* boundaries as a way to focus her thinking and e-learning within the privacy of her home. The focusing "white wall" is a welcome aspect for her. Hers is an experience of how boundaries function as focusing and concentrating (Figure 1).

Figure 1. Connecting and Focusing

> I always studied in my room and always, my room is narrow, not narrow, my room is maybe 15 metres square …. and only a very simple room, just with a table, chair and a bed, something like, very simple and I put my table, for example, this is the room [draws this visually], and I only have a window there and my bed … and my table is at the corner of the wall because I thought that is good when I am working, I just face the white wall, not window, because … I like to look out of the window and not concentrate on my work.

The privacy of her home and its focusing aspect is productive for Lillian as she highlights her unease about taking her laptop to university to study in a public learning place as defocusing.

> …. sometimes I bring it [the laptop] to the campus … I'm that kind of person from my college time … I don't want to study in a public place. I mean, I don't know why. I just want to stay in my room and study in my room. So working in the public lab, I can't focus. I can't concentrate. I always feel other people they are waiting for the computer.

For Lillian, the online class is through her laptop that connects her with the lecturer as she says, "The classroom is only the laptop for me — just the laptop".

> … I just feel there is … a line, a power line connecting me and Brian [the lecturer]. That's it. I sit at the other end of the line and he's sitting at the other end of the line. … I just check the mail box and if I found him [the lecturer online] [then] I copied and I saved every email from him …. because I think that's a kind of … learning material …

She is acutely aware of the "material politics" (Law & Mol, 2008) of how the Internet is changing how people experience and go about learning, saying:

> I feel all the communication is just … typing, and I click the Enter and Send, and that's a message. So I think computer[s] really [the] Internet and computer[s] really change the human world …. the behaviours and … peoples' thinking patterns … dramatically, totally, radically…

Typing, clicking and sending in the e-learning medium changes the sense of engagement; despite its efficiency, it creates a *feel of commercialism*. Here, we witness realities of efficiency coupled with realities of commercialisation abutting each other, as Lillian highlights below.

> I think that makes it more efficient …. The teacher can go out and leave and do his own business, but still he can teach and I'm also, I mean, efficient at doing this, and I type out and didn't go to the classroom and sit in [for] three hours … But also I think that makes peoples' interaction and communication less and less and so makes you feel other things are more commercial …

She further highlights the changes to the student experience, in spite of being potentially isolating and lonely, in developing independence and resilience commenting on a Judy Horacek cartoon of a lone person sitting outdoors under the stars sitting with her laptop looking at the screen of stars (as part of a warm up interview conversation activity).

> For me, this is firstly … loneliness. Yes? And this person is struggling by herself and without immediate help. The help is only through online and other help is as distant as the stars from other planets. So that's a kind of distant help that you kind of feel the touch the personal communication. So that's very lonely and the people should be strong enough so the person should encourage herself … should carry on and comfort herself. You're the only person in the planet … but I think other persons in other planets in other stars, they are also very lonely. Like this. So that's communication between lonely planets. So I think [the] Internet and computer just make every person like living in his own planet. Because you can get anything from the Internet, so that means [the] Internet is enough for you to get anything. Okay, that's adequate for you. So people needn't go outside to communicate with other people in this sense. But that also makes people isolated and lonely.

The sense of isolation is alleviated in the immediacy of synchronous online responses from her lecturer, when he is online, as she highlights.

> … I send my assignment to him [the lecturer] and he asks me to ask him whether he has corrected my assignment, okay so that's 2.00 in the morning and I say okay, I can send him an email on the day, so I send him the email and then quite surprisingly he returns [a reply] immediately, so I feel …. I feel oh, this man is very interesting … that is the first time I feel really quite personal, I mean not impersonal but just a person with characteristics, and then I just write back to him, I say "what a surprise, I didn't expect you [to be] still at the computer now", and he also sends me back an email and he said: "I am also surprised, a student needs to have sleep". Yeah, and I feel he is so lovely, and [at] that time I mean [it] shortened our distance so that is good.

Yet even more significantly for Lillian is the solace and company provided by her laptop computer, saying, "… [the] computer is just like a tool of learning but it is also like good company, when you are lonely … you just stay up very late, alone in your room and [the] computer is the only thing accompanying you".

So for Lillian, as a locally residing international student in Australia, the e-learning experience provides her with connection to her lecturer, and her bounded home helps to maintain her focus and concentration as well as her private personality preferences, albeit that she would be willing to participate in the online public space should her teacher ask it of her. Hers is a strong "isolated connectivity" (Enriquez, 2009).

> Yes. I will tell the teacher … and say, I'm a very self-conscious person and I will say I do feel there's always, I mean, how do you say that, I mean, I'm on the stage alone and so the teacher and other students will observe my behaviours on the stage. So if I didn't do well, I will feel very nervous because I will feel people notice that. Okay, so I hope I can feel safe in the surroundings and supported. So I think I do not say every person will speak out and bare their personalities and bare their feelings, but I will do that if the teacher asked me to do that. I want the teacher to understand me and then the teacher can interact with me and help me according to my introduction. That's it.

Lillian's study spaces have her studying skilfully, diligently, perseveringly, with dedication and commitment, mirroring the stereotype student behaviour of a newly arrived international ESL speaking student. Lillian uses the metaphor of water when she describes her experiences online. There is a sense of respect for the lecturer and that to learn is to practise skills, persevere, and "swim" so as, above all, "not sink". For Lillian, there is solace in the visibility of other peers and their struggles too. She is not alone. We see the perceived importance of the student-lecturer relationship in sustaining students.

> … my metaphor for [Bernie's subject] should be connected compared with [Barrie's subject]. In [Barrie's subject], it is just like I was swirling in a pool and I am struggling; I don't know how to swim … and then in [Bernie's subject] after [Barrie's subject] experience, I am a little bit more skillful about how to survive in the water but still sometimes [I] panic when there are waves, but sometimes when I look around and find the other peers, they are also struggling in the water, okay I feel not so nervous then, and I think, "okay, I won't die because this is only in a pool, and the teacher is just practising, making us practice, learn by practising, so I won't really die", but yes, still you can say some students, they swim very well and very fast, and I am just beginning to learn how to swim and … just not sink.

I ponder Lillian's evocative metaphor of water, and swimming and how an online lecturer might know that a student is drowning or unable to swim well or quickly enough in an online world? What cues can they pick up in a purely online medium? What anchors can they provide? And how are these translated online, across cultures, and geographic spaces, and especially for those students who may not have English as a first language?

Vignette 2 ~ (Dis)Locations: Encaged and exasperated …?

In this vignette, I discuss one of the haunting lingering impressions of a 23 year old 'digital native' (Prensky, 2001a, 2001b, 2009), a Chinese international student, Koko, interviewing her face-to-face in her room in her shared household. Her online experience was extremely isolating and her comments were tinged with exasperation (missed in the mere textual translations of her words). I've assembled interview comments to illustrate her metaphor. Online simply does *not do* here; nor does it address Koko's need for embodied engagement and the salience of lecturer and student physical presence (McWilliam & Taylor, 1998). Her words are hauntingly striking when she says:

> They just give you a computer in a cage, that's not enough. You always live with a computer, *it's not real*! They provide you with a computer in the cage, but the computer is just a box, the computer tells you [about] the blue sky, the green grass, the computer provides you with the picture of that, but *it's not real*! *It's not real*! So it's just like the lecturer through the online course, they give you the material, they answer your questions, but they do not solve the problem, so *it's not real* …" (original emphasis)
>
> I don't want to use the prison (laughter) because prison is a little bit serious, [it's] just like a cage. You can see all things, you can see, you can hear, you can find yourself … you're just like a tiger, which is in a cage, which lives in a cage; you can find all the beautiful sky; you want to go outside; you want to touch them with your hand, but at last you are just waiting for them [online lecturers] to give you something. And sometimes they won't give you enough things you really want. You have full energy, but you are living in a cage …

I'm reminded of Rilke's (1984, p. 25) poem, "The Panther", "His vision, from the constantly passing bars,/has grown so weary that it cannot hold anything else./ It seems to him there are a thousand bars;/and behind the bars, no world./ As he paces in cramped circles, over and over,/ the movement of his powerful soft strides/ is like a ritual dance around a center/ in which a mighty will stands paralyzed…". And yet for this online student, unlike Rilke's tormented panther, Koko's will *was* mobilised. She sought institutional places of libraries and wired learning centres to connect with others to sustain her in the e-subject and to excel at it, despite her exasperations. Koko seeks other actor-networks of humans, materials, and spaces. She finds these by relocating her online study by taking her laptop to the university library campus to be present with other university students to connect her with *real* people to find a way to live through the online experience and move beyond the encaged feeling she gets from the LMS (Learning Management System) space in her little room (Figure 2). The vibrant university library spaces and the flurry of noisy flexible library learning hubs which sustain her connection and reduce her sense of isolation become vital actors in sustaining her e-learning.

However, during library closure when she is at home, she resorts to Marty — a teddy bear — to reduce her isolation and the solitariness of doing the online subject, suggesting that he keeps her company when she's "studying all alone at night" — a surrogate companion of sorts perhaps, albeit non-human. This is not so different to Haraway's (2003, 2008) works on companion species where "becoming with" is "a practice of becoming worldly" (Haraway 2008: 3), albeit in Koko's case "*becoming with"* a teddy bear (an inanimate sensuous object).

In figure 2, I collage one of her rescue artefacts in the photographs. She asks me to take digital still images of her room as she places her teddy bear, Marty, in various positions around her bedroom/study amongst her other vital materials.

Figure 2. Marty with the Laptop!

I have mused over Marty, this teddy bear and what to do with him; I do not want to place him under erasure since he is so integral in Koko's account, for his mediating role is in anchoring her to a pseudo-human companion when she studies alone online at night in a foreign city. And what of the other objects here – the flags on her wall, a map of the world and various other sustaining artefacts, mugs, laptop, and …? Perhaps Marty, helps *secure* her in the online learning world in which she felt "caged" more than I could have thought possible.

Vignette 3 ~ (Dis)Mantlings: (Sacred) Rituals …?

I highlight how e-learning and e-teaching replicate *formalised rituals* of *traditional* academe. In some e-learning spaces various lecturers and students enact positions of "being the *good* student" or "performing *the student*" role in response to a lecturer *performing a teacher role*. For some, partaking in online question-answer interactions is seen as ritualised *mechanical performances* of *going through the motions*.

I juxtapose Paul's various identity expressions and affective spatial encounters and impressions in the different e-learning spaces of private e-mail interactions with his lecturer and the public online subject forum with his peers and lecturer in Table 1.

Table 1. Juxtaposing email and LMS forum spaces

Emails — "I'm jumping through hoops!"	**Forums — "I'm 'being held' somewhat!"**
"I can't even remember his [lecturer's] name I felt a bit like I was 18 years old and back at university and trying to guess the right things to say and really having no idea what I was talking about and what I was meant to be saying and what would meet with the lecturer's approval. It felt very much like a performance that I was involved in. That I was having to send this weekly email that would be judged as suitable or not suitable and I felt often like if I guessed the right answers then I'll get a tick. And, if I got a couple of responses back in a theoretical, de-personalised way that I thought were brusque, it put me off the whole experience. It felt like I was doing this because I had to and because I had to get a pass to get to the thesis but it wasn't actually particularly helping me with anything. It felt like I was jumping through some hoops because the university demanded it. Yes, being a novice and being in someone else's territory that wasn't my own and that, you know … maybe I was a bit of a fraud by being there because I was just desperately trying to work out what was expected of me and not really knowing. It would have been better to have more of the experience of other students. I was constantly trying to work out what was going to be good enough and how much I would have to do. And I was getting back these responses that were, I know … as a teacher myself I was aware of the lecturer of the subject kind of reading through it at a hundred miles an hour thinking, "Oh, I better comment on four points, this one, this one, this one, that one. Okay, I've said something to him and sent it back." You know, I felt like I was performing for him and he was doing the teacher role for me of doing sort of the four responses per text back, so there wasn't any sense of mentoring or any sort of real guidance.	"Even where there was the forum, it still felt like I have to produce a certain amount of text, get it there on the website, make sure it's not less than everybody else's, make sure it's reasonably coherent. I didn't feel like I was particularly interacting by doing that; I felt a bit like I was performing. But the notes that we had were I thought produced by someone who was mindful of communicating in an accessible, human sort of a manner so that they talked through the issues in a very engaging and real and conversational way … I felt like it was actually assisting me and developing my own thinking about my research. There was first person pronouns used and it was someone talking to me about my experience of research and someone warning me, "You might experience this, you might experience that"… And I got some very good email support from the lecturer and I also got some very good telephone support from him. And when you asked me about the forum And who I was on it I thought it was a very interesting question. The forum was an interesting sort of thing because I was writing to other people who were presumably professionals and postgraduate students so, yeah, there was a bit of "this is my professional environment." And there was some status and pride to be protected in talking about that. Interesting. I think I realise, and I hadn't thought about this before, but I guess what I was doing in writing those forum entries each time was being fairly careful

Occasionally he would write back and say, “No, this is not, bold in capitals, what the text says”. And I’d just think, “Stuff it, I don’t care what the text says anyway I just want to get my thesis done”, So … It felt detached and it felt somewhat authoritarian.” Paul	to show that I was competent and articulate and thoughtful and that this was my domain that I was working in and I have quite a bit of expertise about this and you know, I’m a teacher and I’m a professional. So, yeah, there was that element of performance … and I felt that Bernie was quite respectful of our experience and knowledge ….. so nourishing is the word that comes to mind.” Paul

It is perhaps paradoxical that despite the private individualised one-to-one email interactions between Paul and his lecturer — this only served to intensify his *connected-isolation* rather than connectedness. He was connected, yet isolated — the relationship via email seeming “formulaic”, configuring him to play “the good student”. Issues of authenticity and trust prevail for some in hypertext worlds (Bayne, 2005, 2006a, 2006b; Bayne & Land, 2000; Kreber, 2010; Land & Bayne, 2005a, 2005b, 2006, 2008).

This contrasts with suggestions that email provides a *hyper*-intensification of connection and intimacy — a “hyper-real”, where relationships are intensified in the absence of-face-to-face interactions (Milne, 2003) to provide an intensified “presence-absence” (Enriquez, 2009). A continuum of impersonal to hyperpersonal in CMC is possible (Walther, 1996). Yet in the online public discussion forum, in the presence of other online students as well as the lecturer, Paul felt somewhat “held” whilst being *careful* to present more of his professional identity (rather than his student self). Paul’s identity shaping and projecting is mediated through the medium type here — private email learning spaces versus public online LMS forums (further significant actors).

When asking Paul about his perception of the e-learning medium, his response extends his earlier comments. “I don’t actually know that I have a sense of being in a space when I am in the virtual world. I don’t really. … that I am working at the time? I find it hard to find an answer to that question I would have to say. I think I probably, I mean I think the computer for me is … yes I don’t know. I don’t know if I can answer that …”. Put simply, there is no sense of place, because for Paul there is no sense of “holding the class” through the online lecturer’s presence, or of a “relation with” the teacher, or invitation to “rest” in the online learning space. “I tend to feel that there is something that can be lacking in the online delivery that’s very important in a … classroom and to do with the presence of the teacher”, he says. The online class does not maintain a sense of “entering” a learning space, a notion used frequently by Paul, where there is a sense of boundary or threshold, of going into a learning space/place “to be held” and to be in an “energetic space”. His words remind us of the rituals of entry, “And so I really like the idea of going into a classroom”.

In describing his physical learning spaces, he says:

> Attached are a few thoughts on the sad corner of the house I refer to as my study. … it’s not a pure study, it’s also the way to the laundry and the way out to the back door and where the pet lizard is kept and where some of the kitchen stuff is kept, so it’s just … it’s off the kitchen …. It sits in the back room of my house which kind of doubles as a study ….

Paul commenting on the perception of the online subject says:

> … it was the over here, separated from everything else that is going on in my life and my work, and everything else, is this little nuisance that sits on the computer that has to be got through …”

Paul elaborates in an email exchange about his study:

> … The space in which I work is located at the back of the house. It is essentially a thoroughfare — the door behind the desk in the photo leads into the laundry. The space also opens onto the kitchen, the toilet and the back yard. It is, in a word, unsatisfactory — too much noise, constant traffic, no privacy and insufficient space, a product of too many people living in too small a house ….
>
> … It is quite ironic that I should bang on about the sacredness of learning space, when my own 'refuge' is so beleaguered — or maybe it's no coincidence at all …

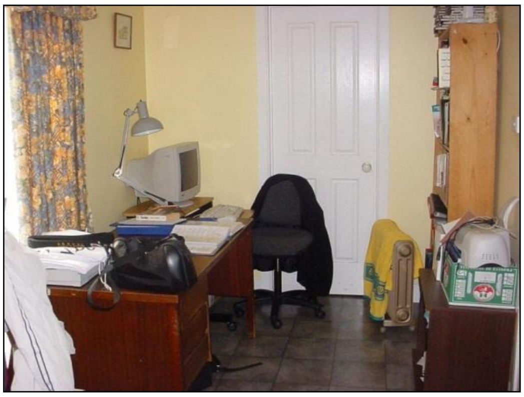

Figure 3. Paul's sad corner of the house

Paul provides some very rich descriptions of his learning experiences and of his physical and digital learning worlds. The profound effect of his martial arts training and embodied experiences of ritual and respect have influenced his own teaching philosophy — expectations which he carries with him, as a student into the online class environment. However, the lack of an online student-teacher relationship for him, and the lack of rituals and embodied practices, renders the online learning experience as diminished and *lacking*. Paul connects or translates his martial arts views of the teacher-student relationship expectations to the online environment, but finds it significantly lacking, for there are no spaces to be "held", to be "contained", so the e-learning environment never reaches this ideal. His sense of being in a "place" is absent in the e-learning spaces. The contrast with his physical space seems to create this yearning perhaps for the ideal. His need is for embodied online relational teacher presence to create a *sacred learning-teaching place*. For Paul, the online space never becomes a learning *place*. Arguably, Paul remains feeling extremely isolated and alone during the online subjects. And reflecting on Paul's desire to be "held" and "contained" in a respectful, restful, relational way, I wonder how can we translate teacher presence in e-learning spaces such that they might become "sacred learning places"? From Paul's perspective, the impossibility of achieving this is one that concerns embodiment in its fullest sense, saying:

> … there is potentially some schizoid dynamic going on in partaking of the virtual world .... If I do go in there, it's, as I said, compartmentalising things, that I can sort of put a bit of my intellect and maybe a tiny amount of my emotion and my everything else in there, but I am consciously splitting off that part there and putting it there and holding a great deal of myself separate. … I believe the most effective teaching-learning interaction is one that engages the whole person — body, mind and spirit. And I don't know how that gets involved in a virtual process. Maybe it does, but I can't envisage it.

Desiring encounters

I have juxtaposed these vignettes to highlight the affective and spatial realms of participant pedagogical experiences (Zembylas, 2007a, 2007b, 2007c) and their (e-)learning impacts (Zembylas, 2007c; Zembylas & Vrasidas, 2005). Through these vignettes, we glimpse a multitude of participant desires along with various nuanced subjectivities that emerge. This forms a 'pedagogy of desire' that mobilises the "creative, transgressive and pleasurable forces within teaching and learning environments" (Zembylas, 2007c, p. 331). This enables "a new view on affect in education as a *landscape of becoming*" (Zembylas, 2007c, p. 331, original emphasis). In these vignettes, participants, materials and spaces configure *radical* selves (Zembylas, 2007c, p. 331). Here we see that desire, subjectivity and pedagogy are relational – they are inextricably linked and co-shape the other. Zembylas (2007c, p. 338) affirms this highlighting that "Desire produces pedagogy as it produces subjects …. A pedagogy of desire is therefore not based on a notion of desire as being a state, position, or feeling towards teaching and learning practices, but it is a pedagogy of the subject and the relation between subjects and objects and artefacts".

The material embrace of the subject-object hybridity in the vignettes highlights the material politics of practices – the *politics of things* (Fenwick, 2010) – where people are not placed "above materials (as the creator or user) but among materials" (Sørenson's, 2009, p.2). Hybridity dismantles the boundaries of humans as set up "in opposition to things" (Dolwick, 2009: 35) to act "'on' things" (Dolwick, 2009, p. 35, original emphasis) to consider how humans act "with, through, or in response" to things (Dolwick, 2009, p. 35). There is a vibrant materiality (Bennett, 2010) and vitality of objects (Knorr-Cetina, 1997; Pels, Hetherington & Vandenberghe, 2002; Turkle, 2007, 2008a, 2008b) and spaces that is highlighted in these vignettes. These all configure e-learning spaces as "*affectively charged places of learning*" (Leander, Phillips & Taylor, 2010, p. 336, original emphasis). We might then need to consider how and in what way we might make university e-learning spaces and designs "affectively malleable" (Leander, Phillips & Taylor, 2010, p. 341) to encourage *engaging* encounters for participant desires. Insights into these spatial engagements and affective encounters may well inform language design patterns (Goodyear, 2005; Goodyear & Retalis, 2010).

Encouraging encounters

How might we as universities, lecturers, and designers then ensure that all students have access to engaging and pleasurable e-learning experiences? This study highlights that e-learning has multiple enactments, and that not all students *connect* or *engage* (Prensky, 2005) in the same way in e-learning environments. What is striking in these vignettes is that despite student-centred learning mantras, there is centrality of the teacher/lecturer role and presence. This is not only pertinent for the two Chinese students, but also for the local Australian student. Standard ritual practices of traditional academe — when/if they are replicable online — can provide reassurance and sustenance to facilitate e-learning as a welcoming and familiar space (in an *e-classroom*). Every*thing* (from learning, to engagement, to first impressions online) is held in delicate balance — from the nuance and texture of a word to the timing of responses; everything is judged, interpreted and waited for by the students — indeed, *the human matters through the machine*.

Moving the student-teacher relationship to standardised commercial online LMS text-dominated platforms that attempt to replicate *traditional* university rituals can be problematic in that they can be (de)stabilising experiences. Through the LMS, the university inevitably becomes *(hyper)textualised*. We need to find creative ways to imbue e-learning 'environments' with the liveliness of space (Massey, 2005, p. 189) in creating more vibrant platforms that engage and entice students in terms of spatial encounters. For our educational designers, this might mean not only creating replicable traditional classroom spaces, in secure places of enclosure, but also to create opportunities for more exploratory and dynamic open spaces that move beyond current standardised LMS platform designs. How might we provide online environments that allow for public and private spaces, for *sacred* rituals of entry beyond passwords, towards open, inspiring and exploratory e-learning spaces? Indeed, these "less familiar and less stable environments" (Hannon, 2009: 428) of LMSs could provide new pedagogies and paradigm shifts (McLoughlin & Lee, 2008) that might risk encouraging radical transformations.

In addition, within the LMS spaces, how might we create opportunities for welcoming international students living in the host cities of the e-learning university, and indeed all students? We need to think about not only how we use the digital spaces, but also how we might integrate them with existing physical university spaces. Altogether, connectivity and engagement can be common mantras (and myths) that influence social justice and access issues in e-learning environments (Zembylas & Vrasidas, 2005; Vrasidas, Zembylas & Glass, 2009). This impels us to consider the complexities of spatialities and how they influence learning. *Ultimately, online and offline practices are mutually imbricated*, so we need ways to move beyond thinking of the e-learning medium in binary terms of a physical/digital divide so that we might engage online students with multiple university spaces. It may insightful to consider the language taxonomies that our online students use to describe their actual e-learning experiences of the online learning spaces and those that describe their ideal e-learning environment. For Paul, it was about "*entering* a space" and "going *in to* a space", and yet the waiting and visibility/exposure for Koko merely created for her a sense of "being watched", "being fed" and feeling encaged within the boundaries of the LMS. Yet, for Lillian, the e-learning space was a "sink or swim" space, and a place to learn with others, with all the connotations of fluidity, panic, survival and so on.

Tracing student experiences and analysing them can certainly (trans)form and contribute to how we might (re)think our educational design platforms and pedagogical practices. Altogether, we need to open up spaces for understanding *spatial and affective encounters and engagements based* on our students' experiences. Using the metaphors of these students, I have shown how different practices emerge — fragilities unfold — where material, spatial, and human *matter*ings are (per)formed — sacred spaces are sought, found, made, and lost. How might universities facilitate *holdings, swimmings*, and spaces for students *lost at sea* online — beyond online *lifelines*? For the fates of *those lost — online/offline, beyond lines* — seeking buoyancy — *"so as not to sink and learn to swim"* in Lillian's words — is what lingers in precarious balance.

Let us aim to move differently to embrace the *more than* — beyond human/material divides, and beyond online/offline divides to embrace ‘pedagogies of desire’ that can transform (e-)learning.

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ICT-assisted multi-campus teaching: Principles and practice to impact equity of experience for students

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Given the range of ICT-assisted delivery options available today, the uninitiated might assume that teaching across multiple campuses no longer presents any significant challenges. Further, it could be argued that terms such as multi-campus and distance teaching have less relevance now that ICT enables flexible learning beyond the time and spatial confines of the physical campus. In fact, research literature indicates that multi-campus teaching continues to present some unique pedagogical, technical, learning support and administrative challenges. Based on a search of Australian University Web sites, this paper examines principles, practices and challenges for ICT-assisted teaching and learning at multi-campus institutions, at the same time noting a lack of comprehensive online resources that address ICT-assisted multi-campus teaching as a distinct category of flexible learning.

Keywords: Multi-campus teaching, learning, higher education, education technology

Background

Information Communication Technologies (ICT) can enable flexible learning beyond the time and spatial confines of the physical campus. These “improved access” benefits are widely acknowledged (Allen & Seaman, 2007, p.2) even by educators who raise concerns about “the push for flexible learning” (Lynch & Collins, 2001, p.1). While in respect to educational value, recent studies have produced evidence of online learning that has surpassed face-to-face teaching. Based on a meta-analysis of over one thousand empirical studies of online learning the US Department of Education found that, “on average, students in online learning conditions performed better than those receiving face-to-face instruction” (2009, p.ix). Similarly, a case study conducted by the Australian Government Department of Education Science and Training (DEST) Programme Research, Analysis and Evaluation Group found that “online education provided a powerful pedagogical tool …” (DEST, 2011, pp.150-151).

In the light of promising evidence about the educational value of online learning, and faced with increasing student demand, many education institutions in Australia and internationally have "tended to see 'flexible delivery' as a panacea …" (DEST, 2001, p.iii). It follows, therefore, that the uninitiated might assume the solution to multi-campus teaching is to simply "put it on the web" (Lynch & Collins 2001, p.380). In fact, best practice literature shows that effective online and blended learning involves much more than simply uploading books and multimedia with some links and ad hoc questions "added to make them 'interactive'"(Gayeski, 2005, p. 98 in Herrington et. al. 2007, p.1).

According to Ebden (2010), universities have drawn largely on "technology-driven solutions to overcome some of the challenges posed by multi-campus learning but these pose their own set of challenges" (p. 267). For example, writing in relation to alternative methods trialed at Deakin University, "such as narrated PowerPoint presentations and videoconferencing in place of face-to-face lectures, and e-Live tutorials instead of face-to-face tutorials," … Ebden notes that "no solutions or combinations of solutions were deemed instrumental in addressing all of the challenges adequately" (ibid).

Cognizant of Ebden's observation concerning a lack of evidence to guide the development of multi-campus course delivery, the present study was designed to examine how Australian universities are endeavouring to foster good practice and equity in their MCT operations through their online resources and relevant policy documents.

It was anticipated that the results of this web-search could in turn inform the development of evidence-based resources and guidelines for ICT-assisted teaching across multiple campuses at the authors' home institution.

Method

A qualitatively driven mixed method case study approach was adopted to "illuminate contextual complexities and nuances on multiple levels" (Hall & Ryan, 2011, p.1).

A web search of policies, strategies and resources used by Australian universities for multi-campus teaching was conducted using the same search strategy for every university site. This was done by first ascertaining whether the university was a multi-campus institution, then searching the university's web pages using "multi-campus", "multi campus", "multiple campus" and "cross-campus", also "multi-campus teaching" and multi-campus policy." This search was of publicly available information and may not reflect the internal policy, strategy and resource generation processes currently in action.

Additional insights into how institutional policy and principles are interpreted and applied in practice were gained through semi-structured interviews with staff (n = 15) at the authors' home institution. To gain a cross-discipline perspective, participants were recruited from a variety degree programs: Mathematics; Music; Education; Information Communications Technology; Indigenous studies; Marine biology; Cultural studies (Media); Physiotherapy; Nursing; Pharmacy; Architecture. Transcripts and quotes extracted from transcripts were routinely coded to help preserve the anonymity of participants. Using an "interpretive approach" (Neuman, 1997, p.71), inductive category coding and comparing of meaning across categories" led to "an understanding of the people and settings being studied" (Maykut & Morehouse, 1994, p.135).

Results and discussion

Results of the web search indicate that there are 37 (of 42) universities in Australia that have more than one teaching campus. Readily accessible were the publically available web pages or documents of five universities that have policies, strategies and resources specifically addressing MCT (Table 1, also highlighted in yellow in Table 2). In addition, two universities have developed policies and strategies to support specific technologies used in multi-campus teaching and flexible learning (highlighted in green in Table 2).

Table 1. Evidence of university-wide equity of experience principles for students on different campuses

University	Principles*	Recommended Strategies †	Evidence
LaTrobe University	√ x	√ x	Multi-campus Teaching by Videoconferencing http://www.latrobe.edu.au/teaching/assets/downloads/VideoconferencingGuidelinesVer6.pdf
Monash University	√ √	√ √	Multi-Campus Consultation for Unit Management http://www.eng.monash.edu.au/secretariat/policies/download/multi-campus-consultation-policy-v0.1.pdf
Central Queensland University	√ x	√ x	Multi Campus Roles & Responsibilities http://dfm.cqu.edu.au/FCWViewer/getFile.do?id=3105
University of Tasmania	√ √	√ √	Cross-campus teaching http://www.teaching-learning.utas.edu.au/orientation/cross-campus
Griffith University	√ √	√ √	Program leadership in multi-campus universities, http://www.griffith.edu.au/education/program-leaders

At the time of the initial web search, University of Tasmania was identified as having the most comprehensive publically available online resources addressing MCT pedagogy and equity principles directly. The essence of the MCT principles noted by most other university sites were represented in the UTAS publically available online resources, therefore, an abridged summary of these are included in the following legend for table 1. Note that * stands for Principles whilst the symbol † represents Strategies.

* Principles:

1. Equity and equivalence – Irrespective of the campus at which students and staff are located, all must be treated equitably. In addition, teaching and learning standards must be equivalent at each of the campuses.
2. Equivalent not identical – Specific learning activities can vary in the way they are taught yet still result in equivalent learning outcomes for students (UTAS, 2010, p.1).

† Strategies:

1. Learning decisions should come before delivery decisions – Decisions about the most appropriate means of delivery should begin with consideration of the teaching/learning situation and the intended learning outcomes.
2. Integrate, don't duplicate – "Multi-campus teaching is generally not about using identical strategies at all campuses." Rather, it is about using "an inclusive suite of flexible teaching/learning strategies for all students” (UTAS, 2010, p.1).

Seventeen universities have developed strategies or resources or recognise that they need to develop policy, strategies, resources and/or research related to MCT. The remaining 14 do not appear to have documents on MCT publically available online. None of the 37 multi-campus universities had markedly comprehensive publicly available multi-campus teaching resources.

Table 2. Publicly available statements on the Principles, Strategies and Online Resources used to support MCT

University	Principles	Strategies	Online resources
La Trobe University	To ensure that high quality teaching and academic support are effectively and equitably provided to students on all La Trobe campuses.	Multi-campus teaching 'Alert' brochure: "Importance of Training" and "Next Steps".	http://www.latrobe.edu.au/teaching/assets/downloads/multi-campus-teaching-alert.pdf
Monash University	With a growing number of units being offered on more than one campus, it is important that the equivalent academic standards be maintained across all sites.	Multi-Campus Consultation for Unit Management.	http://www.eng.monash.edu.au/secretariat/policies/download/multi-campus-consultation-policy-v0.1.pdf
Central Queensland University	To sustain an autonomous, multi-campus, Central Queensland-based university	Multi Campus Roles & Responsibilities	http://dfm.cqu.edu.au/FCWViewer/getFile.do?id=3105
Griffith University	Guidelines for Cross-Campus Consistency: Maximum use of Expertise Efficient use of Resources Coherence and Consistency of Presentation http://www62.gu.edu.au/policylibrary.nsf/	Developing Program Leader Networks and Resources to Enhance Learning and Teaching in Multi-campus Universities.	www.griffith.edu.au/__data/assets/pdf_file/0017/100556/Developing-Program-Leader-Networks.pdf
University of Tasmania	A guiding principle for multi-campus operations: to ensure that all students and staff are treated equitably and equivalently: http://www.utas.edu.au/university-council/university-governance/university-guidelines/teaching-and-learning-quality-issues-related-to-the-multi-campus-nature-of-the-university-of-tasmania	ALTC-funded research: Enabling and developing leadership in multi-campus universities through the development of communities of practice [at] universities [in] Cross-campus teaching	http://www.altc.edu.au/project-enabling-developing-leadership-utas-2007 http://www.teaching-learning.utas.edu.au/orientation/cross-campus
University of Southern Queensland	USQ made a commitment to mainstream the use of Virtual Classrooms into its core Technology Enhanced Learning infrastructure.	Virtual classrooms … collaborative media allowing cross-campus and multi-campus teaching.	http://www.usq.edu.au/extrafiles/ltsu/PRP/tel_flexdel/virt_classr/virt_classr.htm
Curtin University of Technology	Flexible Learning mode provides students with comparable learning experiences in respect of the course and unit learning outcomes…that are available to students through traditional campus-based methods of delivery.	In regard to multi-campus and international partnerships. Suggestions for use of Elluminate Live to facilitate individual or group meetings, mentoring, exam/assignment moderation.	http://cel.curtin.edu.au/tools_tips_training/LetsGetFlexible/email_template/Issue13_elluminate/Issue13_elluminate.html

The five universities identified in Table 1 were active in addressing the principles of equity of experience of MCT as follows:

1. Latrobe has a guide to *Multicampus Teaching by Videoconferencing*. Key principles relating to equity of experience, student engagement and the alignment of relevant content, activities and assessment to intended learning outcomes are addressed in relation to best practice teaching by Videoconferencing. The document includes advice on lesson preparation including practical student engagement strategies such as welcoming students (especially those at the remote sites), structured discussion mediated by a facilitator at the remote venue, and 'wrap up' time to clarify anything that remains unclear for students.

2. Monash University (Engineering) has a policy document titled *Multi-Campus Consultation for Unit Management* with links to other relevant policy documents (referenced in Table 1). This document provides a clear rationale and list of responsibilities for multi-campus unit management groups (key teaching staff involved in offering the unit from campuses involved). These are consistent with those outlined in the UTAS principles used as a point of reference in Table 1.

3. Central Queensland University (CQU) has a Multi Campus Roles & Responsibilities Fact Sheet that provides a concise plain language explanation of the key responsibilities of the Course Coordinator, Lead Lecturer, Head of School, Associate Deans (Teaching and Learning), Associate Director Academic Programs, Campus Directors & Heads of Campus, and Deans.

4. UTAS, similarly, has a web site that clearly articulates principles and practice information specifically focused on multi-campus teaching. Importantly, a number of these principles are unpacked to clarify how particular principles can be applied in practice. For example, in regard to equity of experience for students, UTAS note: "The specific details of an assessment task might be varied if aspects are unsuitable for a site at which the course is offered. For example, assessment details may be altered if students are required to undertake a project or task that relates to the local context" (UTAS, 2010). UTAS also provides links to additional documents that can assist lecturers in planning for multi-campus teaching and learning, such as: a) *learning and delivery systems*, a flow chart model that prompts the user to consider the alignment of intended learning outcomes, learning activities and assessment before making decisions about the most appropriate combination of delivery systems; and, b) *delivery systems capability considerations*, a grid that provides an overview of the various delivery system options from face-to-face to web/Internet, print, and multimedia, and the suitability of each for various types of interaction and real-time versus delayed asynchronous communication in lecture, tutorial or seminar contexts.

5. Griffith University has developed a publically accessible web site titled "Program leadership in multi-campus universities." With a clear emphasis on supporting the practice of program leaders through professional development resources, the site features a range of evidence-based strategies and ideas for effective program leadership stemming from an ALTC funded project with partner Institutions University of Western Sydney and La Trobe University. Embedded video clips of program leaders responding to hypothetical questions about improving quality in multi-campus teaching contexts add a degree of authenticity and authoritative voice, at the same time capitalizing on the power of interactive multimedia to engage the viewer at their own pace, scrolling forward and back to replay at their discretion. The amount of MCT-targeted content on this site appears to have grown from the time of the initial web-search for this study (early 2011) to the time of publication.

Common to the five Australian university web sites categorised in Table 1 were resources that enable lecturers to translate general policy and principles concerning flexible delivery into practical strategies for ICT-assisted multi-campus teaching. One that stood out as useful to guide course design and planning for multi-campus delivery was a "learning and delivery decisions" flow chart published online by UTAS (2010) that could, ideally, be used in conjunction with a grid that compares the strengths and weaknesses of different ICT tools for various teaching and learning contexts (e.g. Thomas, R. & Presley n/d). Towards understanding how similar policies and principles are translated into action at the grass roots level, the first of a series of interviews with staff responsible for MCT were conducted at the authors' home institution.

Interviews with staff involved in ICT-assisted multi-campus teaching

In the following summary and discussion of interviews with teaching staff, coded initials representing each participant are used as in-text references to indicate the volume and source of quotes and summary statements.

Almost half of the participants had recently taught courses entirely online to cater to the flexible and/or distance learning needs of their postgraduate student cohort (LB; DE; GL; WJ; BC; BMC; WGM; FG). Some of their students were geographically dispersed parents studying for a graduate qualification part-time while employed full-time. Other categories included undergraduates based at smaller satellite campuses and those based temporarily off campus during practicum or workplace integrated learning placements (GL, GP, SS).

Most participants used the Learning Management System (LMS) Blackboard in keeping with the University's guideline that all courses should have an online presence (described as an 'institutional factor' in Stacey and Gerbic (2008, p.966). Their general approach to course design and facilitation corresponded with Oliver and Herrington's (2001; 2003) description of the online learning experience as a "network of three overlapping elements of a learning design, that is, learning tasks, learning resources and learning supports" (ibid).

The teaching context of two participants stood out as they deliver courses across institutions as well as multiple campuses. Their interaction with students relied primarily on room-based videoconferencing used in conjunction with electronic whiteboards, email, and occasional desktop videoconferencing and telephone calls. The videoconference and electronic whiteboard (Smartboard) technology infrastructure was installed as part of a national initiative to support cross-institutional teaching and learning of mathematics. One lecturer explained that this essentially predetermined their approach to ICT-assisted teaching:

> "Well the [ICT-equipped] room was set up first and the challenge was to use it" (WGM).

While this is not a text-book example of the principle "make learning decisions first" (UTAS, 2010) ahead of choosing the most appropriate delivery system, both lecturers agreed that the videoconference system used in conjunction with Smartboards has been appropriate for teaching of maths in this cross-campus/cross institutional context, especially since it enables synchronous, real-time interactive communication.

> I think that mathematics really is an activity, … you need to actually do it and demonstrate it when teaching – and so that's what I tried to do using the Smart whiteboard. One of the advantages … is that you can save everything as a pdf, and so I saved everything I could and circulated that to the students as well after the classes" (WGM).

The second mathematics lecturer had arrived at similar conclusions about the immediacy of communication enabled by videoconference, and the benefit of being able to save electronic whiteboard presentations for students to view before and after lessons.

> (BMC) The combination of the Smartboard and the video camera facility … were just perfect! … I can talk it through and they [students] can … actually watch me drawing it … so I think that helps reduce the anxiety factor about the maths. … And it's the ability to even interact with the students and ask them questions, you know "well how would you do that?" … So the ability to have them actually participate in the process … while still having prepared materials … that I can put up on Blackboard afterwards, just the combination was fantastic!" (BMC)

Although the literature suggests that room-based videoconferencing is not a panacea for multi-campus delivery (Downey and Brown, 2009; Ebden, 2010) the immediacy afforded by videoconference and electronic whiteboards was clearly valued by these mathematics lecturers as a means to interacting with and engaging students at remote campus locations. The ability to save, distribute and reuse digital resources was also valued by their colleagues in other disciplines (JS; WJ; JC). Combined these practices correspond with a number of established best practice recommendations for blended learning, such as: a) develop shareable and reusable digital resources to ensure that blended learning is sustainable (Littlejohn & Pegler, 2006 in Stacey & Gerbic, 2008); and, b) design courses for "strong integration between the two environments" [face-to-face and online] (Garrison and Vaughan, 2007 cited in Stacey & Gerbic, 2008). It is also significant to note that these lecturers stressed the usefulness of the electronic whiteboard to make the most of the videoconference-mediated teaching. This corresponds with Downey and Brown's (2009) reflection that not being able to simulate an electronic whiteboard contributed to "a lack of interactivity" in a cross campus videoconference-mediated teaching situation they describe (p.220).

Asynchronous discussion via forums on the LMS (Blackboard) discussion board were the primary means of online communication used by most participants. Several staff responsible for teaching smaller groups used synchronous communications technology such as Chat in the Blackboard virtual classroom environment. Two lecturers (LM; NO) were enthusiastic about Chat citing positive feedback from students. One spoke about the social learning aspects of using a 'talking circle' approach in the context of an online indigenous studies course:

> Being an aboriginal studies area, and being indigenous myself, we put a lot of store on the fact that it is a relationship environment and in class you get great opportunity to do that interaction and personalize the delivery. Online was a challenge, Chat was perhaps the best that I could do to try to create that same

classroom environment, and as a whole I think we achieved it. (Lecturer, 'NO').

This example of using Chat successfully to facilitate a learning activity normally conducted in a face to face setting is indicative of an 'equivalent not identical' learning activity (a common principle in multi-campus university policy statements and guidelines (e.g. UTAS, 2010). The lecturer conceded, "it took a little while for the students to warm to it [as] none of the students had been exposed to chat before." However, in terms of achieving intended learning outcomes by a different means the ICT-assisted 'talking circle' approach in real-time (synchronous) was considered a success.

In contrast, several lecturers at a small satellite campus perceived that most of their students prefer 'asynchronous' communication tools largely due to their circumstance as distance learners with professional and personal commitments that are easier to balance with the flexibility afforded by discussion boards and other asynchronous communication tools.

> I got no takers [for Chat] in the time slot. … I guess because they are at a distance from the campus and they've often got other work commitments that preclude them from always being in one spot at one time, so it's about them juggling their commitments so that's why the asynchronous method I think still is more attractive to them (LB).

Summary of Interviews

Interviews with teaching staff helped to identify the variety of ways that multi-campus teaching equity principles are applied at the grass roots level. Not surprisingly, factors such as size and geographic location of students, and the nature of the course being taught influenced decisions about asynchronous versus synchronous online communication tools, course design and facilitation methods. Most significant to note, however, was the evidence of stated course objectives and outcomes being achieved in spite of being taught in different ways across multiple locations. For example, talking circle learning activities and advanced mathematics being taught in a blended mode to some students and fully online (including by videoconference) to others were two such examples.

Conclusion

Results of the literature review revealed a growing body of scholarly literature on the challenges of multi-campus teaching. However, few concrete solutions or comprehensive models to assist decision-making and planning were found in the literature or by following links identified through a search of Australian university web sites. Only a small number of universities appear to have developed publically available resources that treat ICT-assisted multi-campus teaching as a distinct category of flexible learning that is worthy of special attention. This accords with Ebden's observation that "despite the growth of multi-campus teaching, little evidence exists to guide the development of multi-campus course delivery" (2010, p.1). Interviews with teaching staff helped to identify various ways that multi-campus teaching equity principles are applied in practice at the grass roots level. Importantly, these participants were in the habit of critically reflecting on their new innovations and practices, although only a few had formally written up results of systematic evaluations for dissemination among colleagues and scholarship of teaching and learning publications. It is anticipated that more investigating, aggregating and sharing of such information could inform improved guidelines, teaching practice and equity of experience for students at multi-campus institutions.

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The iLessonPlan: a lesson planning tool for the 21st century

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Learning technologies increasingly play a key role in enhancing teaching, learning and assessment. However, it is common practice for English Language trainee teachers to use hard and or soft copies of sample lesson plans presented in a table or list format in the classroom and for feedback. This is the conventional approach used to plan lessons. This approach compounds the complex and complicated process involved in planning ESOL (English to Speakers of Other Languages) lessons. Also the approach does not take advantage of new learning theories and new learning technologies. This paper reports the findings of an ongoing project where a lesson planning tool was designed and developed to replace the conventional approach. This tool, the iLessonPlan, is a prototype interactive online lesson planning tool. In this paper, the design of the iLessonPlan is described, a prototype version is demonstrated and feedback on the use of the tool is presented.

Keywords: interactive lesson planning tool, iLessonPlan, planning ESOL lessons,

Background

Lesson plans serve to ‘provide a means of formalizing learning activities and a framework for teachers to reflect in a deeper and more creative way about how they design and structure activities for different students and help achieve constructive alignment between theory and practice’ (Littlejohn, 2003; Conole & Fill 2005 as cited in Conole, 2007, p. 87).

Although learning technologies increasingly play a key role in enhancing teaching, learning and assessment, it is common practice for ESOL (English to Speakers of Other Languages) teachers to use hard and or soft copies of lesson plan templates presented in written form. This is a conventional approach used to plan lessons. The term ‘lesson plan’ as used in this paper refers to ‘a description or outline of the

‘objectives a teacher has set for a lesson,

activities and procedures the teacher will use to achieve them and the order to be followed, and

materials and resources which will be used’ (Richards, Platt & Platt, 1993, p. 210).’

Statement of problem

Planning an ESOL lesson is a complicated and complex process for ESOL trainee teachers. A typical lesson involves teaching language skills: Reading, Writing, Speaking and Listening and or language features: Grammar, Vocabulary and Pronunciation. Each skill and feature is divided into microskills. In Reading some examples of the microskills are 'Identify main ideas', 'Identify specific information', 'Identify sequence of ideas'. In Grammar, they are 'Use the present simple tense correctly'; 'Use the present continuous tense correctly' etc. In planning the lesson, the trainee has to take into account several factors: background information about their students (age, gender, nationality), their level (PreElementary, Elementary etc), time allocated for the lesson, number of students in a class, the microskill to be taught, aligning learning outcomes with various learning activities, and the resources and equipment for them.

Trainees face several issues in planning lessons as they lack the knowledge required. For example they have problems in identifying and recalling key components in the lesson plan e.g. background class information and especially teaching procedure. Another is in comprehending the lesson structure and flow (from warmer, activities and wrap-up in the teaching procedure) and how it fits together into a well planned lesson. Confusing terms used in the lesson plan e.g. language skills and language features pose another difficulty. Also understanding the concept of learning outcomes linked to the design of learning activities is a real challenge to the trainees.

It is common practice for trainees to make use of hard and or soft copies of sample lesson plans to use in the classroom and for feedback. Sample lesson plans are generally presented in either a table or list format. The former is illustrated in http://www.englishraven.com/files/Lesson_planning_sheet_641321.pdf. A list of 'generally agreed components of a lesson plan' is provided in http://teflbootcamp.com/tefl-skills/tefl-lesson-planning/

Trainees can use either format and after completing the information required, they submit the plan

to their tutors for feedback. Based on the feedback, the lesson plan is revised and then delivered. After delivery trainees complete their reflection of the lesson. This is the conventional approach used to plan lessons. This approach compounds the complex and complicated process involved in planning ESOL lessons as discussed above. Also the approach has inherent limitations in that it is not interactive, intuitive or user friendly.

Planning lessons is a time consuming process as it involves accessing and assembling hard and soft copies of materials and resources required from different locations e.g. resource centers and online repositories. Moreover materials are available in different formats e.g. audio and video files, images etc. Time and effort spent in accessing, collecting and assembling materials from different locations also impacts on planning a lesson. Using the conventional approach to planning lessons does not in any way make this process easier.

The iLessonPlan

To address the issues, the iLessonPlan (iLP) tool was designed and developed to provide an approach to lesson planning to replace the conventional approach. The iLP is a prototype interactive online lesson planning tool. The iLP was created to be intuitive, trainee friendly and capable of running online or offline via a standalone browser. The tool designed with an inbuilt lesson plan template captures the process of planning a typical ESOL lesson in an explicit and well organized manner.

Purpose of the iLP

The purpose of the tool was to help trainees understand the process of planning a typical ESOL lesson. Trainees here
refer to ESOL trainee teachers enrolled in an ESOL Certificate Programme in New Zealand. The tool has an inbuilt lesson plan template which assists them to complete a lesson plan. It also gives the trainee an interactive soft copy of the lesson plan.

Using the tool would enable the trainees to:

1. Develop their knowledge of lesson planning by:
   i. Identifying and recalling key components in a lesson plan.
   ii. Following the structure and flow of the lesson plan
   iii. Getting just in time help with difficult terms used in the lesson plan.
   iv. Using learning outcomes as a basis to design learning activities.

2. Plan and prepare their lesson plans more effectively and efficiently by:
   i. Using a tool that is intuitive and trainee friendly.
   ii. Engaging with a tool that promotes active learning and interaction
   iii. Using a tool that provides an authentic learning experience
   iv. Reducing the time, cost and effort spent in planning lessons.

The iLP: an overview

The tool facilitates the process of planning a lesson. The tool is a vehicle for the lesson plan itself as the template is embedded in the tool. In producing an interactive lesson plan, it is ready for feedback and ultimate use.

The tool is composed of Parts 1-6 as seen below and in Screenshot 1. The key components of a lesson plan are found in Part 2: Class Info (Screenshot 2) and Part 3: Teaching Plan.

Parts of the iLessonPlan tool

Part 1: Intro provides an overview of the iLP

Part 2: Class Info identifies

1. Class level
2. Time allocated
3. Student profile – number of students, students' ages, gender and nationality.

Part 3: Teaching Plan includes

1. Main teaching point
2. Learning outcomes
3. Resources and Equipment
4. Teaching procedure
   i. Warmer
   ii. Activity 1, Activity 2
   iii. Wrap-up

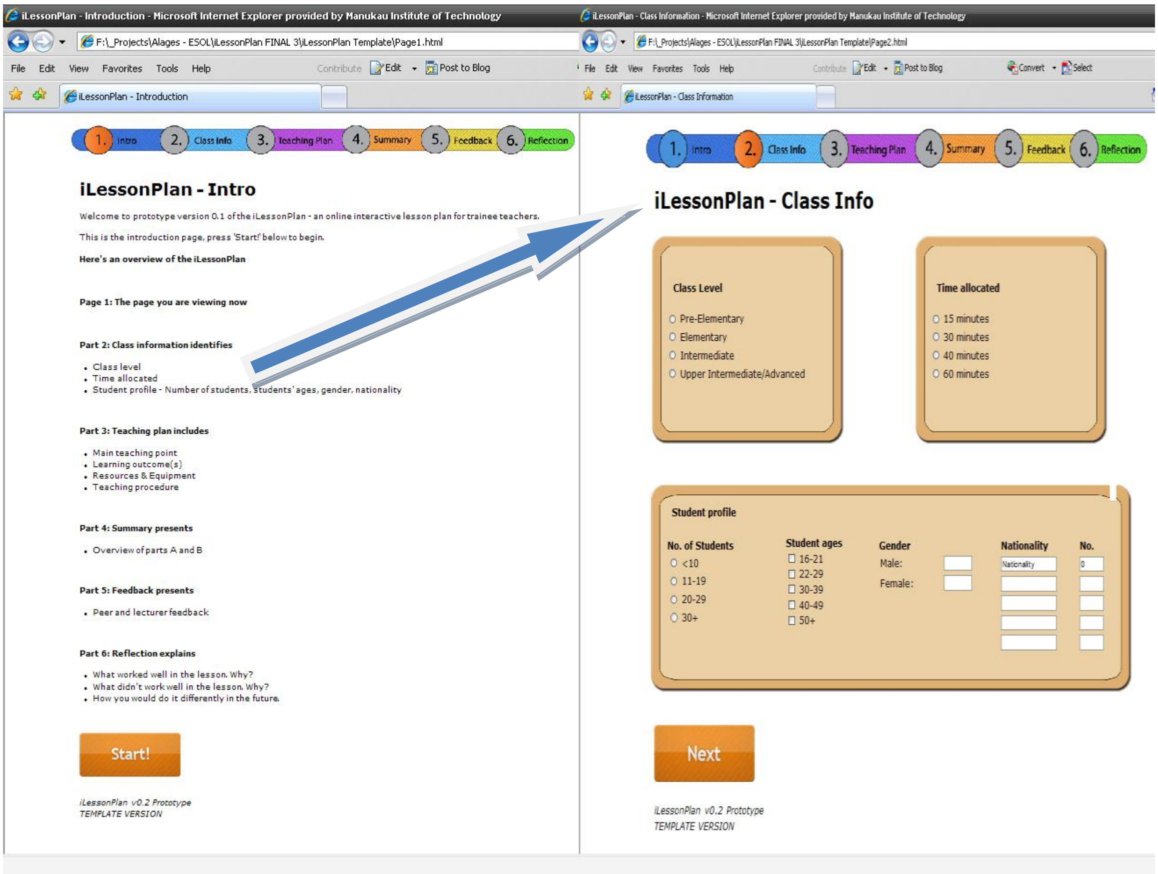
Part 4: Summary – should read Lesson plan as it comprises Part 2 and 3 and it can be printed and kept for future reference.

Part 5: Feedback presents Peer and Lecturer Feedback

Part 6: Reflection explains

i. What worked well in the lesson and why?
ii. What did not work well in the lesson and why?
iii. How would you do it differently in the future?

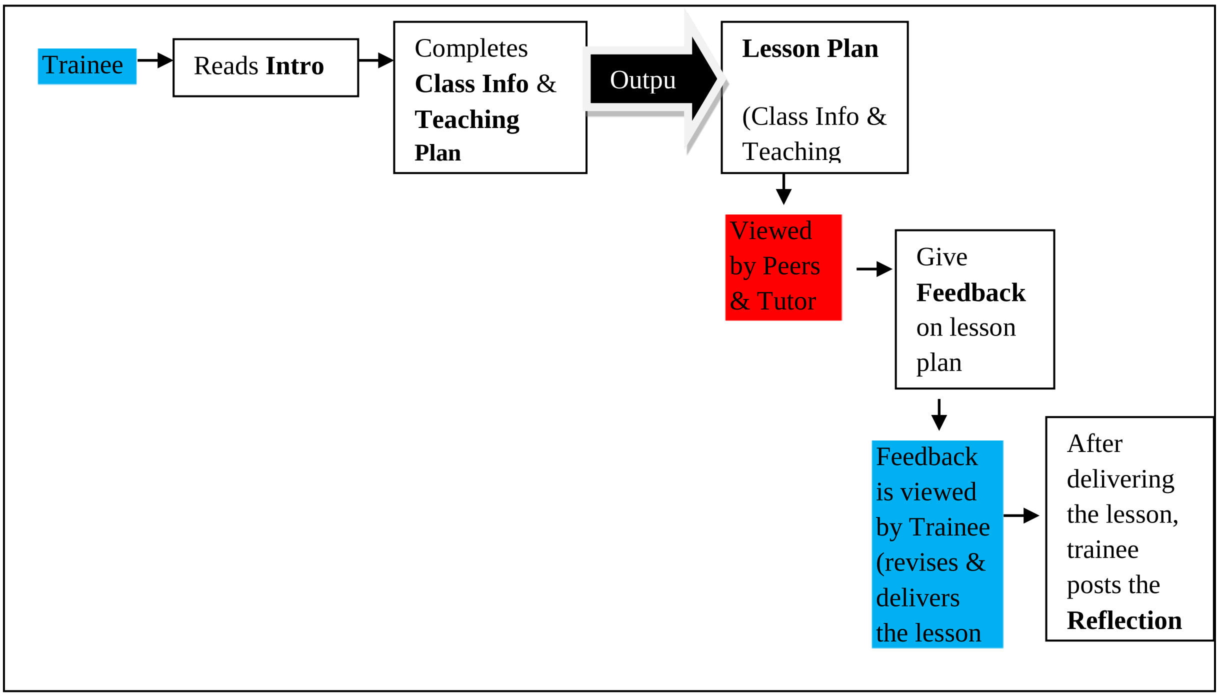
Screenshot 1: iLP-Intro p.1 **Screenshot 2: iLP-Class Info p.2**



Using the iLP

An overview indicating how the tool is to be used is presented in the flowchart below. The three users of the iLP are the trainee, his/her peers and tutor. The process starts when the trainee reads Part 1: Intro to get an overview of all the parts in the tool. Then he/she clicks START which takes him /her to Part 2: Class Info (inbuilt lesson plan template). After filling in the information required about his/her class, the trainee clicks NEXT to Part 3: Teaching

Using the iLP: the process



Plan (inbuilt lesson plan template) and completes the template following the instructions given. Next he/she clicks SUBMIT and the OUTPUT is Part 4: Summary (to read Lesson plan in the next phase of the iLP development). The lesson plan comprises information in Part 2 and 3 which can be printed or saved as a file for future use. If the trainee omits some information then a popup window will appear indicating that some fields have not been completed in. When all the information has been completed then the trainee is able to submit the lesson plan (The iLP is stored in a remote server where the trainee gets access to it when he/she is logged in).

At this point the peer and tutor view Part 4: Lesson Plan and click NEXT. This takes them to Part 5: Feedback which they complete. Then they click NEXT. (Now the plan is stored on the remote server (web server). The trainee can download a version of the plan to keep it locally if he/she wishes).

The trainee views the feedback and then revises the lesson before delivering it to a class. After delivery the trainee posts his/her reflection. (At this point, the iLP is stored on the remote server permanently (unless the trainee wishes to delete it). Peers can view and submit the plan (but not edit it). They can also submit comments or feedback which is also kept on the remote server. These may be moderated or disabled by the trainee who submitted the plan).

Discussion of the iLP

The iLP comprises six parts which are described below:

Part 1: Intro

Part 2: Class Info

Part 3: Teaching Plan

Part 4: Summary

Part 5: Feedback

Part 6: Reflection

Part 1: Intro provides an overview of the six parts in the iLP. The aim is to give a broad description of the iLP, what trainees can expect to see and how it works. (Refer to Screenshot 1: iLP-Introduction p.1).

Part 2: Class info comprises the following elements as illustrated in iLP. (Refer to Screenshot 2: iLP-Class Info p. 2).

1. Class level is one of many factors that need to be considered when planning a lesson as it significantly affects selection of learning outcomes, resources used and the teaching procedure.
2. Students are grouped into classes based on their levels: Pre-Elementary, Elementary, Intermediate, Upper Intermediate and Advanced. Descriptors for each level are provided for the four language skills: reading, writing, listening and speaking. One example for reading is Pre-Elementary where a student is described as having 'little ability to read English' and is 'able to match isolated words to picture prompts' (Descriptors used at the selected tertiary institution). This information is crucial for trainee ESOL teachers as it impacts on selection of relevant materials and resources to use.
3. Time allocated for the lesson is another important consideration as this helps trainees plan the number and type of activities that can be completed within the time frame given: 15, 30, 40 and 60 minutes.
4. Student profile includes information about student numbers, students' ages, gender and nationality. Establishing student numbers helps trainees prepare the required number of handouts, and plan suitable activities. Also student numbers can be used to plan how students work on activities: individually, in pairs, groups or the class as a whole. Adequate provision can also be made in terms of furniture and equipment e.g. chairs and tables, computers, headsets etc. Having knowledge of the approximate age group of students, gender and nationality is useful in enabling trainees identify potential topics of interest, their students' cultural background and learning styles.

Part 3: Teaching Plan comprises four key elements: Main teaching point; Learning outcome; Resources; and Teaching procedure. Content is made accessible to the trainees in two ways so that they can 'progress from teacher directed activity to self-regulated activity' (McLoughlin 2002:149). One is by deconstructing terms using explanations and examples. Another is by clarifying instructions given in the rubric using key questions.

Scaffolding is provided in terms of task support when suitable. According to McLoughlin (2002:149),

> Designing scaffolds for learning involves conceptualizing new roles for learners and teachers in fostering task engagement, social interaction and peer feedback … support must be designed in a principled way in order to ensure that learners progress from teacher-directed activity to self-regulated activity.

Using scaffolding also illustrates the associative approach to learning where concepts are built 'step by step' (Beetham & Sharpe, 2007, p. 221). The key elements in the Teaching Plan are explained below:

1. Main teaching point refers to language skills and language features. The former refers to reading, writing, listening and speaking and the latter to grammar, vocabulary and pronunciation. Each language skill and feature is subdivided into microskills which are accessible using the dropdown menu. When trainees mouse over language skills, the dropdown box lists the four language skills and when each of these skills is moused over, the microskills appear.

   In moving the cursor over reading, the microskills listed are 'Identify main ideas', 'Identify specific information' and 'Identify sequence of ideas'. When the trainees mouse over writing, a dropdown box lists the microskills e.g. 'Begin every sentence with a capital letter. End every sentence with a full stop'. (It is important to note that NOT ALL microskills are listed as the iLP was designed to be a prototype). The advantage provided by the drop-down menu boxes is an example of task support which is one of the 'core elements of support for the learning process in environments mediated by technology' (McLoughlin &

Oliver, 1998 as cited in McLoughlin, 2002, p. 4). The design feature facilitates quick and easy selection of items and clarifies the terms used by providing examples.

2. Learning outcome/s specify what students will be able to do after the lesson. Task support is provided in the rubric in each element: explanations of the instructions and examples of answers clarify to trainees what is required. The outcome/s relate to the microskills selected by the trainees under language skills and features.
3. Resources include materials used in the lesson which are subdivided into physical and digital resources. The former refers to hard copies of text: brochures, schedules, newspaper articles etc and the latter to websites, media, images, sound files etc. Digital file upload is a design feature to facilitate the lodging of files such as scanned copies of reading and listening comprehension questions, audio and video clips on a server. Equipment includes items, tools or other objects used in the lesson: computers, document cameras, whiteboards, markers, etc. Utilizing the digital file upload feature has several benefits. One is that it is a time saving tool as files can be uploaded quickly. Another is that it saves cost making copies of CDs for sound files and DVDs for video files. It is also friendlier to the environment as it reduces the amount of paper used. Storage and retrieval of files is also a plus point as it is just a click away.
4. Teaching procedure describes the four steps involved in teaching a lesson.

   i. Warmer introduces the topic to students in a fun and engaging way. The purpose is to interest students in what they are about to learn in the lesson.

   ii. Activity 1 is a task that relates to the learning outcome. The term 'task' refers to 'an activity which is designed to help achieve a particular learning goal' (Richards, Platt, & Platt, 1992, p. 373). The learning goal or the learning outcome/s is / are established with reference to the language skills or language features selected. Retrospectively, the term 'task' should be used instead of 'activity' as it is a more accurate description of what is involved in planning a lesson.

   iii. Activity 2 is the same as in (ii).

   iv. Wrap-up summarizes the lesson, or assesses what students have learnt.

Part 4: Summary presents an overview of Parts 1 and 2. It was designed to be viewed by other trainees so that they can post feedback on the lesson plan in Part 5 Feedback.

Part 5: Feedback includes peer and lecturer feedback. The importance of feedback is supported by all three learning approaches. Feedback facilitates learning 'whether that feedback comes from within, a teacher, or a peer. When provided the opportunity for revision, students can achieve at higher levels and reach deeper understandings' (Driscoll, 2002).

Part 6: Reflection describes the trainee's reflection on the lesson conducted. This involves looking 'back on teaching, calling some aspect of it into question, analyzing it, evaluating it and making plans for improvement' (Cook, 1998, p. 1). Reflection is essential to improving one's practice as a teacher. This is supported by the situative approach to learning where 'People learn by participating in communities of practice, progressing from novice to expert through observation, reflection …' (Beetham & Sharpe, 2007, p. 221). Reflection is also considered a critical activity in the constructive (individual) and constructive (social) approaches to learning.

Design of the iLP: Criteria used

The design and development underpinning the iLP is based on learning theories and applied research in elearning. The criteria and rationale used in the design are explained below.

1. Building concepts and competences step by step facilitates learning

In the iLP, the process of planning a lesson was deconstructed into six parts. Each part was further segmented and in some cases sub-segmented to make it simpler and easier for trainees to understand key components and important stages in planning a lesson. This is based on the associative approach where learning is understood as 'building concepts or competences step by step' (Beetham & Sharpe, 2007, p. 221). Two examples are provided: Part 2: Class Info and Part 3: Teaching Plan. The former includes: Class level, Time allocated and Student profile – number of students, students' ages, gender and nationality. The former comprises: Main teaching point, Learning outcomes, Resources and Equipment and Teaching procedure – Warmer, Activity 1, Activity 2 and Wrap-up.

2. ***Sequencing and structuring information in a learning workflow promotes effective learning***

The rationale is that there is a logical progression of content from general to specific which students can relate to. This strategy is used consistently in the design of the iLP. For example providing an overview of the iLP: Part 1 Introduction helps trainees anticipate what they are about to read and gives them a logical framework to follow the progression of the lesson from start to finish. (Refer to Screenshot 1: iLP-Introduction p.1).

3. ***Active learning and interaction engages learners more effectively***

The concept 'active learning' refers to learners as 'active participants in the knowledge construction process' ... and 'using technology tools "to think with" facilitates working with ideas and learning from that process (Scardamalia, 2002 as cited in Driscoll, 2002). Technology tools provide "the means through which individuals engage and manipulate both resources and their own ideas" (Hannafin, Land, & Oliver, 1999, p. 128 as cited in Driscoll, 2002). In using the iLP, trainees are required to plan their lesson taking into account: class level, time allocated and details of student profile. The considerations inform their decisions on type and difficulty of teaching materials, type of resources, design of learning activities etc. The 'technology tools' mentioned above are exemplified in the interactive trainee interface: navigation buttons, drop down menu boxes, text boxes etc.

Encouraging active learning can be implemented by designing activities which require learners to share and debate ideas, give and respond to peer feedback, reflect on the tasks and activities etc. Chickering & Gamson (1987) highlight 'Encouraging active learning' as one of the seven principles for best practices in undergraduate education. Trainees are required to provide feedback on their peers' lesson plan and complete their reflection of the lesson after it has been conducted.

Not only do learning activities promote active learning, they also enhance interaction as it is considered a 'key value proposition' in 'technology mediated learning'. It is perceived as 'the defining attribute for quality and value in online learning experience' Wagner (2006: 44). The term 'interaction' has several definitions depending on the context of use. The term 'instructional interaction' in Cowley et al (2002) is used here as it relates to a pedagogical context. The term refers to:

… an event that takes place between a learner and the learner's environment. Its purpose is to respond to the learner in a way intended to change his or her behavior toward an educational goal. Instructional interactions have two purposes: to change learners and to move them toward achieving their goals (Wagner 1994).

Incorporating interaction in learning activities keeps learners engaged and motivated. Activities that foster interaction provide opportunities for dialogue and feedback between learners, peers, and others (instructors and the world at large). The importance of feedback is supported by the three approaches to elearning theories: the associative '(building component skills into extended performance)', constructive '(integrating skills and knowledge, planning and reflecting)', and situative approach '(developing identities and roles)' (Beetham, 2007, p. 27). Feedback informs learners of their progress and stimulates them to reflect on areas for future progress (Chickering & Gamson, 1987).

These activities also encourage consolidation and integration of knowledge, skills and performance. Providing 'interactive environments … and opportunities for reflection' is supported by the constructive (individual) learning approach. Arranging the use of 'collaborative environments' and giving learners 'opportunities for discussion and reflection' is based on the constructive (social) approach (Beetham & Sharpe, 2007, p. 222). In the iLP, trainees interact with content when they use hyperlinks to access multimedia resources and drop-down menu boxes for explanations of terms used e.g. language skills and features. Interaction with instructors and peers is seen in the feedback given to trainees in Part 5 Feedback which includes 'Peer and Lecturer feedback'. (Screenshot 1: iLP-Introduction p.1). Also interaction can be seen when trainees are able to redo their lesson plan (Part 2 and 3) and submit it for feedback.

4. *Authentic learning activities engage learners readily and meaningfully*

'Authentic activities are real-world tasks that a person can expect to encounter on the job, in the home, or in other social contexts (Newmann & Wehlage, 1993, p. 72-75 as cited in Woo, Herrington, Agostinho & Reeves, 2007). As these activities are directly related to students' real-life experiences, they see the relevance between what is being taught and what they are required to do in a real life task. Consequently they engage with the tasks much more readily and meaningfully.

Ten key characteristics of authentic activities were identified by Herrington, Oliver, & Reeves, 2003; 2006, p. 5-6). Of these four are linked directly to the iLP.

i. 'Authentic tasks have real-world relevance.' The iLP can be used by teacher trainees not only during the course of their training but also when they start their teaching. Key elements in the lesson and the logical order and sequence in which they are presented match those used in the classroom. Including authentic tasks and activities is based on the situative approach to learning as they help develop practice in work place communities. Also it contributes to developing their identities in the roles they will soon embrace in the work place.
ii. 'Authentic tasks comprise complex activities to be investigated by students over a sustained period of time.' For trainees, preparing and planning a lesson is a challenging and time consuming task. Selecting and creating suitable and relevant learning activities, considering the level of the students, their prior knowledge, their learning styles and topics of interest, to achieve stipulated learning outcomes is a skill that improves with time and practice.
iii. 'Authentic tasks provide the opportunity to collaborate.' This encourages interaction which in turn engages students more effectively in their learning (Merriam & Caffarella, 1999). Interaction which includes interaction with content, instructors and peers features highly in the iLP. Collaborative work is typical of social constructive approaches' (Beetham & Sharpe, 2007, p. 221) to learning.
iv. 'Authentic tasks provide the opportunity to reflect.' Reflection, which ties in with the social individual and constructive learning approach, is essential in improving future performance. 'Students who analyze and reflect on their learning are more effective learners; that is, they are more able to acquire, retain, and apply new information and skills' http://www.nclrc.org/sailing/chapter2.html Thinking through the lesson and identifying what worked well and what didn't provides valuable input for future lessons. This is the rationale for including Part 6 Reflection in the iLP.

iv. An interactive trainee interface enhances learning from multimedia

'An interactive trainee interface appears to have a significant positive effect on learning from multimedia' (e.g., Bosco, 1986; Fletcher, 1989, 1990; Stafford, 1990; Verano, 1987) as cited in Najjar (1998). He explains that 'An interactive trainee interface may allow learners to control, manipulate, and explore the material or periodically asks learners to answer questions that integrate the material.' This design principle is strongly supported by a variety of studies. See Najjar (1998) for details.

The interactive trainee interface in the iLP comprises design features and functions as listed below:

i. Navigation buttons facilitate easy and seamless movement between sections and pages. On top of each page are menu options: 1. Intro, 2. Class Info, 3. Teaching Plan etc which also function as navigation buttons. Navigation buttons are also present at the end of each page: Start on Page 1 Introduction; Next on Page 2; Submit on Page 3 etc to enable easy movement between pages and sections. (Screenshot 1: iLP-Introduction p.1).
ii. Sub-menus provide a planning pathway for selection of resources and materials in relation to class levels, time allocation, and student profile. (Screenshot 2: iLP-Class Info p. 2).
iii. Drop-down menu boxes enable quick selection of items and provide task support to trainees e.g. definitions and or explanations of terms and concepts used.
iv. Hyperlinks expedite access to multimedia resources: websites, images, podcasts, video clips etc.
v. Text boxes record responses to instructions given: 'Describe the teaching plan', 'Provide feedback' etc.
vi. File attachments enable quick and easy upload of digital files: scanned copies of text and or images, audio and video files etc.

5. *Rules for good design enhance usability of the iLP*

i. Utilizing a colour scheme to enhance readability. White background with black text was chosen to create a better contrast and highlight and to increase the readability of the text. Bright colours for the navigation buttons on top of the page made them distinct against the white background. The colour scheme was repeated on each page for consistency. The overall effect aimed for was an uncluttered slate to make it visually appealing.
ii. Using panels to chunk information enables information to be chunked graphically thereby making it reader friendly. In Part 2: Class Information, there are three panels: Class level, Time Allocated and Student Profile. In Part 3: Teaching Plan there are four panels: Main Teaching Point, Learning Outcome, Resources and Teaching Procedure. Each panel is further segmented into sub-sections e.g. Teaching Procedure is subdivided into Warmer, Activity 1, Activity 2 and Wrap-up.
iii. Presenting overviews of the content is an effective means of presenting information which helps trainees anticipate what they are about to read and therefore make more sense of the information (Part 1: Introduction - iLP Template and Sample). These elements also facilitate scanning which saves trainees time in reading the text (Morkes & Nielsen 1997). The overview also provides a framework for the sequential progression of the components into a structured work-flow.
iv. Highlighting headings, subheadings and key points makes them prominent and distinguishes them from the rest of the text. Bulleting (e.g. Part 1: Introduction and Part 3: Teaching Plan in iLP Template and Sample) and numbering points (e.g. Part 3: Teaching Plan in iLP Sample) enhance scanning.
v. Writing concisely. Short phrases and sentences ranging between 2-17 words per sentence were used in the iLP Template and Sample.

6. ***Using the iLP reduces time, cost and effort in planning lessons.***

Hosting the iLP on the internet provides several advantages which are not possible utilizing the conventional approach.

i. Trainees have quick and easy access to a wealth of materials in different formats (text, audio and video files, images etc) and resources (search engines, websites, social networks, portals, forums, libraries, dictionaries etc) which they can use to plan their lessons. Providing materials in different mediums caters to their students' diverse learning styles (Chickering and Gamson 1987; Kilby 2009; http://www.fgcu.edu/onlinedesign/designDevc.html). Also 'Information presented in more than one medium is recalled better by learners.' (Beetham and Sharpe 2007:226).

i. Accessing materials and resources online reduces time, cost and effort compared to accessing them in different physical locations.
ii. The web provides the means for trainees to store, retrieve, share and replicate iLPs for future use.
iii. The iLP would be available 24/7 and can be translated into any language using Google translation.

Testing the iLP

It is important to note that the iLP is a work in progress. At this stage of development it is a prototype lesson planning tool and it was trialed with only a small group of trainees to show proof of concept. As facilities for proper html testing were unavailable, nine trainees used a pen and paper version of the iLP out of which one third provided feedback. Also due to the small sample size, it was decided to collect qualitative data to identify the trainees' response to using the iLP. They were asked to answer three questions:

1. Did you find the iLP useful in planning your lesson? Why / Why not?
2. What do you think are the advantages of the iLP?
3. What do you think are the limitations of the iLP?

Two of the respondents found that the iLP helped them to plan their lesson in terms of providing a good structure whereas one did not find it useful. Their feedback is as follows:

Feedback 1**:** 'I found the iLessonPlan useful in the way it helped me structure my lesson, step by step. It clearly outlines the exact requirements needed to plan a lesson'.

Feedback 2: 'It's easy to identify the requirements applicable to your lesson plan, has good structure and would only require minimal training if any but this would be dependent on the trainee'.

Feedback 3: '… would much prefer to be given a copy of info/plans etc … didn't find ilesson plan useful in planning because it never crossed my mind to use it'.

Feedback on the iLP was also collected from 2 ESOL lecturers and an ESOL teacher. Their feedback was based on

my presentation of the iLP, 'Design and use of an iLP' at the 'Community for Languages and English for Speakers of Other Languages 2010 Conference'. As the feedback was given verbally it is summarized below.

A senior lecturer from a NZ tertiary institution that coordinates the Graduate Certificate and Diploma in TESOL said, 'Why wasn't this done five years ago? It seems logical to put a lesson plan online'. Another who had taught the CELTA (Certificate in English Language Teaching to Adults) programme identified with the problems faced by ESOL trainee teachers and said the iLP is 'a good tool to use as it addresses the problems trainees face in planning a lesson'. The ESOL teacher mentioned how easy it would have been to plan a lesson if the iLP had been available to her when she did her teacher training two years ago.

It is acknowledged that the feedback on the use of the iLP has been collected from a small sample size. Generally the feedback has been positive however, further in-depth evaluation needs to be conducted using a bigger sample.

Conclusion

The iLP has considerable potential as the design, creation, use and trialing of the iLP indicate that the tool is proof of concept and is worthy of further development. Proper testing of the tool was not able to be done due to the unavailability of the facilities required. This will be addressed in the next phase of development where a website will be developed to host the iLP. Additionally, a formal evaluation of the tool will be conducted and the outcomes will be utilized to further develop and refine the tool.

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Collaboration, community, identity: Engaged e-learning and e-teaching in an online writing course

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This paper presents a narrative enquiry of the use of learning technologies and communities of practice (Wenger, 1998) in creating and delivering the online Master of Arts (Writing) at Swinburne University of Technology. We consider the research question of how we have come to understand and practice elements of a social constructivist pedagogy involving engaged, learner-centred peer and community support both as a creative team and as e-moderators. We consider, too, that our pedagogy is informed by poststructural understandings of learner identities as invested and unfixed (Weedon, 1997). This study utilizes the self as data by drawing on narratives of course developers and lecturers collaborating to create unique materials. While our methodology utilises elements of autoethonography (Chang, 2008), it also involves analyzing themes and narrative configurations in stories (Polkinghorne, 1995), specifically those of tutors and students. Our narrative exemplifies and proposes strategies for writing e-curriculum for web 2.0; for scaffolding e-learning, and for creating and maintaining communities of invested, engaged learners. Simultaneously we add nuances to the scholarly conversation about e-learning communities, e-curriculum development and subjective academic narrative methodology.

Key words – creative writing, e-curriculum, communities of practice, learner identity

1. Introducing our story

This paper relates the ongoing story of the use of learning technologies in creating and delivering the online Master of Arts (Writing) at Swinburne University of Technology (SUT). Ours is a story spanning a decade, questioning how we have come to understand and practice elements of a social constructivist pedagogy involving learner-centred peer support and engaging learners within communities of practice. Broadly, what have we learned that we can share with providers of online learning? More specifically, how have our experiences of such teaching interventions as building and maintaining online communities of learners and fostering ‘critical friendships’ impacted on the student experience of studying Writing online and the tutor experience of e-moderating? The themes of our enquiry, collaboration, community and identity, serve to structure our story. Our story is itself formally and methodologically a narrative enquiry, a subjective academic narrative. Like Polkinghorne (1998), we hold that narratives contain, or even *are*, people's identities.

Since 2002, this postgraduate course has provided a virtual learning environment through the Learning Management System (LMS) Blackboard. Its pedagogical position utilises people, print and electronic technologies to engage students through virtual lectures, dedicated websites, hyperlinked selected readings and dynamic e-tutorials. This engagement comes in part from creating interventions linking program materials to the writing practice of individual, developing writers, and partly from encouraging sense of community, 'a feeling that members have of belonging, a feeling that members matter to one another and to the group, and a shared faith that learners' needs will be met through their commitment to be together' (McMillan & Chavis, 1986, p.9) through collaborative and authentic practices that build partnerships and community allegiances between and among participants.

Collaboration in communities is a key pedagogical intervention, but for writers there is also the question of the individual invested in her or his writing, creativity and applied learning. This paper, to some extent, examines how we use online communities to reconcile the collective and the individual. Since all of our participants strongly desire to identify as writers and to belong professionally to groups attended by writers, we conceive of their desires to be, to become and to belong in terms of desire to align with 'imagined communities' (Anderson, 1983). Yasuko Kanno and Bonnie Norton (2003) believe Anderson's analogy of nationhood and community helps those who want to belong feel a sense of community with people not yet met. In applying Anderson's concept, we envisage a culture's sense of community as an imagined space. We view individuals as idealising community and creating a sense of self through these imaginings. Students of writing want to belong to the elite group labelled 'writers' and to associated communities; but they also want to develop their own voices. There are, as in Jean Lave and Etienne Wenger's (1991) formulations, connections between imagined community and desired identity. The MA draws on this insight in its application of the collaborative pedagogical intervention of critical friendship and in understanding learners' desires for a future self as a writer impacts learner investment (Andrew, 2009).

The core unit of year 1 study 'Critical Friends' acculturates our students to learning in communities of practice (CoPs), establishing the behaviours that characterise their support of others' learning throughout the program. 'Critical friendship' refers to an organised, mutual, reciprocal exchange of ideas and work for the purposes of improving submissions before they are posted to tutors. The concept used *the collective* – the community of practice – as a vehicle for addressing the *individual*. Critical friendship involves giving and receiving feedback at both mechanical-discursive and critical-analytic levels. At various stages, the technique is used with the aid of both criterion-based guides to giving critically friendly feedback and, prior to submission, guides to editing. Critical friendships are forged early in the 13-week course between sympathetic participants within online discussion forums, are mediated by tutors and may last for the duration of the program and beyond.

The evolving story of the MA (Writing) emphasises the interconnected themes of collaboration, community and identity in relation to both our e-curriculum and e-learning designs and our teaching/delivery. For Rena M. Palloff and Keith Platt (2005), collaboration is the 'cornerstone' of e-learning and the grounding of e-community (p.xi), accomplishing such outcomes as addressing all learning styles and cultures, assisting with deeper knowledge generation, promoting creativity and initiative and allowing shared goals for the foundation of a learning community (pp.6-7). Social constructivism, informed by both Vygotskian and sociocognitive theories of learning, foregrounds the centrality of engaged learning communities mediated through the LMS, particularly the discussion and chat facilities (LaPointe & Reisetter, 2008). In their study of postgraduate students' 'sense of community online', LaPointe & Reisetter point to the importance of 'belonging'. This suggests both the need for an articulated and *heard* voice in the e-community and a desire for identification with other imagined communities beyond the immediate e-environment. In this context, we recognise identity for writing students is more than 'social presence' as involving the salient person we become online and how we express that persona (Gunawardena & Zittle, 1997; Kear, 2010). Our experience indicates that the identities involved in creating and participating in e-environments in writing are, like poststructuralist identities Weedon

(1997) describes, complex, affected by power, desire and discourse and subject to change. Bourdieu (1986) would consider them 'invested' identities, beyond the dualities of extrinsic and intrinsic or instrumental and integrative motivation, but rather integrated towards creating and developing authentic writerly identities, the cultural capital of writing programs (Ivanic, 1997).

While the themes of collaboration, community and identity apply to our learners – largely working professionals seeking to develop their creativity and/or a career tree-change – our story also tells of how the still-evolving program develops from *carpe diem* style collaborations among lecturers, learning designers and ITS specialists (Armellini & Jones, 2008; Salmon, Jones & Armellini, 2008); how our ongoing curriculum development and e-learning design are impacted by insights from the social constructivist concept of CoP (Brown & Duguid, 2000; Jonassen, Peck, & Wilson, 1999; Lave & Wenger, 1991; Wenger, 1998), and how we recognise the individual pedagogical contributions of members of the lecturing team as contributing to well-mapped subjects within a clearly structured program comprising 12 subjects across 3 levels.

Beyond the core team of lecturers, we involve the wider teaching team - including specialist guest lecturers and sessional tutors - in the design-redesign action research cycle that informs our teaching and learning practices. These people have writing identities and links to industry. The curriculum gives them as well as the tenured lecturers and their specialist discourse audiovisual presence in our program. The concepts of *mutual engagement, joint enterprise* and *shared repertoire* (Wenger, 1998) – and the sharing of this repertoire – are central to both the development and reconstruction of e-learning environments and the facilitation of collaborative learning spaces in the LMS. The sharing of lecturer, tutor and learner discourse informs sections 4 and 5 of this paper, where we relate designer, lecturer, tutor and participant experiences of teaching and learning in our e-environment.

An increasing body of research investigates the impact of socialisation and collaboration in CoPs on learner identity in cyberspace (Brook & Oliver, 2003; Haythornthwaite, Kazmer, Robins & Shoemaker, 2000; Jones & Peachey, 2005; Kreijns, Kirschner & Jochems, 2003; Rovai, 2002). Socialisation is, of course, Gilly Salmon's crucial second stage in her five-stage model of teaching and learning online (2003; 2004), emphasising a mixture of constructivist learning design and strategic e-moderating bringing forward 'imaginative and creative images' (2004, p.34) as two keys. Palloff and Platt (2005, 2007) led the way in strategising the scaffolding of e-learning to maximise sense of community while similarly promoting creativity and critical thinking. In our narrative, this strategising has shown itself as most significant for the students' learning journeys.

Fundamentally, engaged students need to be both *responsive* and *involved* to enable community building (Palloff & Platt, 2007, p.72). In such communities, constructivist learning is 'active, constructive, intentional and cooperative' (Jonassen et al., 1999). Brown and Duguid (2000) established three principles for learning in communities; it is: *demand-driven, a social act* and *an act of identity formation*. In our narrative of the MA (Writing), we view learning as collaboration yet we focus on each individual constructing their identity within the social space of the learning group. As a result, people have shared visions and identities in common: 'People, forming a community, come together because they are able to identify with something – a need, a common shared goal and identity' (Hung & Der-Thanq, 2001, p.3). 'In an e-learning community', Tu and Corry (2002) advise, 'members work together to solve their problems and to improve their communities using knowledge construction media and technology' (p.209). Our fundamental subject 'Critical Friends' informs this throughout the MA (Writing).

Studies also suggest that the resulting imagining of participation in future communities can be an even more powerful spur to students' investment (Kanno & Norton, 2003). Students' imagined communities can be better realised by understanding learners' desired selves (Markus & Nurius, 1986). Hazel Markus and Paula Nurius emphasise that learners might possess conceptions of possible selves that differ from their current actual self; this certainly applies to our writers. The sharing of discourse and repertoire in our e-learning environment helps learners describe their desires and ambitions, and to see themselves both as developing individual voices and as members of imagined communities, starting with their online tutorial group and developing with their development of critical friendships facilitated and mediated by the e-environment. For many, imagined communities are sites of publication, virtual or real, places of desire for belonging.

2. The story of our methodology

This is our story about how we practice autoethnography and subjective academic narrative enquiry in both making and reflecting upon our e-learning and e-teaching curricula and delivery. Such academic narrative non-fiction is a research method academics apply in their writing to demonstrate that autobiographical experiences can be analysed and interpreted in their research so as to unpeel and unpack their cultural assumptions (Chang, 2008, p.9).

Arising from and embedded in our unique curricula pedagogy, this methodological prism recognises the impossibility of seeing ourselves as academics as either independent or unaligned. We come from a cultural discourse and we participate in that discourse. Our storytelling recognises this and provides a space in which we can understand acting against the 'given' or cultural meta-narratives that have dominated so much of academic discourse. We recognise that we are enabled by critiquing perspectives that lead us to undertake research in an area and/or pursue a certain line of investigation and research question because of our Eurowestern understandings, particularly those of the Enlightenment.

The self-narrative in autoethnography leads to and involves the analysis of storytelling and enquiry into self and others as data rather than mere presentation of story. Autoethnography takes self-narrative from the arena of storytelling into that of the production of data leading to new knowledge and/or new understanding of areas of known knowledge. Stemming from anthropology, autoethnography 'transcends mere narration of self to engage in cultural analysis and interpretation' (Chang, 2008, p.43). Unpeeling and unpacking the self and the ways in which it produces data through interactions, observations, analyses and interpretations provides us with insights into the modes of thought, action and interaction that underpin and/or evolve from enacting the self and others as data. For Carolyn Ellis and Art Bochner (2000), this provides 'autobiographies that self-consciously explore the interplay of the introspective, personally engaged self with cultural descriptions mediated through language, history and ethnographic explanation' (p.742).

While our study is methodologically an autoethnographic subjective academic narrative, we also draw on and analyse qualitative data from our nine tutors and from 12 students who completed the program in 2010. The nine tutors all responded to a series of directed cues in a questionnaire administered by e-mail and the students contributed free-written 250-word reflective logs in the LMS addressing the question of the learning value of the program's development of a sense of community. The questions asked the tutors were:

1. What sort of support do students studying writing in an online environment need and find?

2. What, in your view, are some of the ways that we can foster a feeling of community among our online writing students?

3. In what ways do you like the feeling of being part of a community can help online students of writing?

Because our method analyses data about others as well as ourselves, we draw from Polkinghorne's (1995) theory of narrative configurations in enquiry, enabling us to identify elements and themes in both our own stories, and those of our tutors and final year students. Seeking key themes and common understandings is a feature of autoethnographic approaches (Chang, 2008), but is also resonant with the form of thematic analysis Ryan and Bernard (2003) call 'theoretical sensitivity' (p.88). This method draws on 'word-based' and 'scrutiny-based' techniques of readerly observation (Ryan & Bernard, 2003). Borrowing from Sandelowski (1995), we used a method of closely reading the material, identifying key micronarratives to understand everyday practices and underlining key phrases 'because they make some as yet inchoate sense' (p.373). To ensure this data is controlled for this paper, we focus on micronarratives related to collaboration, community and identity.

While we acknowledge the limitations in a methodology reliant on self-reportage and small sample size, we maintain, with Polkinghorne (1998), that narrative of self as an academic autoethnography is a strong qualitative methodology; it is most appropriate in our discipline, Writing.

3. Our backstory

This section develops the story of how we came to teach online, including what unique features we saw as presenting new and valuable learning possibilities.

Since 2002, this postgraduate course has been delivered online, providing a virtual learning environment and learning and teaching community through Blackboard. As sections 4 and 5 reveal, online learning has provided both staff and students with challenging yet productive experiences regarding developing their own writing understandings and capacities as well as interacting with staff, peers and the possibilities of web 2.0. We have developed, and continue to develop, strategic intent to adopt appropriate technologies and pedagogical approaches (Salmon et al., 2008). For the past five years (2007-2011) subject enrolments have reached between 700 and 1000 per annum, and 5 graduates of the program have so far completed PhDs by artefact and exegesis, with another 20 candidates enrolled.

As early adopters, we were not hamstrung by paradigmatic thinking and were encouraged to produce 'imaginative and creative images' such as those Salmon described (2004, p.34). Funded by a grant, we were initially (2002) engaged by what we could do with a games-based CD-Rom for multimedia interactivity and how we could combine this with online delivery spaces where students could practice interactions with the materials, with one another, and with relevant expert information/ opinions/ deliveries from selected sites. This pedagogical innovation involved the provision of an interactive multi-media game 'G21: Australia's Cultural Dreaming' (Arnold, Green & Vigo, 1997-2003), dedicated web pages for each unit with virtual lectures delivered in print enlivened with visual interviews, weekly questions for discussion with links to relevant expert contacts, discussion threads as virtual tutorials, an interactive chatroom and virtual spaces for students to workshop one another's writing.

The excitement of asynchronous deliveries meant that we exploited fully what was different to time and space regulated f2f delivery: an early recognition of the timeless and non-geographic factors of cyberspace (Arnold, 2004). We applied student-centred principles, anticipating those of Palloff and Pratt (2005) and Salmon (2004), and developed a curriculum that enabled teachers to act as co-constructers of student learning towards particular goals in particular subjects. As we redevelop, we respond to such observations as LaPointe & Reisetter's (2008):

> Avoiding the use of the traditional FTF communication template, and creating instead new structures that make optimal use of the autonomy-supporting strengths of online course delivery, appears to be a necessary paradigm shift (p.655).

In our ongoing updating of units, lecturers have applied a range of agreed innovative principles, such as

- maximising opportunities for learners to develop autonomy and agency;
- utilising texts which privilege indigenous and 'other' voices;
- ensuring weekly tasks have different cognitive demands;
- maximising spaces for reflection for, in and on action;
- incorporating critical friendship in each unit as they are redeveloped;
- involving representatives of industry in our curriculum development;
- understanding how e-moderation scaffolds learning from lectures, hyperlinked texts and student-generated texts, balancing the need for individuals to develop new and confident voices with the collective impulse to work in online communities of learners.

This is a necessary compression of our narrative about the background to a course that began in 2002. It indicates how a narrative requires a reader and a purpose for that reader (Barthes, 1977).

4. The story of course developers and lecturers

Thus, as our backstory testifies, our unique activities in the asynchronous MA have arisen from a long interaction with theory and practice regarding the opportunities offered by cyber-deliveries including the dimensions of cyberspace itself. In practice, we have investigated what the cyber experience of learning spaces offers the developer of curricula that f2f deliveries may not, particularly the ‘multi-layered communicative experiences’ beyond ‘mouse click and keyboard activities’ (Reimann et al., 2003). We have developed interviews with lecturers and experts within dedicated subject websites that provide virtual lectures and tutorial spaces. The 3,000-5,000-word lectures are hyperlinked to a range of texts beyond the virtual classroom from, for example, streaming videos of book shows to archives of radio interviews with writers. The subject websites have weekly questions arising from lectures, leading learners to a pathway in cyberspace of relevant expert comments and offerings. Students share their own discovered sites with the e-learning community, in itself an empowering use of cyberspace for student contributions to e-curriculum.

A as we update materials, considering and utilising ‘multiple possibilities’ as they arise in the new technologies remains an essential element. These vary from, for instance, recommending downloadable mind-mapping and note-making programs, to exploring oral feedback, to exploiting social media as an informational tool and a supplement to e-communities located in the LMS. Interactivity, ‘capable of establishing a two-way connection between distributed participants for the exchange of audio, video, text and graphical information’ (Kreijns et al., 2003, p.346) affords multiple possibilities that we, as a community of learners, explore assiduously with staff and students.

In preparing and delivering this material, we acted in ways that developed unique e-learning and e-teaching methodologies. For example, both during the course’s creation (2002) and its recreation (2009-2012), we formed a *carpe diem*-style team. This included online designers and evaluators as well as staff who developed curriculum with a view to producing online electronic lectures and interactive complementary or supplementary tutorials, followed by an assessed environment for discussion, collaboration, community building and identity negotiation. We paid particular reference to e-tivities facilitating online learning (Salmon, 2003) and cybercollaboration in ways that were different from f2f presentations (Palloff & Pratt, 2005). We saw that whilst an excessive amount of the www is print-based, we could bring virtual (and real) people into videos, and design screens with their own aesthetics rather than being simulacra for chalking-and-talking heads (Arnold, 2004).

The capacity to connect with ‘critical friends’ (peers, colleagues), virtual learning communities (tutorial groups; industry-related, writing and professional groups); lecturers, guest lecturers and tutors (e-moderators, supervisors, mentors, experts) is another unique feature of our pedagogical applications of the web. The WWW is used as a dynamic place for curriculum to develop and change frequently and for the most up-to-date applications and information to be available to academics and students as they turn ‘information’ into knowledge. We concentrate on CoPs that ‘inform’ evolving voices as writers, abilities to support others in their learning community and potential to contribute to other future imagined communities, such as sites where writers present and publish their work.

Through lecturers’ interest in the scholarly discourse of writing, representation generally and cybertextuality, we bring to our e-curriculum development a depth of theory that provides a nexus between information and understanding. So electronic asynchronous learning and teaching spaces with access to web 2.0 and its social media interests us practically and theoretically. The theory involves an understanding of the practical implications of such areas of critical and cultural theory as the rhizomatic text (Deleuze & Guattari, 1981). Such a linearity of thinking is a way of understanding the possibilities of cyberspace as lateral. Just as grass ‘creeps’, so the multiple links and connections enabled by the vast resources of cyberspace can be seen as a new way of conceptualising e-knowledge interactions.

Postmodernist theories about textuality, discourse and identity (Barthes, 1977; Derrida, 1978) advance thinking about and practice of any linear analytico-referential knowledge-model being overtaken by lateral postmodernist discourse. Such a conceptual framework involves Ulmer’s ‘mystory’ (1989) and the dispersal of certainties in considering the practice of writing a discursive piece on a given topic that adds to academic knowledge. Briefly, Ulmer proposes that there is in academic writing the self and the researched, the conscious intellectual semiotic and that arising from storytelling. These insights, applied to learners writing in e-communities, open for learners multiple textual possibilities and present options for multiple, flexible writerly identities.

5. The story of tutor and student experiences

The stories of the tutors who e-moderate the ALN and the students who experience the program lie at the heart of this section. More specifically, we draw on a study of nine tutor reflections on the themes of collaboration in community (Andrew, 2009), and 12 MA students' freeflow reflections on the usefulness of the learning environment of the MA, with its emphases on critical friendship and learning in CoPs, written after they completed their final unit. The nine tutors whose words inform our story are largely graduates of the program who have undertaken professional development in e-moderation and who have worked a minimum of four semesters on the program. From these reflective narratives we extract a range of micro-narratives, reconstructed here to create a narrative of experiences (Polkinghorne, 1995), using the authentic voices of the writers.

The first micronarrative addresses the issue of whether the program's use of critical friendships and spaces for building partnerships and community adds substantive pedagogical value; all agree (one reservedly) it does. Tutor 1 holds the most representative and clearest *pro*-voice:

> The sense of community is highly constructive. Students relax and feel easier, ask more questions, find their own experiences relevant and learn more effectively. Many are amazed at the sense of community that can emerge through the digital environment … many students express genuine amazement at how supported they feel, not only via staff, but by each other. For many the sense of community between the students is the most important and valuable aspect of the course – and a completely unexpected bonus.

This tutor's discourse speaks for her students' senses of ease and amazement at the effect of the community support scaffolded into the program's delivery. The amazement she describes originates partly in the realisation that peers are assets as well as tutors and partly in the fact that such support is possible in a virtual environment. The following voices also testify to the learning value of being invested in the community, itself comprising skilled individuals:

> It's the quality of the people and relationships where the real learning takes place (Student 12)

> I have no doubt I've been in the company of some future best-selling authors, screenwriters and renowned academics (Student 9)

> I gained from having been exposed to committed students/ peers who were open in their participation on the discussion board that genuinely enjoyed sharing their vast knowledge and experience (Student 11)

> Along the way, I found companions who shared my passion, my belief, that this way forward is our particular life journey we must brave. We have supported and held out hands to help one another over those seemingly impossible parts of this journey. (Student 4)

In the student voices there is also consensus that sharing experience, reassurance and feedback within critical friendship is a key way to build supportive networks. This impacts on individuals' learning about others' creative processes as well as their own both in the present community and, quite explicitly, into future imagined ones:

> My fellow students and critical friends provide reassurance as well as feedback that creativity can be frustrating, sometimes difficult and a never-ending evolution of ideas but it is something we all need to do. (Student 2)

> The discussion between team members has been vibrant. We have exchanged samples of our proposed artefacts to get a feel for each other's work. (Student 9)

> There is no full stop to this post, in keeping with a lively future anticipated for the critical friendship network formed by our tutorial group. (Student 3)

> Feeling part of the professional writing community can allow students entrée and mentoring in a very competitive and quite nepotistic industry. (Tutor 8)

The CoP in which the students share and reflect is microcosmic of the wider world of writers' communities beyond the program - imagined communities: the professional organisations such as the Writers' centres recommended by tutor 8. For such future and imagined communities, though, some students are unready:

> I am reluctant to step beyond familiar, imposed structures of the course into future in which I must find my own path. I am not ready (student 3)
> I've found this log a bit hard to write as I've psychologically shifted into break-up mode and haven't written anything on the computer for a few days (student 5)

These references to psychological reliance on community resources point to the need to use social networks to preserve the impetus on the learning and take us into the micronarrative on autonomy and agency. The ability to be an independent learner and a technological self-starter in the face of being physically isolated helps define the necessary learner orientation for those studying writing online:

> Working online has sometimes been difficult and yet it is at present, the only way I can attend a university. Aside from this course I do not regularly have the chance to discuss ideas, debate, share writing or cultural ideas. (Student 1)
> When people enrol in a distance-learning course, they assume a high-degree of individual responsibility for their learning, working with prepared materials to learn the terms, concepts, and skills presented there. (Tutor 2)
> Tutors need to demonstrate that working collaboratively on each other's texts has mutual benefits for all participants, as well as building writerly autonomy. (Tutor 3)

Working in communities ideally focuses writers on their weaknesses and tendencies in their writing so they can generate texts agentially. A related micronarrative focuses on individual writerly identities. There is a strong feeling that, while the community of learning was effective as a constructive and supportive mechanism, there was space in the pedagogic design for individual reflectiveness and learning about individuals' identities as writers:

> The course encourages them to think of themselves as writers from day 1 – and this is an important step in the development of their practice. (Tutor 1)

> All writing students are probably by definition centred on their writerly selves. (Tutor 5)

> And throughout my writing journey I have paused to look within. Who am I? What do I believe now compared to a year ago or ten years ago? Where do I want to go on both my inner and outer writing path? How will this change the other parts of my life? (Student 1)

> I have grown so much personally from the degree, which it has transferred across to my writing…. at the end of this journey I consider myself a writer and for that I am thankful to all as I couldn't have asked for a more concluded result. (Student 11)

The final micronarrative describes the most effective e-moderating and tutoring interventions for teaching and learning in a context of critical friendships and e-community:

The tutor should always provide positive criticism and say encouraging words whenever possible. This will make students feel competent and it will definitely do wonders to their motivation. (Tutor 9)

> The tutor can focus on working with students to master the content by using directed discussion to answer questions, stimulate critical reflection, and most importantly, give the student high-quality

> feedback and assessment of his or her performance on assignments and examinations. (Tutor 8)
>
> Feeling the need to be competent requires that the students challenge their beliefs, actions, and imagination, hence a tutor should never do is to criticise students harshly. (Tutor 7)

The tutor stands beyond the community of writers yet plays e-moderational roles of questioning, challenging, critiquing, validating and encouraging with authority.

6. Concluding our story

Our paper asked how our experiences of building and maintaining online communities of learners and engaging them in ‘critical friendships’ impacted on the student experience of studying Writing online and the tutor experience of e-moderating. The themes of community, collaboration and identity resound strongly as the uniting factors in our story of how we engage our online students of postgraduate writing. Engagement means students are *responsive* and *involved* and these also enable community building (Palloff & Platt, 2007). The Wengerian concepts of *mutual engagement, joint enterprise* and *shared repertoire* (1998) remain sound precepts, but writers also need space to grow, develop voices and imagine communities beyond the e-learning environment we created. The narratives of students and tutors suggest that positive experiences in learning situations like e-environments building critical friendship can achieve have impacts on motivation, learning and identities, potentially making future selves and membership in imagined communities beyond the e-environment seem more achievable. They also suggest that it is possible for teaching and learning in our e-environment to privilege the development of individuals’ writerly voices and identities, aided by tutor feedback, e-moderational interventions and, perhaps most revealingly, insights and critiques from peers.

The creation of an e-environment for writers emphasising critical friendship and learning in CoPs provides a focus for constructive, interactive, engaging text generation/ regeneration as well as a site for thinking about writing as a negotiated construction and the product of postmodern unfixed identities. This seems particularly apt as we continue to think about cyberidentities and cybertextualities. Social constructivist insights align with postmodern. Ulmer’s (1989) ‘mystorical’ approach, for instance, enables academic writing and language to be open, explorative and aware of its own evanescent nature. The texts that students create in our e-environment are hopefully ‘in-formed’ in that they construct knowledge out of textual, hypertextual and audiovisual lecturer input and cybertextual information beyond the LMS and apply it to their own generated texts; the process of coming to know ‘in-forms’ both their writing and their writerly identities. This process of becoming informed in turn enables writers to challenge and develop their individual voices and push the boundaries of their understandings of the forms and genres they write comfortably in. It’s an examination of self within an ideally trustworthy e-community still characterised by McMillan and Chavis’s ‘sense of community’ (1986).

Once again, the elements of community, collaboration and identity emerge as defining themes in the story of the origins and evolution of our program. It’s a story of learners’ challenging yet productive experiences regarding developing their own writing understandings and capacities as well as interacting with staff, peers and the possibilities of the www. It’s a story of lecturers’ *carpe diem*-style collaborations with web and learning designers, at the same time preserving the uniqueness of their own individual marks.

Broadly, our paper was an enquiry into what we learned that we could share with fellow providers of online learning. The story of the students and tutors acts as a reflective evaluation of the creation and recreation of an e-environment for teaching and learning postgraduate writing outlined in the story of course developers and lecturers. Amongst our learning, mirroring that of LaPointe and Reisseter (2008), is the need to foster autonomy and agency more strongly. We continue to struggle with how best to utilise what is perhaps the least considered element in e-learning communities: the logistically-unfriendly area of the aesthetics of the e-screen. Our aim throughout the processes of (re)designing and (re)delivering was and remains to provide a quality e-learning experience through curricula that utilise the possibilities provided by ‘the e’ itself, particularly the possibilities for collaboration, community and the negotiation of writers’ identities. Clearly, to echo Reimann et al. (2003), our students' burgeoning e-literacy and the multiplicity of possibilities arising in new technologies should be the basis for new learning opportunities for curriculum development. This is a story about creating a multi-faceted e-learning environment and the empowering use of cyberspace and being open to what Deleuze and Guattari (1987) might regard its rhizomatic potential. Like the story of lifelong learning in 'the e', this, too, is, and must be, an unfinished tale.

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Changing student learning preferences: what does this mean for the future of universities?

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Learner preferences appear to be changing and there is some evidence that students are seeking a different kind of learning experience than currently commonly available. This paper provides a brief discussion of changing student learning preferences and suggests that these are being driven by the accessibility and characteristics of available and emerging technologies, rather than by technological determinism. The paper also suggests that, in many ways, the majority of higher education institutions are ill-prepared for these changes and that a gap is emerging between student expectations and student experience. It is proposed that students are looking for more connected and mobile learning opportunities and that 'loose networks' are playing an increasingly important role in supporting learning. The paper discusses the implications these changes have for institutions and suggests that while universities face challenges they also have choices.

Key words: learner preferences; mobile learning; social networking; loose networks.

Introduction

The ownership of mobile technologies is becoming increasingly widespread and many of these devices enable ease of access to a range of tools including social networking tools and rich media experiences (Traxler, 2011). The statistics indicate that this growth in ownership and use of these tools, while more widespread amongst young people (Jones, 2011), is by no means confined to this group, with many older people both going online and participating in social networking activities (Lenhart, Purcell, Smith & Zickhur, 2010). This growing use of technology by students of all ages, is having an impact on teaching and learning as students are increasingly seeking to use their own technologies (Andrews & Tynan, in press; van der Werf & Sabatier, 2009) to engage in a range of academic activities. As Williams, (2011), points out, students are looking for more engaged learning experiences using these tools and a move beyond the strong focus on delivery of information that still dominates much of higher education teaching.

Technological determinism versus 'networked individualism'.

Over the last decade the notion of the 'Net Generation' as a homogeneous, wired, group with high-level digital skills has gained currency and persisted (Tapscott, 2009; Oblinger & Oblinger, 2005; Prensky, 2001). This has influenced much thinking and debate around the provision of education for this generation, including the need to focus on greater engagement for these learners. This view takes a technological determinist approach, which suggests:

> The ubiquitous nature of certain technologies, specifically gaming and the Web, has affected the outlook of an entire age cohort in advanced economies (Jones, 2011, p. 42).

However, there is substantial evidence emerging that this group in fact demonstrates considerable variation in the ways in which they use technology and much recent research has sought to refute the notion of homogeneity and to highlight the diversity within this group (Jones et al., 2010; Kennedy et al., 2009; Fitzgerald & Steele, 2008).

Further, as Jones (2011; 2010) suggests, rather than a generation being defined by the time into which they were born, it is the technology itself that is affording change:

> The new technologies emerging with this generation have particular characteristics that afford certain types of social engagement. (Jones, 2011, p. 42).

This position is supported by emerging evidence that learners of all ages are embracing technology and are aware of the opportunities that mobile and web 2.0 technologies offer them to support both mobile and connected learning (Andrews & Tynan, in press; Williams, 2011).

Students' use of their technologies for teaching and learning

Recent research by the first author found that students are tending to use technology for teaching and learning activities in a number of interesting ways (Andrews & Tynan, in press), the first being individuality in this use. Students are demonstrating a high level of distinctiveness in their use of ICT to fit learning into their busy lives. As learning environments are become increasingly mediated by technology and students are heavily committed with families, work and other pressures they are utilising technology to engage in learning in very different ways.

The second way students are utilising technology has to do with mobility and connectedness. While concentrated learning is still important, they also appear to plan and manage their learning in smaller mobile bites. Few students are without devices that allow them to connect to the internet and access their learning, while on the move. As mentioned previously, the use of both mobile devices and social networking is increasing across all aspects of learners' lives regardless of age. Use of students' personal technology for learning purposes is evolving. Madge et al., 2009 found that on-campus students are using Facebook for mainly social purposes. Selwyn (2007), however found that while the primary use of Facebook for on-campus learners was social support, he also found that they used it for a range of transactional activities and low level teaching and learning activities:. These activities included:

- Recounting and reflecting on the university experience
- Exchange of practical information
- Exchange of academic information
- Displays of supplication and/or engagement
- Banter.

The third way students are using technology is in regard to resourcefulness and this is resulting in a shift away from using social networking tools as largely tools for social interactions, albeit, at times around issues related to learning (Selwyn 2007). Learners are seeking out their peers as a first point of call to resolve problems. As

Andrews & Tynan (in press) found, distance learners of all ages are appropriating Facebook and other social net working tools to support a range of teaching and learning activities including online discussion forums, creating repositories for learning artefacts and supporting special interest groups. Additionally Andrews & Tynan (in press) found that the use of 'loose networks' (Traxler, 2011) was used by students to support a variety of informal learning activities. Jones, (2011) also comments on the emergence of 'loose networks'. While little is understood yet as to how these networks operate, the availability of mobile and social networking tools appear to enable to students 'dip in and out of' activities and engage with a range of different peer learners to support particular learning needs (Andrews & Tynan, in press; Traxler 2011) as and when it suits. Meeting the diversity of student needs in this regard will become a challenging issue for curriculum designers and teachers. As Anderson (2008) has already pointed out, diversity in the need for connectedness will increase the difficulties faced by institutions in meeting the range of learner needs.

An emerging gap

Tools such as Facebook, Twitter, SMS and Skype are freely available to students and along with widespread ownership of mobile devices is providing an endless range of affordances for use for both personal and learning activities that students are increasingly appropriating. Hughes, (2009) suggested that the ways in which learners might want to learn and the ways in which universities are providing learning is creating a disjunct for learners. Despite the rapid acquisition of technology and the increasing focus on blended learning, most universities remain largely mired in a 20th century approach to pedagogy which focuses on transmission of knowledge. While technology is widely adopted and used across the sector, it still serves mainly as a means of delivering information rather than supporting and fostering engagement (McKeogh & Fox, 2009). The affordances of Web 2.0 tools are clear to many students (Andrews & Tynan, in press; Williams 2011) but mostly overlooked by the majority of lecturers (McKeogh & Fox, 2009; Lonn & Teasley, 2009). Although technologies such as learning management tools including Web 2.0 tools are widely available, most teachers simply adapt the basic aspects of these technologies to their existing teaching and learning practices, rather than change the way they are teaching to make more effective use of the technology to enhance learning (Gosper et al., 2009).

Further to this, Hughes (2009) also suggested that while the current generation of learners appeared to be tolerating this disjunct, the next generation might not be so accommodating. There is evidence emerging, however, that the current cohorts of students, regardless of any generational orientation in relation to using technology (Jones, 2011), want to learn differently and are already actively seeking changes to the ways their learning is provided to them (Andrews & Tynan, in press; Ram, 2010).

However, although recognising that change is occurring in the world at large, institutions have been generally slow to respond to changing learner preferences. Supporting Gosper et al's. (2009), observation in relation to the reluctance of many staff to change their practice to integrate new technologies Elhers & Schneckenberg (2010) point out that there is a general lack of interest and engagement by many staff in using technology effectively for teaching and learning activities. The situation is compounded by a general lack of attention to quality considerations for online learning and universities may not have strategic plans to address a changing environment. Consequently, these factors can cause paralysis in many institutions (Elhers & Schneckenberg, 2010) limiting their ability to respond to the changes occurring as a consequence of the ways technology is increasingly being uses in the broader society how this is impacting on universities.

The implications for learning in higher education

Some commentators (Bates, 2010; Ram, 2010; Williams 2011) suggest that given the availability of information enabled by ease of access to the internet and the ways in which mobile technologies and social networking tools support activities such as knowledge construction, that the future of universities as we know them will inevitably have to change:

> There is little doubt technology is not only changing the way we teach and learn, it is also challenging centuries-old academic structures and practices, the very notion of what it means to be literate and, potentially, the primacy of universities as the world's arbiters and repositories of knowledge (Williams,

2011, p12).

Bates, (2010) suggests that institutions have an emerging responsibility to ensure that all stakeholders involved in the student learning journey are cognisant of the way in which knowledge, its access and production is changing. Furthermore that the ways in which we teach may need to be altered and reconsidered alongside this. Further to this, Salmon, (2010) suggests that universities might a focus on 'capacity building, partnerships and collaborations' (p.40). This focus could enable the sector to more effectively support both leaners and staff needs.

From this perspective, taking a proactive position and providing a responsive culture and policy environment (Elhers & Schnekenberg, 2010) that has a focus on meeting students expressed learning preferences appropriately, could be seen as a viable way forward for institutions. This does not suggest that universities should respond uncritically to students changing expectations. Indeed, as Salmon (2010) suggests 'A more sophisticated and involved view of the 'net generation' and its need for learning needs to be taken (p.40).

However as Bates (2010) points out, the nature of most institutions means that these kinds of activities and associated changes will not necessarily occur in many institutions. To address this, amongst other strategies he suggests that support from government agencies will be necessary. This might include the provision of greater incentives for institutions to change, appropriate credentialing for university teachers and improved recognition of and incentives for innovations in university teaching,

Conclusion

This growing ownership and use of technology by learners of all ages, is having an impact on teaching and learning as students are increasingly seeking to use their own technologies. They are mobile, connecting in ways in which we do not fully understand and are resourceful in doing so. Knowledge construction is moving into new areas outside the control of academics. Most institution are struggling to address the changes currently occurring as a consequence of the widespread availability and use of technology. However, along with improved understandings of the learning needs of those entering universities (Andrews & Tynan, in press) more strategic approaches to innovation supported by appropriate Government incentives can be seen as possible strategies for minimising the gap between learner expectations and institutional responses.

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Virtual environment as a collaborative platform to enhance pupils' information literacy skills

Sivagouri Arunasalam

The Internet has erased international boundaries allowing our young charges the potential to develop as global citizens. Research studies have given good insights on the role of information literacy on the effectiveness of learning. However, very little studies demonstrate an effective implementation of programmes in virtual learning environments. The paper highlights how Beacon Primary School, one of the futuristic schools in Singapore, has implemented its Tamil Language programmes in a virtual learning environment thus providing a collaborative platform for pupils to meet and discuss issues. P4 Tamil curriculum and lesson packages are designed to infuse Information Communications Technology (ICT) meaningfully and make virtual learning a reality. Information literacy had been weaved into the P4 Tamil language curriculum with online Web 2.0 software, wikispace, PBworkspace, as the platform for collaborative virtual learning environment. This paper presents how the virtual environment acts as a collaborative platform to enhance the pupil's information literacy skills.

Keywords: Virtual Environment, Information Literacy Skills

Introduction & Purpose

Pupils are surrounded by a wealth of knowledge. Today, at the click of a button, students have access to events occurring anywhere on the globe within seconds of it happening. Given this scenario, it is critical that our pupils are equipped with the skill to connect, construct and relate the information presented. The virtual environment provides the space for collaboration amongst pupils. The virtual environment eases and enriches the process out of which meaning is derived from the multitude of information presented. The virtual environment also presents a knowledge-based forum for pupils to build on each other's contribution.

Today's educational system has to respond to two seemingly contradictory demands. On one hand, it has to effectively transmit constantly evolving knowledge and know-how to a knowledge-driven civilization. On the other hand, it has to enable learners with the right skills to select pertinent information out of the explosion of available information. It also has to ensure that the personal and social development of the young learner is catered for. Therefore "education must ... simultaneously provide maps of a complex world in constant turmoil and the compass that will enable people to find their way in it" Delors (1996). This translates to a shift in focus for the amount and level of content taught in schools. It also calls for greater emphasis on equipping our pupils with relevant skills to pick out relevant information. This forms the basis of the nation-wide initiative of 'Teaching Less, Learning More'[1]. In today's context, the ability to access, evaluate, organize and use information in order to learn, problem-solve, make decisions in a formal and informal learning contexts are an integral part of their learning. A key characteristic of the lifelong learner is strongly connected with critical and reflective thinking.

Information communication technological tools are constructive tools that provide a collaborative platform for pupils to come on board and build on each other's knowledge. "Constructive tools are general-purpose tools that can be used for manipulating information; constructing one's own knowledge or visualizing one's understanding" Lim & Tay (2003). Jonassen, Carr & Lajoie (2000) purport the following constructivist approach - "ICT as mind tools for constructing evaluating, analysing, connecting, elaborating, synthesizing, imagining, designing, problem-solving, and decision-making." The term "constructive" stems from the fact that these tools enable students to produce a certain tangible product for a given instructional purpose. This paper takes a reflective, narrative approach in documenting our attempts to integrate the virtual environment as a collaborative platform in enhancing pupils' information literacy skills. This paper is my attempt to share possible strategies in integrating information literacy into our daily lessons. It is through such sharing and exchanges where ideas could build upon ideas to further push the boundaries of our pursuit for pedagogical break-through in this fast changing world. The paper examines how the integration of information literacy into Tamil lessons may improve the Tamil language competencies of the students.

My Reflections

One of the key themes in the Primary 4 curriculum revolves around the topic of 'My Country'. The broad objectives include exposing students to the various issues that surround the country. The lesson design is tailored to educate on the various national issues, including the importance of tourism and consequently make logical connections to the implications and impact it poses to Singapore's economic growth. The lesson was planned and carried out via the virtual learning platform as a collaborative platform for pupils to virtually meet discuss and develop their knowledge on the issue.

The discussion began from an article on Tourism from the Singapore local Tamil newspaper, Tamil Murasu. The teacher posted questions adopting the Blooms Taxonomy to scaffold pupils' skills up to the different stages. Relevant links for extended learning was also provided. These links however, was in the English language. Pupils were instructed to explore these links independently and gather pertinent information. They were subsequently asked to present them coherently in the Tamil language.

Pupils were taken through three main stages:

1) Connect – refers to the understanding of the article/ information presented.

2) Construct – refers to the pupils' ability to comprehend the information, build on possible relationships and extend their knowledge and understanding from the information presented collectively in the platform.

3) Relate – relates to the presentation of collective information, analysis, synthesis, evaluation and creation of new perspectives from the issues presented. The following section details the activities conducted as part of each of the stages.

[1] 'Teach Less; Learn More' (TLLM) is a call for schools and teachers to focus more on the active learning of students and the construction of their own knowledge.

1) **Connect:**
   - Pupils were asked to highlight the keywords and use the mind mapping technique to identify all the important points in the article.
   - Each pupil is to contribute one finding from the article via online postings.
   - Pupils also verified their friends' understanding of the article and their related thoughts.
   - If there was a misunderstanding of aspects in the article, the responsibility lay on fellow mates in the team to post a more accurate interpretation of the information.
   - The teacher acts as a facilitator to ensure that pupils connect with their ideas.

2) **Construct**
   - Pupils paraphrase, translate or give a short summary to express their comprehension of the article and the related issues.
   - In response to the questions raised, other members in the class contribute and build on one another's ideas via the platform.
   - The pupils' understanding of the content matter becomes apparent when they are able to identify relationships amongst ideas posted.
   - Pupils also tap on prior knowledge to build on these ideas.

3) **Relate**
   - Pupils are challenged with questions that require them to analyse available information and find logical patterns.
   - Pupils then evaluate the information and relate it to the current situation and seek new perspectives and understanding.

Pupils were observed to be very engaged and used the language appropriately. However, there were instances where pupils used English language to express their ideas, instead of Tamil. Although pupils were strongly encouraged to use Tamil language, weaker pupils who needed to resort to code-switching to express their thoughts, were not discouraged. The other pupils in the subsequent postings helped to translate these ideas. This created a win-win situation for pupils to tap on and maximise each other's strength and to learn collaboratively.

As part of the school ICT program, pupils were introduced to search engines and were guided in searching for the relevant information. Pupils were also taught principles of cyber-wellness and exercised civic respect in contributing ideas and in providing feedback and comments in the online platform. The contributions of students to the discussed topic and the postings of links leading to other related information was motivating. Even students who were less proficient in the language displayed interest in contributing to the discussion. Their posting displayed the collective understanding of the various points contributed in the platform. As all pupils had to work with their own personal learning, the learning was seamless.

The second extensive discussion took place after Japan's natural disaster. Pupils were exposed to this information during the morning assembly programme. As an extension an article from the newspaper was selected for online discussions. There was an intense discussion amongst pupils including the implications to the society and country. Pupils related the probable consequences. They were able to relate chain actions that would take place because of this disaster. Pupils used the Internet search engines to look up for latest update on the disaster such as on the British Broadcasting Corporation (BBC) news website. It was gratifying to note that the students took it upon themselves to update one another on the latest developments. In addition, they discussed and evaluated the situation and thought about the loss of those affected and the possible implications on their lives. It was heart-warming to note pupils expressed concern and empathy for those affected.

Discussion & Conclusion

Technology is used as a constructive tool to facilitate pupils' learning and making sense of their learning via a collaborative platform. Pupils' engagement was evident throughout the discussion. They were critical about their contributions and took great responsibility in actively using the net to search for information to enhance their learning. The project had benefited even pupils, less proficient in the Tamil language, who was observed to be actively contributing ideas. There was sincere commitment on the part of the students. They also showed initiative in providing additional links and support for others to make sense of the issue. This helped to bring out the best in each pupil. Pupils in addition, expressed positive feedback. Every pupil contributed and has equal share in collaboratively constructing the knowledge, thus the ownership was very strong amongst them. This was a demonstration that young age is not a barrier in understanding world issues if it is tailored to meet the needs of the young learners. What really matters is whether pupils are equipped with skill to understand the implication and impact of the issue discussed.

In terms of skills, all pupils were able to sieve out and decipher the main points from the information presented and build on this information. Through this communication, it was observed that pupils had tapped on prior knowledge and experience in developing their alternative perspectives. Pupils learned to use the information and ideas presented in a graphical organising format to organise ideas. Pupils exhibited strong bonding and collaboration during the various collaboration sessions. The usage of technology was pervasive and as Breivik (2000) puts it "Information literacy (is not)... teaching a set of skills but rather a process that should transform both learning and the culture of communities for the better."

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Unpacking TPACK and students' approaches to learning: Applying *knowledge in pieces* to Higher Education teaching and learning

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This conceptual paper considers how the TPACK (technological, pedagogical and content knowledge) framework (Mishra & Koehler, 2006) can be used to gain an understanding of technology use in teaching and learning. For technology to enhance traditional teaching and learning, TPACK itself may require a tighter definition. We consider the effects of incorporating technology on both teachers' knowledge and students' approaches to learning. The intention is to look deeper into the TPACK construct and to view it from an alternative theoretical perspective. diSessa (1988) proposed a 'knowledge in pieces' theoretical approach that enables a finer-grained scrutiny of knowledge. This theoretical perspective considers knowledge to consist of small elements or 'resources'. We propose that 'knowledge in pieces' may help provide a better, more nuanced understanding of both TPACK and how technology-driven contextual change can affect learning. We conclude by outlining some implications of this theoretical perspective for future empirical research.

Keywords: Teaching; learning; TPACK; knowledge in pieces; teachers' knowledge; technology.

Introduction

Teaching in higher education requires the use of many different types of knowledge. This knowledge is diverse and includes both content and pedagogical knowledge. In recent times a new type of knowledge has been attracting attention, that of technological knowledge. Mishra and Koehler (2006) provide a framework for considering the integration of these types of knowledge that they refer to as TPACK (technological pedagogical and content knowledge). They describe TPACK as "an emergent form of knowledge that goes beyond all three components" (Mishra & Koehler, 2006, p. 1028). The implication is that this new form of knowledge is greater than its constituent parts. Angeli and Valanides (2009) consider TPACK to be an emerging type of knowledge that still needs a tighter definition. Furthermore, they question whether TPACK is a distinct/unique body of teachers' knowledge, constructed from other forms of knowledge, or whether TPACK is the integration of existing forms of knowledge.

The use of technology in higher education is largely accepted to be an integral and expected part of the student experience. This paper looks at the implications of applying a TPACK framework to teaching and how technology can affect students' approach to learning. We look at how teachers in higher education can incorporate technology effectively into their teaching and how technology can be utilised to shift the context of learning to affect the learning process. To investigate the implications of technology in teaching and learning, a 'knowledge in pieces' perspective will be suggested as a useful theoretical lens.

Knowledge in pieces

The way the human mind works, and how knowledge is created, stored and used, remains elusive. One traditional view is that of 'schema'; a theory that suggests that as knowledge is acquired it is abstracted and stored ready for use at another time (Sawyer, 2006). When presented with a new problem or situation, the mind locates an appropriate schema to make sense of the situation. This theory suggests that individuals have stable and coherent states of knowledge; once a schema has been created it is available at all times. While helping to explain much about how thinking and knowing takes place, this view does not explain how some knowledge appears to be available in one context, but not available in another.

diSessa (1988) introduced the theory that knowledge comprises many small, fine-grained elements that activate, or do not activate, depending on context. These elements, which diSessa describes as "phenomenological primitives" (p-prims), appear self-evident to an individual and require no explanation. Considering knowledge at a much finer grain-size provides the possibility of explaining how an individual can hold opposing knowledge positions without noticing any problems caused by the conflict. For example, one piece of knowledge that an individual may hold is that motion requires the continued application of a force (I push a cup across a table and it moves, when I stop pushing it stops); the same individual can also hold another piece of knowledge which states that motion does not require the continued application of a force (I toss a coin in the air and it continues to move after I have let it go) (diSessa, 1993). These two elements of knowledge are in conflict. They are, however, often held simultaneously without the conflict being noticed. The context has changed (pushing a cup versus tossing a coin) and hence different knowledge elements are activated. The 'knowledge in pieces' theory has been used to provide insights into various issues in higher education, such as transfer (Wagner, 2006), pedagogy (Goodyear, Markauskaite, & Kali, 2009) and epistemology (Hammer & Elby, 2002). We suggest that this theory may also provide a better, more nuanced understanding of TPACK guiding the understanding of technology use in higher education.

Higher Education: Teaching with technology

Teachers' knowledge of technology, and how technology is integrated into the curriculum, has become a major focus of research. Graham, Burgoyne, Cantrell, Smith, Clair, and Harris (2009) state that knowledge related to the effective use of educational technologies has become widely recognized as an important aspect of an educator's knowledge-base for the 21st Century. Technology, in this context, incorporates more than the use of ICT tools; it is the creation of complex relationships between artefacts, users, tools, and practices (Koehler & Mishra, 2005). Higher education institutions are focusing on technology-facilitated learning environments to improve the quality of the teaching process. Ertmer (2005) reports that technology is now considered to be an integral part of providing a high-quality education. Further studies indicate that the use of technology in education demands that teachers develop their knowledge of technology and hence become more able to integrate a range of technology tools effectively into their teaching (see Goodyear, Jones, Asensio, Hodgson, & Steeples, 2005; Yunus, Kasa, Asmuni, Samah, Napis, Yusoff, Khanafie, & Wahab, 2006; Zenios, 2006; Strampel & Oliver, 2007).

Mishra and Koehler (2006) stressed that, as well as being technology users, teachers should gain a proper understanding of the technology. This implies an understanding of how technology can be used to teach particular content and how content could be altered to make teaching with technology more meaningful for learners. Mishra and Koehler further posit that more effective and constructive teaching may rely on generating an understanding of the factors that make particular concepts difficult or easy to learn. This understanding, based on the integration of technological, pedagogical and content knowledge, could lead to innovative ways of incorporating technology into existing teaching practices.

Despite attempts to understand how TPACK is formed, there still appears to be a disagreement about the definition and nature of the combined knowledge (see Koehler & Mishra, 2009; Angeli & Valanides, 2009; Cox & Graham, 2009). Harris, Mishra, and Koehler (2009) suggest that TPACK is formed through many interactions between the component knowledge types. By fluently integrating different knowledge elements and by gaining an understanding of the interrelationships between the knowledge types, teachers may be able to switch between, and integrate, the three component knowledge areas of TPACK according to the context.

Considering the three component knowledge areas that make up TPACK (technology, pedagogy and content) as separate and isolated areas of knowledge, it is hard to understand how the combination of these areas can produce anything more than the simple integration of existing knowledge. However, considering each of these knowledge areas as being encoded in the form of smaller knowledge elements that may or may not be activated depending on context, provides the possibility of understanding how the combination can become greater than the parts. When some knowledge elements in one of the components of TPACK become activated, they may influence the activation of other knowledge elements from another component of TPACK.

Teaching with technology may change the traditional role of the teacher. Gonzalez (2010) outlines four roles that a teacher needs to appropriate when teaching with technology. These roles are: provider of online information, creator of communication spaces, facilitator of discussions, and designer of "knowledge building" environments. These roles may require specific knowledge, much of which is based on traditional pedagogical and content knowledge that needs to be integrated with technological knowledge. Seeking out the technological, pedagogical and content ‘p-prims’, and looking for ways that these knowledge elements interact, may provide a starting point that leads to a better understanding of teachers’ knowledge.

Higher Education: Learning with technology

Technology is often considered to be an additional tool, available to students to help with their learning. Selwyn (2007) provides an insight into the usefulness of technology from the students’ perspective. Rather than embracing technology as an effective learning tool, students take a more pragmatic approach to their learning, concentrating on those aspects that are most likely to help them reach their goal - a good grade (Selwyn, 2007). Unless technology performs a useful role in this respect, it may remain an adjunct. One way technology can help towards the students’ goal is by changing the context of learning.

It is thought that learning may be affected by the context in which the learning is taking place; individuals approach similar problems in different ways when in different settings. Lave (1988) shows evidence that when ‘real life’ problems are presented in school, the ‘situation’ part of the problem is generally ignored, or treated as some kind of *red herring*, designed to disguise the real problem. However, when a similar problem is encountered in real life, the situational context is not only recognised, it is used as an integral part of finding a solution (Lave, 1988). Carraher, Carraher, and Schliemann (1985) found a similar example of this mismatch of knowledge. They reported that knowledge became unavailable in certain situations; street sellers could make complex mathematical calculations when trading but were unable to perform similar calculations in a school setting. Interpreting this with a ‘knowledge in pieces’ theoretical lens, suggests that different knowledge elements are activated in the different contexts.

Technology may provide the possibility of changing a learning context, which may in turn help students activate different knowledge elements. Rather than limiting technology use in higher education to that of enhancing an existing pedagogical style, technology could also be used to change the context of learning. To understand the effects of changing the learning context, it may be helpful to investigate the process of learning and how that process can be varied when technology is introduced. Viewing the process of learning using a ‘knowledge in pieces’ theoretical approach may enable the identification of specific fine-grained knowledge elements (elements that are self-evident to the individual) that become activated. Discovering these knowledge elements and understanding the factors that enable them to become activated, and in which context, may provide a key to a better understanding of how context, and therefore technology, can change learning.

Implications for future empirical research

Gaining a better understanding of how technology affects teachers and teaching may provide an insight into effective use of technology in higher education. The use of technology as an integral part of the process of learning may also affect learners by varying the context of learning. A ‘knowledge in pieces’ theory provides a lens through which this can be viewed.

Further research will be necessary to investigate these two areas. Following on from work by diSessa (1993), Hammer and Elby (2002), Wagner (2006), and others, we suggest the following ways forward:

1. Explaining the nature of TPACK.

To gain a better understanding of how teachers utilise different knowledge types and how different knowledge elements are activated, it may be necessary to consider the 'thinking' process when teaching. Investigating a thinking process is challenging; knowledge elements, while self-evident to an individual, remain elusive to others. These elements may be detectable from observing teachers and also by undertaking content analysis of teachers' activities (such as planning and teaching sessions), employing techniques such as 'thinking aloud'. Observing differences in pedagogical and content 'p-prims', when technological 'p-prims' are activated, may lead to a better understanding of the nature of teachers' knowledge.

2. Understanding how technology can change the context of learning and how that change can affect student thinking.

To gain a better understanding of how students' thinking changes as context changes, it may be necessary to investigate the 'thinking' process during learning and how that process changes when a student is learning in different contexts. As above, investigating a thinking process is challenging and the challenge is increased by the necessity to study the process in different contexts. Observing students working in small groups may provide an insight into their thinking process as they articulate their thoughts to other members of the group. By analysing students' speech, while they are working on similar problems in different contexts, it may be possible to detect different knowledge elements being activated in the different contexts. Gaining a better understanding of how students learn, when technology has affected the context of learning, could be used to develop better technology-driven learning environments.

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The blending of blended learning: An experiential approach to academic staff development

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Along with the increasing emphasis placed on blended learning approaches in higher education, has come a need to engage and support staff in developing knowledge and skills for designing and managing blended learning curricula. This paper describes one strategy for such support: an elective course within an existing Graduate Certificate in Higher Education program. Staff have the opportunity to complete this course as part of a formal program of study or as a one-off professional development opportunity. The course specifically aims to support staff in developing an understanding of the philosophical and pedagogical underpinnings of blended learning design, as well as in gaining skills in designing curricula from a blended learning perspective using information and communication technologies (ICTs) for teaching, learning and assessment purposes. Itself designed in blended learning mode, this course attempts to embody good practice in blended learning, and here we present an initial evaluation of the course from this perspective.

Keywords: blended learning, academic staff development, higher education, evaluation

Introduction

Blended learning is fast becoming embedded as the primary method of course delivery in most universities, both in Australia and internationally. Whilst there are likely to be varying drivers for this development across institutions, many would espouse the aim of engaging students and enriching the quality of student learning.

Despite the fact that the term ‘blended learning’ is now commonplace in higher education, there are differences in the interpretation and enactment of the concept. According to Wild (2007, p.1) at its most basic, blended learning is “…a blend or mix of the approaches that can be used to design a learning experience”. So, even though essentially “…Learning is always blended” (p.1) we typically take this concept to mean the use of technologies in learning through the integration of online and face-to-face modes. Along with the adoption of blended learning approaches has been the need for teachers to make more explicit their intentions for learning and teaching, and curriculum design is now a more considered process and outcome than perhaps ever before. When designing a course, teachers now have to contemplate the notions of place, proximity and technology, and make decisions about what is best for learning within existing possibilities and constraints. For example, what is the value of bringing students together in a single place and time? How is it different when students are learning face-to-face vs. online/distance, or in in real time vs. asynchronously? What resources do I, and my students, have access to?

Therefore, the move towards blended learning approaches has placed a great challenge on many teachers in higher education who are faced with a need, indeed an imperative for some, to acquire knowledge and skills in designing and managing blended learning curricula. This need is supported in varying ways within institutions, including formal academic staff development initiatives, one of which will be addressed in the present paper.

Context and overview

From 2008, blended learning has been an institutional strategic priority for our University, having set the goal to "…systematically embed blended learning approaches in the teaching and learning activities of all programs" and "…nurture and extend staff capabilities in the applications of blended learning" (Griffith University, 2007). As part of the institutional strategy for blended learning, an elective course was developed as part of the existing Graduate Certificate in Higher Education program. This program has been running for many years, and is completed by academic and allied staff from the University, as well as staff from other post-secondary education institutions. The new elective course is open to those completing the Graduate Certificate program, as well as any staff who wished to complete the course as an independent study option.

The blended learning elective course aims to support staff in developing an understanding of the philosophical and pedagogical underpinnings of blended learning design, as well as in gaining skills in designing curricula from a blended learning perspective, and in using information and communication technologies (ICTs) to facilitate communication, collaboration (interaction) among students, content delivery and assessment. Developing practical knowledge and skills in blended learning design and delivery is obviously an important aspect of this course. However, being able to identify and apply relevant theoretical concepts, and provide a rationale for what one does, is also emphasised and supported as an important aspect of professional practice.

This course was designed specifically to allow participants to experience blended learning first-hand, and thus was not just about blended learning, but was conducted in blended learning mode. This meant that we not only facilitated participants learning about blended learning, but we modeled a blended learning approach. Indeed, we needed to model best practice and provide an evidence-based approach to our own work. To this end, we worked from three key theoretical frameworks; each is briefly discussed below.

Technological pedagogical content knowledge (TPCK)
TPCK (Mishra & Koehler, 2006) is a conceptual framework for the use of technology in education, which builds on Shulman's (1986) notion of a teacher's 'pedagogical content knowledge' which reflects knowing what teaching approaches best suit the content, the representation and formulation of concepts, pedagogical techniques, knowledge of what makes concepts difficult or easy to learn, knowledge of students' prior knowledge, and theories of epistemology.

Mishra and Koehler (p. 1017) argue that 'thoughtful pedagogical uses of technology require the development of a complex, situated form of knowledge' that goes beyond all three components (content, pedagogy, and technology) and differs from the knowledge held by a disciplinary (content) or technology expert, and also from the general pedagogical knowledge shared by teachers across disciplines. TPCK is central to good teaching with technology, and it combines content knowledge, pedagogical knowledge and technological knowledge to form knowledge of how to use technology to best facilitate learning in a particular discipline, for particular content, contexts and cohorts. TPCK guided the design of both content and activity in the course, and placed an emphasis on facilitating participants' learning about technology within their personal teaching contexts.

Community of Inquiry
The Community of Inquiry (COI) framework for blended learning, developed by Garrison and Vaughan (2007), is founded on the belief that a framework helps to avoid separation of theory and practice and "…provides a means to shape practice…to reflect upon and make sense of outcomes…" (p. 13). They argue that the ideal 'educational transaction' involves a process of collaboration and construction with inquiry at its core, where such social interaction helps students to share knowledge, develop and evaluate meaning, and hence enrich their understanding.

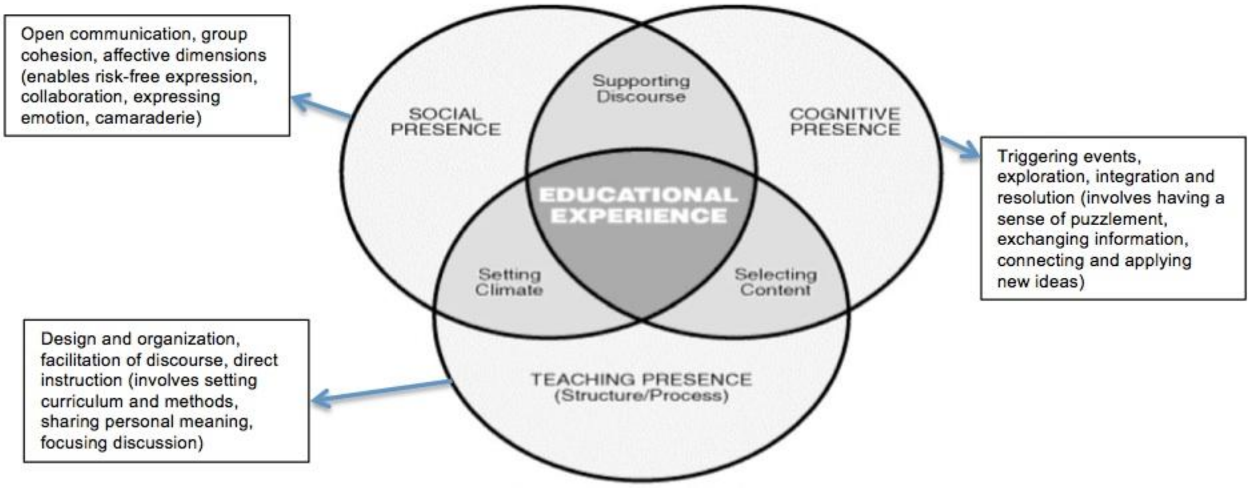

Figure 1. The Community of Inquiry Framework (Garrison & Vaughan, 2007, p. 17-18)

Their framework involves three key components; (1) *Social Presence* - the ability of participants to project themselves socially and emotionally in the community, through trusting and purposeful communication and interpersonal relationships, (2) *Cognitive Presence* - the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse, and (3) *Teaching Presence* - the design, facilitation and direction of cognitive and social processes to create personally meaningful and educationally worthwhile learning. Research has shown (Garrison & Vaughan, 2007) that teaching presence is a significant determinate of student satisfaction, perceived learning, and sense of community. The COI framework guided the holistic design of the course, and then the ongoing delivery and management of the course experience.

Experiential learning

In addition to the TPCK and COI frameworks, the design of the course was underpinned by an experiential learning approach. Experiential learning involves learning from experience, from a direct encounter with the phenomena being studied. Kolb and Fry (1976) proposed that learning is continuous and cyclical, where it is formed and re-formed through the individual's experience; what is essential in the process is reflection and reconceptualisation in order for new experiences to be integrated with prior knowledge and for knowledge to be built upon. In their model, learning begins with *concrete experience* (doing, having an experience), which leads to *reflective observation* (reviewing, reflecting on the experience), and *abstract conceptualization* (drawing conclusions, learning from the experience) in order to move on to *active experimentation* (planning, then trying out what one has learned). This model of learning was perhaps the most fundamental to the course, as it underpinned both TPCK and COI frameworks and provided both teachers and participants in the course a simple yet effective purpose and guide for learning.

Course structure and activities

The course is structured around three face-to-face workshops (o-week, mid-semester break, study week), which were designed to: support the creation and maintenance of a sense of connection and community amongst the group; facilitate learning of key literature and some technical skills; and debrief online activities, share and discuss experiences. During the semester, between workshops, the course is segmented into four learning modules, which include set readings and activities made available online, and supported by three online tutorial sessions using Wimba Virtual Classroom. These include: (1) Designing for student activity and collaboration (small group wiki task, discussion forum x 2); (2) Assessment and blended learning (develop marking rubric for wiki task, self and peer assessment of wiki task); (3) Building a learning community (virtual tour of online course); and (4) Evaluating blended learning (develop evaluation tool).

The formal assessment tasks are mostly embedded within the learning and teaching activities throughout the semester, or draw heavily on these activities. For example, to support students from an experiential learning approach, they are required to complete a reflective journal (using an individual blog tool). The small group wiki task is also a set assessment task, and participants are required to utilise their discussion forum posts in another assessment task. Drawing together their learning throughout the course, participants are finally required to design a sequence of activities that are focused on a particular learning objective (chosen by the individual, and can be hypothetical or a real learning objective from his/her own teaching experience). To facilitate the design process, we use the LAMS (Learning Activity Management System) tool, which provides a user-friendly authoring (i.e., designing) environment for creating sequences of learning activities that can be shared with others. Participants submit their LAMS design along with a report detailing the relevant pedagogical approaches, their design rationale, and an implementation and evaluation plan.

Evaluation

In addition to the University mandated student evaluation of course and teaching process, we implemented an evaluation based on the TPCK and COI frameworks that underpinned the design of this course. These evaluation components were also embedded as part of the course itself, and are described in turn.

In order to support and evaluate participants' development of knowledge and skills in blended learning (from a technological pedagogical content knowledge) we designed a self-evaluation instrument that participants completed before and after the course. Using an online survey (www.SurveyMonkey.com) participants rated their own knowledge and skills related to blended learning, both in terms of level (from 1 = not at all, to 6 = extensive) and confidence (from 1 = not at all, to 6 = complete). They were encouraged to reflect on this experience and what it meant in terms of their learning, and to note this in their reflective journals. The overall results are presented below. Because of the number of items included in the instrument, related items were grouped together for statistical analysis; Knowledge (e.g., "…the learning and teaching theories that underpin blended learning design"), Ability with blended learning tools (e.g., "…using a virtual classroom (e.g., Wimba) in your course/practice"), Ability to manage blended learning (e.g., "…effectively managing a technology-rich/blended learning course"). At the beginning, participants also rated themselves in terms of the frequency and level of technology use in teaching; the majority (87%; 13 of 15) rated themselves as low (very little use) or medium (used a few different tools/technologies). Therefore, it is not surprising that at the beginning most rated their knowledge and skills, and associated confidence, quite low (see Table 1 below). There was a significant change in participants' ratings across all groups of items, indicating that as a result of the course the participants experienced an increase in their knowledge and skills, and also felt more confident.

The COI model was introduced at the beginning of the course, and was specifically incorporated into the set readings and discussion forum activities in the first module. Towards the end of the course, as part of exploring online survey tools, participants completed the COI survey (Arbaugh et al, 2008). As can be seen by the results in Table 2 below, participants rated teaching presence indicators most positively. Cognitive presence indicators were also rated quite highly with integration being the most positive (i.e., combining new information helped me answer questions, reflection helped me understand fundamental concepts). Aspects of social presence were rated least positively, which is commensurate with other course feedback indicating that participants wanted more face-to-face contact, particularly early in the course.

Table 1: Participant evaluation of their knowledge and skills in blended learning

Level of knowledge & skills	*Mean*	*SD*	*Confidence in knowledge & skills*	*Mean*	*SD*
Knowledge level: pre-course	2.28	0.99	Knowledge confidence: pre-course	2.41	0.91
Knowledge level: post-course	4.69*	0.75	Knowledge confidence: post-course	4.69*	0.76
Ability with BL tools: pre-course	2.2	0.93	Confidence with BL tools: pre-course	2.68	0.85
Ability with BL tools: post-course	4.33*	0.89	Confidence with BL tools: post-course	4.38*	1.02
Ability to manage BL: pre-course	2.23	0.93	Confidence to manage BL: pre-course	2.61	0.85
Ability to manage BL: post-course	4.42*	0.83	Confidence to manage BL: post-course	4.49*	0.95

* Significant difference between pre- and post-course ratings, with t values ranging between 5.58 and 32.80, $p < .001$.

Table 2: Participant evaluation of COI components of the elective course

Teaching Presence	*Mean (SD)*	*Social Presence*	*Mean (SD)*	*Cognitive Presence*	*Mean (SD)*
Design & Organisation	4.16 (0.42)	Affective	3.58 (0.87)	Trigger Events	3.82 (0.70)
Facilitation	4.23 (0.32)	Group Cohesion	3.73 (0.51)	Exploration	3.67 (0.60)
Direct Instruction	4.15 (0.40)	Open Communication	3.64 (0.66)	Integration	4.03 (0.59)
				Resolution	3.94 (.042)

Note. Responses were made on a scale of 1 (strongly disagree) to 5 (strongly agree)

Summary and conclusions

As suggested by Garrison and Vaughan (2007, p.13), working from an explicit framework in designing this course on blended learning provided us with 'a means to shape practice…to reflect upon and make sense of outcomes…" by carrying this framework through into our evaluation. Although brief, the data presented directly reflects the design of the course and together with the work produced by participants, allows us to evaluate and reflect on the success of the course in terms of it's underlying philosophy and aims. Whilst participant feedback was positive overall, and gains in knowledge and skills significant, participants felt the need for greater face-to- face contact and earlier development of social connections. This is not surprising, as lack of social interaction or connection is often a reported concern of online students (Smart & Cappel, 2006). However, using the COI model and survey allows us to more richly explore this issue, and continue to modify and adapt our blended learning practice.

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Interactive Webinars – the future of teaching and learning online

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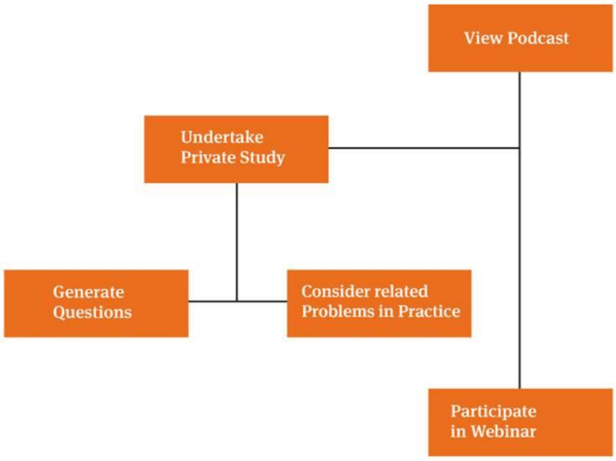
In recent years, a number of factors have contributed to the growth in both quantity and type of online educational resources made available to online learners. Two of these have been the speed of internet connections and advancing web technology. An example of this is the introduction of web-conferencing software, also known as webinars.

In 2009, the Education Development Unit (EDU) of the Australian and New Zealand College of Anaesthetists (ANZCA) introduced webinars as a collaborative teaching and learning tool for trainees preparing to sit the ANZCA Final Exam. This technology, coupled with the newly introduced video podcasts, offers learners a model of education delivered entirely over the internet with both synchronous and asynchronous elements (as described in figure 1.0 below). This model was developed based on adult learning principles, and building on experiential learning theory.



Web-conferencing technology has significant benefits to ANZCA and ANZCA trainees;

- **Collaborative learning:** Trainees are able to access expert information and support and not only access the information, but collaborate and interact in an online environment.
- **Far reaching contact and equitable access: W**eb conferencing technology allows interaction between geographically separated participants. Trainees from remote areas in Australia, as well as those located in New Zealand, Hong Kong, Malaysia and Singapore regularly participate.
- **Participation can occur anywhere:** Learners are no longer required to physically congregate in one area. All that is required for participation is access to the internet and a computer with speakers. This is particularly important for health care professionals with on-call and weekend commitments.
- **Visual: V**ideo feature gives the learner and trainer the social benefits of face-to-face interaction.
- **Instant messaging:** The 'chat' function allows learners to make comments whilst the trainer is talking without causing disruption.
- **Quzizzes:** The 'polling' function allows for on the spot quizzes to test knowledge acquisition and to provide immediate feedback to trainees on their understanding of the concepts presented.
- **Economical** – web conferencing technology is significantly more cost effective than installed video conferencing technology.

Roles

During the webinar, a variety of instructional roles have been developed to provide effective teaching and learning experiences to be provided. The role of moderator (or host) is undertaken by ANZCA staff from the EDU whose main role it is to offer any support that might be required. This has also required significant coaching on online delivery for inexperienced presenters.

The role of trainer (or presenter) is taken by an ANZCA Fellow who is online to make an expert presentation, pose and answer questions from the trainees who assume the role of attendees. To date, it has also been necessary to offer technical / administrative support for participants to assist with other aspects of attendance such as inability to logon, and requests for password reminders.

Trainees are able to ask the online trainer questions by either typing using the chat box feature or by using their microphone and asking their question using their web camera or in-built computer microphone. The process is exactly the same as it was in the traditional face-to-face environment that it replaces– the only difference here is that it is carried out completely online.

Format

During the interactive webinar, the trainer begins by giving an overview of the podcast that has usually been made available 2 – 3 weeks before the webinar takes place. They then invite the attending trainees to ask any questions they had in relation to the podcast topic. There are many features in-built to the online meeting space to encourage interaction amongst the trainees including the recently introduced ‘polling’ segment. This interactive component is similar to an online test where the presenter asks trainees pre-prepared short answer and multiple choice type questions. The trainees answer the questions by voting on the correct answer. The results submitted by the trainees are then shared anonymously and the presenter discusses the results.

The typical webinar format is as follows:

Typically, each webinar commences with ANZCA’s e-Learning Project Officer orientating the webinar participants to the online training environment. Time is also taken to introduce the webinar presenter and to provide instructions on how the participants interact with the presenter and each other.

The webinar presenter provides a brief overview of the content presented in the podcast. Trainees are expected to have reviewed this information in light of their own clinical experience thus encouraging application of the knowledge to their practice.

Trainees are invited to ask the presenter any questions they have in relation to the content delivered in the video podcast about the related topic. Participating trainees can ask their question either by typing in the chat box or communicating using microphone and webcam..

Short case-based discussions prepared by the presenter are shared with trainees in order to increase interaction. Short on-the-spot quizzes or multiple choice questions are also shared and trainees are able to answer by typing responses or talking online using a microphone and/or webcam.

The webinar ends with an end of session online evaluation form which all participants are requested to complete prior to exiting the webinar room.

Figure 2: The ANZCA Webinar format

Communication is challenging with a geographically dispersed working cohort and trainees are notified of webinar events through a variety of communications channels including; personal email invitations to Trainees; adverts in the ANZCA Trainee Newsletter, ANZCA website and ANZCA e-Newsletter. Supervisors of Training, Regional Education Officers and ANZCA Regional Staff are also requested to notify the trainees that they supervise or liaise with. Currently, ANZCA Interactive webinars take place on a monthly basis and the feedback from trainees is very positive. Formal evaluation data will be provided. Indicative quotes are provided below:

Due to the success of the current program, ANZCA will continue to invest in this technology to facilitate training for a broader audience, including International Medical Graduate Specialists (IMGS) and Fellows of the College interested in pursuing CPD opportunities and to formally evaluate the applicability of this innovative model in these alternative cohorts.

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Plug and play learning application integration using IMS Learning Tools Interoperability

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A key barrier to providing learners with engaging learning experiences is the deployment of new, innovative technology. This requires collaborative effort between teachers, system administrators and application developers. The shared goal is to make it as easy as possible for learning applications to be used by learners; the shared challenge is achieving this in a cost effective manner. The IMS Learning Tools Interoperability (LTI) specification provides new opportunities for addressing this issue and provides significant benefits to all three parties. Using LTI can provide developers and system administrators with a standard mechanism for integrating learning applications with existing systems (such as a virtual learning environment) and allow teachers greater freedom to select applications which best meet their pedagogic needs.
Keywords: IMS, Learning Tools Interoperability, LTI, learning application, innovation, community of enquiry

Introduction

The learning and teaching ecosystem is constantly under review with recurring debates within Higher Education about the role and function of the virtual learning environment (VLE) in supporting blended and online learning (Littlejohn & Pegler, 2007; Garrison 2011). For example, this was one of the topics at the 2009 JISC CETIS conference (MacNeill, 2009) at which different models for distributed learning environments were discussed. Subsequently these were summarised in a briefing paper (MacNeill & Kraan, 2010) under the headings of:

1. system in the cloud, many outlets;
2. plug-in to VLEs;
3. many widgets from the web into one widget container;
4. many providers and many clients;
5. both a provider and a client.

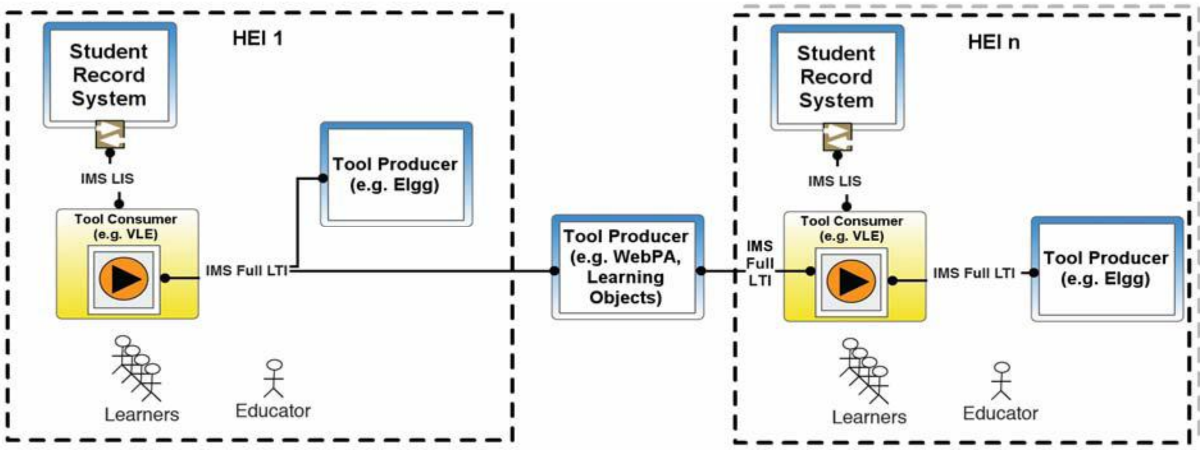

Figure 1: Enhanced "plug-in to VLEs" learning environment model

The common theme was a recognition that a VLE is not the sole source of applications used for teaching and learning; a complete view of a learning environment involves some form of integration of disparate learning applications. This paper outlines a variation on model 2 which retains a central hub (such as a VLE) from which connections can be made to other applications, both ones hosted internally by an institution (such as Elgg in Figure 1) and externally hosted, shared services (such as WebPA in Figure 1).

Teachers value a secure, central single point of entry into an on-line learning environment which enables students to move seamlessly between learning activities regardless of where the applications may be physically located (within or outwith the institution). Such deep integration allows the tutor to focus on the pedagogical design and organisation of a learning environment leading to the development of both social and cognitive presence (Garrison 2011). Unfortunately when trying to blend a range of applications to develop a challenging learning environment, tutors too often find themselves faced with a range of "labels and artificial standards" which limit their experimentation with learning technology (Garrison 2011, p76). The IMS Learning Tools Interoperability (LTI) specification has the potential to remove these limitations by:

- providing a quick and easy mechanism by which additional learning applications can be made available to learners and tutors;
- supporting the movement of data between systems;
- extending collaboration to include learners outside the institution.

This should enable the tutor to focus on supporting learners in meeting the educational outcomes of a programme of study rather than worrying about how students log into online learning environments and move between disparate applications.

IMS Learning Tools Interoperability

The IMS Learning Tools Interoperability (LTI) specification (IMS Global Learning Consortium, 2011b) is designed to provide a standard mechanism for connecting a learning application (referred to as a tool provider) to a central hub such as a VLE (referred to as a tool consumer). The implementation of LTI in an institutional learning environment is illustrated in Figure 2.

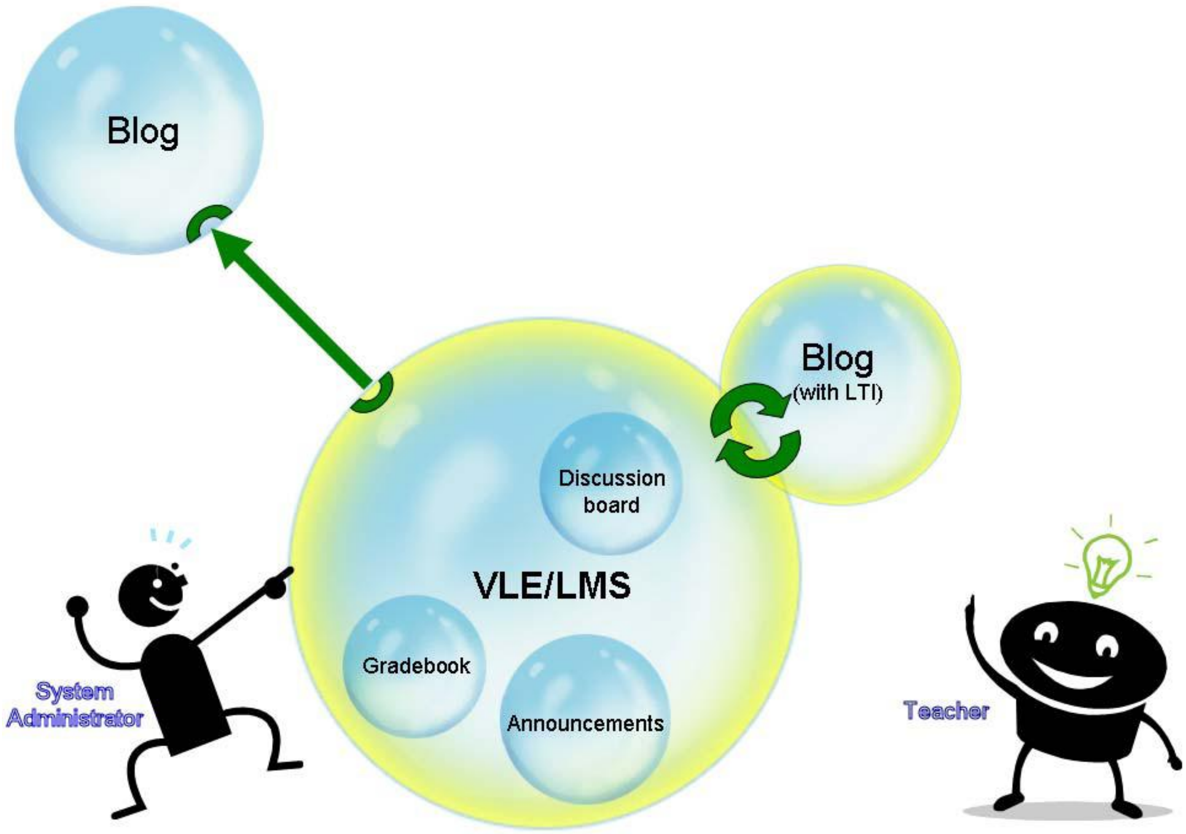

Figure 2: A visual representation of the implementation of LTI

A VLE comprises numerous core applications such as a gradebook, an announcements system and a discussion board. However, by its nature, the VLE will never provide *all* the learning applications demanded by teachers. Traditionally an external blog service, for example, might have been integrated with the VLE by writing custom code at both ends to enable users to launch the blog from within the VLE. Whilst such an approach has commonly been used, it relies on appropriate access to each system and the required developer expertise. The Basic LTI specification released in 2010 implements this form of "launch" (one-way) connection in a standard way such that any tool provider supporting Basic LTI can be connected to any tool consumer which supports Basic LTI. Basic LTI is already supported by all the major VLEs as well as many other learning systems (such as Campus Pack or PebblePad). Severance (2010) and Severance, Hanss & Hardin (2010) provide interesting use case examples of applications of LTI.

The Full LTI specification (not released at the time of writing) extends the design to provide a tighter, two-way integration between tool consumers and tool providers. This allows an external tool to exchange data with the tool consumer (such as enrolments and grades). It also provides a mechanism by which the tool provider is notified of relevant actions undertaken by users within the tool consumer (such as copying a course). In this way an external tool can closely resemble the behaviour of a tool embedded within the VLE and minimise the impact on users.

Impact of Learning Tools Interoperability

Developing a Community of Inquiry

Over the last decade, the community of inquiry conceptual framework has emerged which supports the planning and design of online learning in higher education (Garrison 2011) Drawing heavily on emergent research into online and blended learning and strongly influenced by the work of Dewey, this framework proposes that an online community of inquiry will support learners to develop appropriate skills and knowledge to become creative and critical thinkers. A community of inquiry is:

> a group of individuals who collaboratively engage in purposeful critical discourse and reflection to construct personal meaning and confirm mutual understanding. (Garrison 2011, p. 15)

Three interlocking elements are essential for the development of an online community of enquiry: social, cognitive and teaching presence. The IMS LTI specification supports the development of each of these linked elements by providing a toolbox from which tutors can select appropriate applications to create a seamless learning environment.. For example, a tutor may select:

- *on-line discussions* within a VLE to be used as a trigger activity focussing students on a specific problem but also informing tutors about their learners' current conceptual understandings or misunderstanding of the subject area; such an activity allows learners to develop a connection with the course and fellow students, thereby developing personal and affective relationships;
- *blogs* (outwith the VLE) provide an ideal reflective tool for critical thinking and personal meaning making;
- a *wiki* (within the VLE): an ideal area for learners to explore a specific topic, gather a range of materials and start to develop group meaning;
- *online synchronous tools* within a VLE allowing groups to present their developing ideas in the wiki which can challenged and probed by the Community;
- an *ePortfolio* outwith the VLE provides an individual summative assessment tool.

The adoption of LTI simplifies the process of selecting and implementing new learning applications for tutors. Instead of worrying about if such applications can be used in combination, tutors can focus on designing and maintaining an engaging and stimulating learning environment which facilitates critical discourse and leads to personal meaning making.

Benefits for technologists

The IMS LTI specification also provides benefits to all those involved in delivering online learning experiences to learners including:

- system administrators;
- learning technologists;
- application developers.

Impact on system administrators

Some VLE implementations of Basic LTI (such as Blackboard Learn 9.1) enable teachers to add their own connections to LTI-compliant applications reducing the workload for system administrators although diligence checks on the service provider and data security tests are still required. However, since LTI can be used for both internally-hosted and externally-hosted applications, it can provide institutions with a convenient mechanism for implementing their own developments as well as those from third parties. Furthermore, "Full" LTI provides support for administrative operations such as backing up, copying and restoring courses where the data relating to these courses may be spread across multiple systems.

Impact on learning technologists

Supporting a diverse range of learning applications which do not interconnect gives rise to pedagogical and technical challenges for learning technologists. Disparate systems require significant amounts of support to ensure that learners and tutors know how and where to access such applications in a timely fashion. This distracts from the pedagogical support that learning technologists can provide to academic colleagues and furthermore inhibits tutor innovation in developing an holistic learning environment.

Impact on application developers

The main benefit for developers is that adding support for LTI will enable their application to be integrated with a wide range of VLEs and other systems. This removes the need to create and maintain individual integrations for each VLE, such as a Moodle module, a WebCT PowerLink and a Blackboard Building Block. This does not prohibit a tighter integration from being written for specific VLEs where customer demand warrants the investment.

Conclusion

The adoption of LTI truly delivers benefits to all parties involved in delivering engaging on-line learning experiences to learners. Teachers should find it easier to locate applications which they can use in a seamless manner; the effort required by system administrators to check and deploy a connection to an external learning

application is significantly reduced, thereby increasing their ability to support more of the applications demanded by users; and developers can make their applications more widely available through a single integration. The use of LTI makes it more feasible for staff to innovate in their teaching and learning practices and for successful experiments to be deployed more widely across the institution.
The number of applications and systems which have already demonstrated conformance to the Basic LTI specification (IMS Global Learning Consortium, 2011a) suggests that there is widespread appreciation of the benefits to be derived. Continuing the trend of increased adoption merely serves to increase the benefits being delivered to the education community.

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iPad-eology in Higher Education

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Abstract and Symposium Plan

This interactive symposium will examine the iPad as a pedagogical tool and will explore its potential to transform higher education. 'Padagogy', and 'Podagogy' are swiftly becoming mainstream terms. Whilst this symposium will focus primarily on the role of the iPad in the classroom it will also make reference to other personal computing and mobile devices available to learners.

The symposium will be conducted face to face and via webinar, with input from remote presenters and involvement from (selected) remote participants. ASCILITE delegates and outside participants will be able to comment via a twitter stream, which will be displayed at the venue, and will be able to collaborate more extensively via an ASCILITE wiki.

The symposium will be run as a panel session. Each of the representatives from the three institutions will provide an initial five-minute overview of their experiences in using iPads as teaching & learning devices, exploring the pedagogical opportunities, challenges and risks that iPads and mobile devices present. Immediately following each presentation there will be opportunity for the audience to ask questions and/or make comment. At the end of the panel presentations, delegates, virtual participants and the panel members will have further opportunity to engage in broad ranging exchanges about the value and uses of mobile learning devices and where their future might lead. This dialogue will be transcribed live onto a collaborative site which will remain available for ongoing deliberation at the end of the session. The symposium will be podcast for future online dialogue through the ASCILITE 2011 website.

As stated all delegates at the conference can attend face to face or virtually via webinar and can use mobile devices to *tweet* synchronously or asynchronously to #heipad during and after the symposium. The symposium is intended to encourage dialogue on Padagogy/iPad-eology and/ or i-Devices in higher education during and beyond the conference, as an ongoing collaborative iPad -Communities of Practice and/or Moot. It is anticipated that the symposium will generate interest in the development of a **multi-site research space** – a so called iPad research *blogosphere* – of related sites for ongoing collaboration after the symposium.

Microblogging- Twitter

Tweeting has begun:

...Getting ready for @ascilite11 with a panel on iPads in Australian higher ed, look for #heipad in Dec!

Please cite as: Borbasi, S., Brand, J., Mathew, T., Kordyban, R., Wong, W., Williams, P., Green, Ian., Smith, S., & Carrington, A. (2011). iPad-eology in Higher Education. In G. Williams, P. Statham, N. Brown, B. Cleland (Eds.), *Changing Demands, Changing Directions. Proceedings ascilite Hobart 2011*. (pp.148-149) http://www.ascilite.org.au/conferences/hobart11/procs/Borbasi-symposium.pdf

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Uniting on-campus and distributed learners through media-rich synchronous tools: A national project

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Twenty-first century university students find it increasingly difficult to commit to regular face-to-face classes, yet real-time interaction and collaboration are often essential to achieving successful learning outcomes. This paper outlines the authors' plans for a cross-institutional project funded by the Australian Learning and Teaching Council aimed at identifying, characterising and evaluating technology-enhanced ways of bringing together on-campus and geographically dispersed students and engaging them in media-rich collaborative learning experiences. The project will focus on three synchronous technologies: desktop video conferencing, web conferencing and 3D virtual worlds. The paper first presents the rationale for the project, along with the main outcomes envisaged. The project's focus and methodology are then described, before concluding with a call for expressions of interest from members of the ascilite community wishing to join a network of practitioners and/or participate in case-study implementations that will be supported, monitored and evaluated as part of the project.

Keywords: synchronous learning, rich media, multimodal learning, collaboration, affordances

Project rationale and outcomes

Recent research clearly indicates that Australian university students are coming on to university campuses less and are going online more to fulfil their learning needs (James, Krause & Jennings, 2010). As they increasingly need to juggle the competing demands of work, family and study, the ways in which they engage with their institutions is changing. The use of technology is playing a key role in this change. While most students still enrol to study on a centralised campus, their studies are supported through a range of online resources – lecture recordings, notes, readings, and so on – that make coming to campus more optional. As students choose more flexible study options and technology-based learning support becomes pervasive, the boundary between traditional campus-based and distance learning in higher education is becoming blurred (Dillenbourg, 2008).

Given the changing patterns of student engagement in higher education, the sector is more actively considering how technology can facilitate instructional and collaborative interactions between staff and students who are increasingly distributed and dislocated (Herrington, Herrington, Ferry & Olney, 2008; Lowe, Murray, Li & Lindsay, 2008; Smyth, Andrews, Bordujenko & Caladine, 2011). Higher educators recognise that in many disciplines, interactive activities often lie at the heart of effective, engaging learning experiences. These interactions take a variety of forms, such as: an individual student and tutor participating in a deep discussion about a tricky concept; pairs or small groups of students discussing problems or topics; whole-class discussions including facilitated question-and-answer sessions; or presentations delivered by students before their peers.

While enterprise Learning Management Systems (LMSs) have some ability to support instructional and collaborative interactions, such systems are routinely used for and suited to the provision of resources and asynchronous communication via tools such as discussion forums (Blin & Munro, 2008; Valcke, 2004). But media-rich synchronous technologies have emerged that may be used to greatly enhance the educational experiences of increasingly distributed university students. We have been successful in securing funding through an Australian Learning and Teaching (ALTC) Innovation and Development Grant for a national project that will explicitly consider how three of these technologies – video conferencing, web conferencing and 3D virtual worlds – can be best used to support effective collaborative and communicative activities that engage higher education students and teachers in real-time learning irrespective of their location. The main purposes of this paper are to promote awareness of the project in the ascilite community and to solicit interest in participating in both the project itself as well as the community of practice that it aims to foster.

In undertaking this research and development project we seek to achieve a series of important outcomes:

12. The establishment of a practitioner network comprising higher educators from across Australia with an interest in the use of media-rich real-time collaboration and communication tools for learning and teaching.
13. The development of a collection of case studies documenting six real instances of the design, development, implementation and evaluation of learning and teaching activities that employ media-rich real-time collaboration and communication tools, together with a cross-case evaluation.
14. The development of a publication containing:
    a. a collection of *learning design exemplars* expressed as reusable templates that encapsulate key pedagogical features and patterns;
    b. a *technology capability framework* that provides (i) a map of how the three general technologies being considered (video conferencing, web conferencing, 3D virtual worlds) can be used with particular types of collaborative and interactive learning tasks/activities, and (ii) a matrix of the capabilities and limitations of specific tools (e.g. Wimba Classroom, Adobe Connect, Skype) on particular dimensions (e.g. types of communication channels and interactions supported, degree of synchronicity, visibility of participants);
    c. a set of overarching *guidelines for practice* that will draw on (a) and (b) to help higher educators make informed decisions and choices when designing media-rich real-time collaborative and interactive learning activities.

The project will lead to a greater understanding of how media-rich real-time learning technologies can be most appropriately applied in a range of institutional and disciplinary contexts across the higher education sector. Moreover, as emerging collaborative technologies move into the mainstream, this project will increase the capacity of university staff to use them effectively in conjunction with pedagogically sound learning designs. This has the potential to significantly enhance the learning experiences of students across the sector.

Besides delivering practical value, the project will also leverage, build on and extend scholarly knowledge in a number of areas related to learning, teaching and technology. There is broad consensus among educational researchers about the positive effects of collaborative learning on achievement (see, for example, Jonassen, Lee, Yang & Laffey, 2005; Joseph & Payne, 2003; Slavin, 1995). A key component of the longstanding research agenda in Computer Supported Collaborative Learning (CSCL) has been a focus on the effective design and use of social technologies (Suthers, 2006). Understanding how the features or 'affordances' of these technologies affect learning processes in specific instances and then comparing results across cases makes it possible to determine those elements of technology design that are vital and distinguish them from those that are less crucial

(Dwyer & Suthers, 2005). A primary goal of this project, then, will be to find and share collections of affordances that support effective collaborative and communicative learning processes.

Project focus

The project will focus on ways in which three types of media-rich synchronous technologies can be effectively used to engage lecturers and students in real-time learning regardless of where they are situated. The three technologies being considered are:

- *Video conferencing* systems enable synchronous interaction between remote participants in which they exchange detailed audio-visual information. They have a long history of transmissive use in higher education, for example to allow learners in rural and isolated locations to ‘attend’ lectures at regional centres (e.g. Caladine, 2006) and to connect students with teachers based at different sites of multi-campus institutions. However, as bandwidth and hardware costs continue to fall such approaches may be especially useful for bidirectional exchange of high-fidelity multimedia information, and for allowing students to participate in campus-based classes from their own homes and workplaces.
- *Web conferencing* tools such as Adobe Connect, WebEx and Wimba Classroom allow a group of users to enter a shared virtual ‘room’ that supports synchronous interactions through a variety of modalities. Users can collaboratively author text, draw shared diagrams and vote on issues of common interest, working together in real time in an environment that enables them to focus directly on the task and materials at hand (see Bower, 2008, 2011). While web conferencing has typically been used to facilitate entirely online learning (for instance, see Chapman & Wiessner, 2008), this project will also explore its potential for bringing together face-to-face and remote learners in integrated collaborative learning experiences.
- *3D virtual worlds* allow users portrayed by an animated figure or ‘avatar’ to move around a synthetic environment and interact with other objects and users. Examples of popular virtual world platforms are Second Life, Active Worlds and OpenSim. Virtual worlds can be used to support collaborative and interactive learning by allowing real-time verbal and non-verbal interaction, fostering co-presence, and enabling immediate control of objects and artefacts (Andreas, Tsiatsos, Terzidou & Pomportsis, 2010; Dalgarno & Lee, 2010). They can also be used in conjunction with face-to-face classes to create ‘blended reality’ experiences (Bower, Cram & Groom, 2010).

These learning technologies differ from those commonly provided within a university LMS, in that they are able to provide an increased sense of *co-presence* among staff and students, offer new possibilities for *concept representation*, and depend on *collaboration* coordinated in real time. Human-computer interaction researchers (Clark & Brennan, 1991; Kraut, Fussell, Brennan & Siegel, 2002) have shown how the characteristics of media such as co-presence (people have a sense of ‘being there together’ in the environment), co-temporality (communication can be sent and received at the same time), visibility (people and artefacts can be seen) and tangibility (people and artefacts can be touched) can all impact on the utility and effectiveness of both face-to-face and computer-mediated interaction. In terms of concept representation, selecting the most appropriate modalities is critical because it influences the effectiveness with which meaning is shared (Kress, Jewitt, Ogborn & Tsatsarelis, 2001).

Moreover, collaborative and communicative technologies relate differently to different pedagogical strategies, discipline contexts and types of educational material or content and as such may have different collaborative overheads or ‘costs’ attached to them. For example, Neale, Carroll and Rosson (2004) use the term ‘process loss’ to describe the overhead incurred when attempting to coordinate a collaborative activity. They also define ‘distributed process loss’ as the amount of coordination required to manage the main activity of interest when collaborators are operating remotely. They argue that distributed process loss in technology-based environments is much more costly than in face-to-face contexts, “so costly, in fact, that groups often do not recover from its effects” (p. 117). In their study, they observed that when participants struggled to understand what their remote partners were doing and why, collaborative breakdowns resulted. It is thus essential for higher educators to not only understand which technologies to use to meet the intended learning requirements but also to develop efficient techno-pedagogical strategies for effectively implementing online synchronous learning.

Project methodology

The project will be conducted in four overlapping phases. Phase 1, which will run from October 2011 to March 2012, will involve documenting existing practice in the use of media-rich real-time collaboration tools for learning and teaching. This phase will entail surveying extant literature as well as higher educators in a range of disciplines to create of a bank of innovative practices in the area. Specifically, an online questionnaire will be administered to gather summary information and learning design descriptions from academics and educational designers already employing media-rich collaborative and communicative technologies. Respondents will also be invited to join a practitioner network.

Phase 2 will commence in February 2012 and conclude in June 2012. In this phase, the various learning and teaching activities from the collection of innovative practices assembled in Phase 1 will be systematically analysed to understand their learning design patterns and technological requirements, with a view to creating a technology capability framework. The salient features of collaborative learning designs and the capabilities of the technological tools used in each case will be distilled, characterised and drawn together in a framework to help higher educators make informed media/tool choices and design decisions. As the framework is being developed it will undergo peer review by practitioner network members.

Next, in Phase 3, six cases will be followed and investigated through participatory evaluation. This phase will run for approximately eight months, from June 2012 to January 2013. The cases will be selected with reference to the data gathered during the first phase as well as in consultation with members of the practitioner network. Planning and shaping of the implementations will occur in collaboration with participating staff to encourage renewal and enhancement of their existing practice. Ongoing evaluation and consultation will take place throughout the implementation so as to optimise outcomes for students and staff. In addition, a summative 'effectiveness' evaluation of the approach used in each case will be performed.

A central driver behind this project will be the goal of building a networked community of technology educators interested in media-rich synchronous tools, and as such the final phase (Phase 4 – January 2013 to September 2013) of the project will be dedicated to the dissemination of project outcomes and material across and beyond this network. The project's findings will be reported and shared through a website and publications that draw on the exemplar learning designs, technology capability framework, and the case studies and their evaluations. It is intended that these resources will contribute to the development of staff capability in the domain of media-rich synchronous learning, thereby engendering improvements to their practice and to the learning experiences of students. Through these activities, and with the support of organisations such as ascilite, we expect to be able to not only promote awareness and uptake of the project results and resources, but also to provide demonstrations of the synchronous learning approaches and strategies through webinars so that attendees may more easily apply them in their own practice.

The outcomes of the project will enable university teachers to better understand how important characteristics of synchronous technologies – types of presence, ways of representing information, and modes of collaboration – impact upon learning processes, so that they can more effectively meet the learning needs of their students. The project will build on existing literature, such as that emanating from recently completed ALTC projects focusing on video conferencing (Smyth et al., 2011) and video lectures (Gosper, Green, McNeill, Phillips, Preston & Woo, 2008), as well as other national initiatives (e.g. the DEHub virtual worlds scoping study – see Dalgarno, Lee, Carlson, Gregory & Tynan, 2011), by both widening the spectrum of media being examined and also more explicitly addressing how different tasks and technologies can be *practically* combined to support effective, location-independent real-time interaction among students. The project will also draw on research and literature in the area of reusable technology-enabled learning designs – see, for example, the products of the projects in this area sponsored by the Australian Universities Teaching Committee (AUTC, 2003) and the UK Joint Information Systems Committee (JISC, 2010). The integrated set of synchronous learning design patterns produced will provide the higher educators with concrete examples to support them in synchronously blending campus-based and online learning and teaching. Concurrently considering an array of tools that lend themselves to broader collaborative and representational possibilities will permit the derivation of more robust, pedagogically informed frameworks and principles for technology selection and use, that will readily support application across the sector as the technologies become more pervasive and accessible to students and staff.

Conclusion and call for participation

In this paper, we have discussed the rationale and intended outcomes as well as the methodology for a national project that seeks to investigate approaches for facilitating truly collaborative learning experiences among on-campus and distributed students through the use of media-rich synchronous technologies, with a particular focus on three representative technologies, namely desktop video conferencing, web conferencing and 3D virtual worlds. A key feature of the project is the formation of a network of practitioners, with whose help six case-study implementations will be identified, supported, monitored and evaluated. A technology capability framework and set of exemplar learning designs, along with practical guidelines for staff, will be generated, then trialled and refined as part of the case studies. These resources as well as interactive webinars will be practical outcomes of the project, from which members of the ascilite community will be able to benefit.

We would like to take this opportunity to issue a call for participation in the project, which can be at a number of levels. Firstly, Australian higher educators with an interest in the use of media-rich synchronous collaborative technologies for learning and teaching are invited to join the practitioner network, and may request further instructions on how to do this via email. Secondly, those who have experience and/or expertise in this area are asked to complete the online questionnaire, details of which will be made available through the ascilite mailing list and at the conference. Thirdly, expressions of interest are sought from those wishing to lead the implementation of a case study at their institution within their subject/teaching area.

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An investigation into the use of emerging technologies to transform teaching and learning across differently positioned higher education institutions in South Africa[2]

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This paper reports on a project which was initiated in 2011 and which aims to learn more about emerging technologies in higher education in South Africa and their potential impact on enhancing learning in an inequitable educational landscape. This newly developed research project includes a team of researchers across eight differently placed South African HEIs and one international NGO (see footnote 1 for researchers in the team and their institutional affiliations). The paper elaborates on emerging technologies, the South African context, provides an overview of the rationale for the project and describes the research design for the project.

Keywords: Emerging Technologies, South African HEIs, transforming teaching and learning,

Introduction

This paper reports on a project which focuses specifically on *emerging technologies* which are being used in South African Higher Education to improve teaching and learning. Emerging technologies are defined as those technologies which are ‘likely to have a large impact on teaching, learning, or creative inquiry on college and university campuses within the next five years’ (Johnson et al. 2011, p.3). or those technologies which are on the rise (Johnson & Adams, 2011). According to The Technology Outlook for UK Tertiary Education 2011-

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2016 Report by the New Media Consortium and JISC support centres in the UK, mobiles are likely to become used in mainstream educational settings globally, with cloud computing also becoming prevalent in the next year and game-based learning coming into prominence in the next two to three years. All three of these technologies are seen to have the potential to disrupt what is current teaching and learning practice in higher education institutions (HEIs).

Contextualisation of the project

The question of how to make higher education more inclusive has been a central concern internationally over the past two decades (Drakich, Taylor & Bankier, 1995). South African post-apartheid policy documents on education reflect this same concern, embracing values such as democracy, openness and a human rights approach to education (Department of Education, 2001). Despite these policy intentions, however, the South African higher education landscape is still affected by the historical inequities of past policies, and many students and Higher Education Institutions (HEIs), particularly the Historically Disadvantaged Institutions (HDIs) are affected by scarce resources, poverty and students' inadequate preparation for higher education as a result of inequities in the general education system in South Africa (MacDonald, 2006, Scott, Yeld & Hendry, 2009). Higher educators world-wide also tend to fall back on outmoded transmission practices in their teaching, which are out of sync with the informal learning experiences of students (Ramsden, 2011). Emerging technologies, if used appropriately, have been shown to enhance communication and critical thinking skills, develop lifelong learning behaviour and facilitate student engagement in ways that promote a deeper understanding of coursework (Henard, 2009). In addition to improving teaching and learning practices, providing access to the vast resources that are freely available online may benefit students who lack access to traditional forms of content e.g. textbooks.

This study is intended to contribute to a national understanding of what emerging technologies might contribute to the quality of teaching and learning in South Africa. More particularly this study focuses on how emerging technologies can be used for transforming teaching and learning interactions and paradigms in a diversity of Higher Education contexts, including resource-scarce situations.

Emerging technologies and social inclusion

Emerging technologies can be used in innovative ways to address issues of inequity and social exclusion. These emerging technologies could be used to create seamless and safe embedded interactive learning spaces across diverse contexts (Davidson & Goldberg, 2009; DeViney & Lewis, 2006; Hakkarainen, 2009; Henschke, 2010; Looi, 2010; Sharples et. al., 2007; Traxler, 2009).

Traxler (2009) observes that less privileged individuals are able to access information of their choice using their own devices without needing to accept constraints and conditions historically imposed on them. The use of their own devices or ubiquitous technologies has the potential to improve educators' interaction with learners, learners interaction with content, and learners interaction with peers. Leveraging technologies that are available to people with emerging social practices enabled by technologies thus have the potential to bring about qualitative outcomes to education. The affordances of such integration are the blending of informal with formal learning. To the extent that blended learning could be viewed as empowering learners by widening access to education, the integration of blended and mobile learning has the potential to both widen access and enhance the learning experience. According to Van 'T Hooft (2009), mobility expands learning across space and time and opens many opportunities for learning that is neither sequential nor consistent.

Podcasts, blogs and e-books have been shown to be useful in resource-constrained contexts. Podcasts are seen as particularly useful because of their relative low cost and ease of use - Salmon and Nie (2008, p.3) refer to this as 'a high-value, low cost approach'. This is useful for students who come from impoverished backgrounds and who are not able to afford sophisticated electronic equipment. Many students however, do have access to mobile phones which also function as MP3 players. Salmon & Nie (2008, p. 5) have noted that the 'human and personal features of voices can convey to listener's a richer understanding'. Ng'ambi (2008; 2009) has noted how podcasts have been effective particularly for expansive learning with second-language students.

Blogs have also been successfully used in education to enhance and deepen learning and develop writing capabilities (Williamson, 2006). Quinn et al. (2007) point out that it is the connectivity between the writer and the reader that distinguishes blogs from ordinary paper based journaling practices, bringing the social aspects into learning. The ease and immediacy of the comment function on blogging could encourage the regularity and timeous feedback responses on the part of lecturers, tutors, supervisors and or peers.

E-books which are texts that are made available in electronic format on computers or handheld devices, have also been used in the South African Higher Education sector in a pilot project initiated by the International Association of Digital Publications (IADP) Affordable Access Project, a United Kingdom-based not-for-profit NGO. The main vision of this project has been to improve the education and effectiveness of students who will work in poor communities, particularly in rural areas including agricultural workers, nurses, social workers, teachers and doctors through providing affordable access to digital publications in the form of e-books. The aim of the IADP project has been to enhance education and address issues of poverty through providing affordable and convenient access to high quality, relevant content using digital technology. E-books are regarded as useful in that they are portable and mobile and do not occupy large amounts of space. For students who have to study in multiple environments they are accessible as long as hand held devices or desktop or laptop computers are available. However, in order to be used in a beneficial way, e-books need to be integrated into the curriculum and teaching and learning strategies (Kukulska-Hulme, 2005).

Research Design

This study follows a mixed-methods approach (Creswell, 2002), which includes quantitative and qualitative methods. It is envisioned that there will be two phases to the study - a national survey on the use of emerging technologies to improve teaching and learning in South African HEIs and a series of case studies on innovative teaching and learning practices in the eight HEIs that are part of the research team The project is funded by the National Research Fund in South Africa.

Overarching question

How could qualitative outcomes in education be realised by using emerging technologies to transform teaching and learning interactions and paradigms across higher education institutions in South Africa?

The sub-questions

In what ways are emerging technologies used in innovative pedagogical practices to transform teaching and learning across South African HEIs?

What can be learnt from an in-depth examination of case studies of innovative practice in a sample of HEIs in which these emergent technologies are being used?

What are the conscious and tacit theoretical assumptions guiding higher educators' teaching and learning practices?

What models of innovative theory and practice can be developed from the identification of transformative teaching and learning interactions and paradigms across the HEIs?

Data Collection Methods.

Phase 1 Survey of teaching and learning interactions using ICTs in SA HEIs
The survey has involved designing and prototyping a scoping questionnaire prior to administering this to academics in all HEIs in South Africa to establish current practices regarding emergent technologies to enhance teaching and learning. The online questionnaire comprises of closed and open ended questions. The objective of the survey will be to establish the contexts and conditions that frame current practices of use of emerging technologies within South Africans HEIs.

An online questionnaire was sent to lecturers at HEIs in South Africa who identify themselves as engaged in innovative pedagogical practices using emerging ICTs. The following questions were addressed in the online questionnaire to participants who self-identify as using emerging ICTs to enhance their teaching and learning practices:

The main qualitative questions were - What is the most innovative pedagogical practice that you used recently using ICTs (in the last two years)? What prompted you to initiate or use this pedagogical practice? (own motivation, addressing a specific problem; Please describe your teaching context in which you used this practice (level of programme, discipline, size of class, students' characteristics)? Which technology/tool did you use? Please describe? How did you come to use this specific technology? (eg heard from colleagues, from workshops, from students, from international conferences) ;What impact did it have on your teaching and the learning of your students? Did you use other technologies?

This survey will answer sub-question 1: In what ways are emerging technologies used in innovative pedagogical practices to transform teaching and learning across South African HEIs?

Phase 2: Institutional Case Studies
The team of co-investigators, collaborators and students would conduct in-depth case studies (at least one from each of the participating 7 institutions) of innovative pedagogical practices using emergent technologies to enhance teaching and learning in South African higher education, with particular emphasis on those that would be useful and affordable in resource scarce contexts.
These case studies will be used to answer the second and third research sub- questions: What can be learnt from an in-depth examination of case studies of innovative practice in a sample of HEIs in which these emergent technologies are being used? and What are the conscious and tacit theoretical assumptions guiding higher educators' teaching and learning practices?

Progress of the project thus far

The team has administered the questionnaire to HEIs and is in the process of analysing the data. The next phase of data collection will be case studies at the eight institutions involved in the study which will be started in 2012. There will be PhD students who will be pursuing their own projects using emerging technologies as case studies at these various institutions.

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A framework for evaluating online learning in an ecology of sustainable innovation

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In this session, a conceptualized framework is presented to provide an organization a tool by which to self-evaluate their online learning initiative. The tool is a methodology that leverages Ellis and Goodyear's framework, as well as leverages activity theory (Cole & Engeström, 1993), and a new categorization of online learning as described by Norberg, Dziuban, and Moskal (2011). The methodology is presented in sufficient detail to permit application to most any online learning implementation. A case study will be forthcoming, as this framework will be initiated in 2012 at the University of South Australia.

Keywords: Evaluation Framework, Ecology of Learning, Organization Self-Assessment, Online Learning.

Introduction

Ellis and Goodyear address the complex practice of "E-Learning," alternatively referred to as "learning online," "online learning," "blended learning," or "technology-enhanced learning" (TEL), within institutions of higher education, in an ecological frame. (In this paper, TEL is differentiated from online learning as the latter is used to specifically refer to LMS-type coordinated learning, and the former as referring to a wider variety of technology beyond the LMS orientation.) The argued need for an ecological perspective is rather self-evident: having the big picture view is necessary to best grapple with and manage the complexities of institutional practices, especially as individuals involved with the grappling and managing are likely caught between pressure to maintain flexible policy and to act aggressively, competitively. To understate, this is difficult work.

The need for such a framework is also self-evident. Organizations world-wide are adopting approaches to deliver teaching and learning using multiple modalities through the Internet. In the United States, 63% of institutions participating in a national survey administered and analyzed by the Babson Survey Research Group indicated they consider online instruction strategic for their institution (Allen & Seaman, 2010). The numbers say it best: in the United States, nearly one million more students are taking an online course in 2010 compared with 2009, and nearly 30% of all students take at least one course online. With consideration to this intensive shift in teaching and learning strategies, there is correspondingly considerable effort being invested in the development, implementation, and evaluation of programs to fulfill the goals of these online strategies. These institutions would find a framework to evaluate their organization's efforts to achieve sustained innovative practice very useful.

This concise paper will review activity theory, a new online learning model, and Ellis and Goodyear's work to suggest a framework for an organization's self evaluation of their TEL or online learning practices. The purpose of such a framework is to permit organizations a method by which they may examine their support for sustained innovation.

Activity Theory

The challenge implied with adequately describing the actors and the relationships is in recognizing the complexity of a social ecology. For this, a suitable model can be taken from Activity Theory.

The basic frame of the theory builds on a meditational triangle with subject, object and a medium (or artefact/tools) at the vertices (Cole & Engeström, 1993). Depicted in figure 1, the Activity Theory Model includes the following vertices moving in a clockwise rotation from mid-left: subject, mediating artefacts, object, division of labor (or the different roles that exercise an influence on the subject), community, and rules. This model at once sets the actor and target action (or behavior) within a frame of the key factors having influence on the actor and target action.

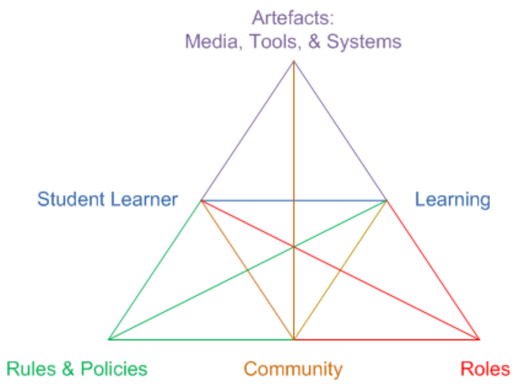

Figure 1: Activity Theory Model in context of the student learner in higher education.

Adjusting the model for a student in higher education, the student is the subject with learning as an object of active learning with an outcome target of new competencies. The influences on learning include the teachers, designers, tutors, administrators, and leaders (Roles) working to support the object target outcomes. Additionally, the student is a member of peers in the course(s) currently engaged, as well as study groups, or other clubs (Community). Naturally, course requirements, moral and ethical obligations associated with study and research, and institutional policies (Rules & Policies) also influence learning targets. Finally, activities will include mediators or tools to support learning (Artefacts), such as books, paper articles, audio and video source materials, and a myriad of technologies, such as learning management systems, both synchronous and asynchronous, and computer programs. It is arguable whether the pedagogy that orchestrates the use of mediators is part of the Artefacts, Rules and Policies, Community, or Roles since depending upon the details of the pedagogy, it could be a member of any of these vertices. In this article for simplicity, pedagogy can be considered a mediator for learning. The resulting model incorporates the key actors playing a role in student learning.

A Time-based Model for Online Learning

Blended learning more often describes teaching and course organization (Norberg, Dziuban, & Moskal, 2011; Oliver & Trigwell, 2005) and leaves for open discussion what "unblended learning" might be. Norberg et al. (2011) effectively argue against space being the key factor in learning as it always takes place where the student is. The more important factor is that the student and the components directing or influencing learning, such as the instructor, the places where students assemble to learn, etc, are orchestrated by time. As program and course directors adopt student-centred teaching models, an emphasis of *learning time* versus *teaching time* becomes necessary: given the increase of control over their learning, students progress in different ways and paces to advantage of their learning style preferences. The authors argue that "...as a result, learning space considerations might be deemphasized and replaced with time-related distinctions, building on synchronicity and asynchronicity, and focusing on a learning process" (Norberg et al., 2011, p. 12).

With this perspective, course structures can be examined by their synchronous and asynchronous blends of meetings and activities that can include technology enhancements (Norberg et al., 2011). Using this time-based approach, the authors identify five opportunities that influence the student experience. The five opportunities Norberg et al. (2011) identify are the following:

- Support – activities presented in a lecture that direct the student to conduct work beyond the lecture should be effectively supported using technology infrastructures, such as Learning Management Systems (LMS), blogs, drop-boxes, forums, twitter, etc. In an earlier time, the asynchronous work performed by students received minimal support.
- Migration – typical course designs tend to group activities as taking place during the meetings (i.e., synchronous sessions) or on the student's own time (i.e., asynchronous sessions). With a time-based model and leveraging TEL or online infrastructures, traditional course elements offer an opportunity to innovate: sessions can be translated from one format to another to better advantage of resource use, such as changing traditional lectures into recordings that are later discussed in detail.
- Synchronous location – traditional course designs tend to assume co-location as a requirement. However, co-location should be thought of as an opportunity for innovation: co-location should not always be a requirement of synchronous meetings, as ICT can be used to provide access to distant students (e.g., video and telephone conferencing, online chat, and online meetings).
- Flow – often the design effort of producing courses and programs keeps a strong emphasis on the alignment of objectives with assessments. This emphasis, while critical for effective instructional design, can reduce attention to the flow between instructional strategies. When learning activities are connected, whether they use synchronous or asynchronous modes, those connections must be supported to be effective (e.g., a prereading of text for a planned synchronous discussion will be dependent upon timely access to the material, or preparation to work with the material).
- Learner empowerment – students are most effective when they can access all course content anywhere and at anytime. Their social networks are useful when studying or for enhancing direction and guidance originating from synchronous meetings or interactions. Further, learner empowerment reflects a fundamental characteristic of effective learning: it's a means by which students take ownership.

With these five opportunities, an examination of TEL or online learning can be conducted regardless of mode. Further, the representation of these opportunities reflects learning more holistically than traditional approaches that tend to focus on teaching – the teaching elements are embedded into the full learning experience.

Ecology of Sustainable Innovation

Ellis and Goodyear (2010) take the completely reasonable position that avoidance of polarising thinking that yields indefensible contrasts, such as *new* versus *traditional*, *cognitive* versus *cultural*, or *technical* versus *human*, is best. The point is to bring focus to *relationships* rather than *differences* to better gain insight into problematic issues. Indeed, the concept of *ecology* is formed upon the relationships that comprise the system elements under study, in this case the sociological relationships inured to benefit students navigating TEL or online learning. From this approach, Ellis and Goodyear (2010) identify the key aspects of an ecology of learning as:

- <u>Balance</u> – given institutions' directive of teaching, research, and service, an ecological balance on learning can naturally "enfold" the three directives. The details surrounding how a learning balance would lead to a natural inclusion of teaching, research, and service cannot be stated in concrete terms, as the interpretation of balance will vary in different organizations. The point here is that *learning as the goal* would provide the perspective to find balance between the three.
- <u>Self-Awareness</u> – when parts of an organization do not each recognize their contribution or necessity to successful goal achievement, the organization as a whole is not *self-aware*. Further, there is an assumption here that suggests some level of awareness to the relationships the other parts carry into the organization. If the balance is on learning, then every part of the organization "...needs to be imbued with an understanding of 'good learning'" (Ellis & Goodyear, 2010, p. 20).
- <u>Feedback</u> – for the parts in an organization to recognize how well they are functioning, relative to the whole, they require feedback. Feedback acquired through systematic processes that communicate effectiveness of contributions creates opportunities for the organizational parts to learn. The origin of the feedback should be students, as well as internal and external stakeholders.
- <u>Self-Correction</u> – as organizations take action on feedback, they have opportunity for adjustment. Adjustments or self-corrections are re-alignments of operations to maintain a balance and focus on the organization's mission.

The four aspects above are inter-connected, inter-dependent, and to some extent heuristically related. But the aspects further demonstrate that an ecological perspective is good: insights gained through its adoption provide opportunities for sustainable innovation.

An Emerged Framework

The framework emerges from consideration of the three presented elements: activity theory set into context of a TEL or online learning support organization; a design model focused on the student experience that uses time, rather than place, as its guiding characteristic; and an ecological perspective taken on the organization that emphasizes sustainable innovation. Below, we identify each information source where data can be collected.

Organizational probes derived from the Activity Theory Model:

1. <u>External roles</u> that support learning environments (e.g., technology support assistants, instructional designers or teachers, teaching assistants or tutors, and the various leaders – team leads, directors, course coordinators, etc.)
2. <u>Internal roles</u> (i.e., those a student carries in the context of learning, such as first-year, group spokesperson, technical specialist, etc.)
3. <u>Community groups</u> supporting learning <u>with an external focus</u> (e.g., course or class peers, peers in different course or sections, or those who have previously completed the course (and may be available through different venues, such as clubs or forums), special tutoring groups, and technical help desk services)

4. Community groups supporting learning with an internal focus (e.g., students may belong to other groups that lie beyond the organization, such as religion or cultural heritage)
5. Rules that govern student behaviour that are often part of the rhetoric of university-related work, course and program requirements (e.g., use of Turnitin to control plagiarism, assignment due dates, assessments, etc.), and ethics originating from peers, family, or culture)
6. Artefacts or mediators that support learning (e.g., suite of technologies, systems, materials, and media – take heed: this item can become quite extensive)

To reduce data collection requirements, as well as analyses, it would be useful and advantageous to rank each within their respective areas (i.e., vertices) to identify major influences. The manner of ranking will naturally vary, but the approach to conduct the ranking should be stated and followed to permit future corrections. With the final inventory, further inquiry using a time-based model can be made, and later if problems or opportunities are uncovered, this inventory can be examined for sources of influence.

Experience from the student's perspective using a time-based model:

1. Take an inventory of all course or program activities and catalogue them as synchronous or asynchronous.
2. For all activities identified as asynchronous, identify the support strategies used, both overtly stated within course materials and those assumed a student will also have use of, that ensure student's successful completion.
3. For all activities identified as synchronous, identify any opportunities a course designer or teacher might use to change it from synchronous to asynchronous to improve focus on critical aspects of what is being learned.
4. For all synchronous activities, identify the rationale for a co-location requirement: does the design require attendance at a specific location, or are other alternatives a possibility? If all activities are mapped or drawn on a chart differentiating between synchronous and asynchronous events, examine the flow between each. What directions or other course elements support the student moving between the succession of activities: is there such a flow, and is there a natural progression that makes intuitive sense?
5. Finally, when examining the full list of activities, where and how is learner-empowerment integrated? Are students given options and choices? How much material or resources are available at anytime and from anyplace?

Following the collection of data previously described, varied analyses may be conducted to identify problems and opportunities of TEL or online courses, programs, and the organizations supporting their delivery. Such analyses serve dual purposes: one is to improve the student's experience that may influence learning outcomes, and the other is to serve as data for how well the organization functions to innovate on a sustained basis.

Ecological practice of TEL or online learning:

1. Conduct an inquiry into how the practice of balance is practiced within the organization. Is the mission of the organization focused primarily on learning? Is the practice of learning directing teaching, research, and service opportunities, and not the other way around?
2. Of the parts in the organization, do they recognize their contribution in the success of mission attainment as demonstrated in the learning analysis? How much does each part of the organization know of the other, and does each recognize the role they contribute to the learning analysis findings? How often do the parts coordinate and share information?
3. What feedback mechanisms are in place to provide the organization they are doing well or not? (For this, the source will originate from analysis using the previously discussed activity theory and the time-based model.) How believable is that feedback – is the information authentic and credible? How current is the feedback? Do opportunities exist to improve the periodicity of feedback, without degrading its authentic and credible nature?
4. How does the organization, the part of the organization or in its entirety, react to the information? How often are changes made? Where are changes being made to practice, policy, technology, communities, or roles? Does the organization react to correct a change in the balance from learning to the trinity of

higher education foci (i.e., teaching, research, and service)? How often does the organization examine their balance and foci of activities?

Conclusion

This paper presents a framework by which an organization supporting TEL or online learning might self-assess to determine their ability to innovate on a sustained basis. While no specific analytics are presented, the framework provides some examples of the type and nature of data to be collected. Analytics will be varied and will need to be fitted to the nature of data collected. A case study will be useful by providing details with the analytics that are specific to the situation under study that other organizations could follow and adjust as needed. Such an effort is the next step to this project. Further, the framework has additional uses: by leveraging an activity theory approach, the framework can be adapted for a variety of organizations. The requirement for such adaptations will necessitate different models to exemplify the targeted object, in the case of this paper, learning using the time-based model.

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iWant does not equal iWill: Correlates of mobile learning with iPads, e-textbooks, BlackBoard Mobile Learn and a blended learning experience

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This research tested the efficacy of a blended learning iteration with iPad tablet computers, an e-textbook and Blackboard's Mobile Learn application connected with a learning management system (LMS). Mobile learning was embedded into the pedagogical design of an undergraduate subject run in two semesters with 135 students. Using design-based research (DBR), an empirical investigation examined four variables including: iPad use; mobile technology use; attitude, including the unified theory of acceptance and use of technology (UTAUT) scale; and academic performance. Quantitative analysis with PASW Statistics included descriptive, scaling, correlations, partial correlations and ANCOVAs. Results suggested that students were positive about mobile learning, but were unconvinced that it made a difference to their learning. Performance variables demonstrated that age and self-managed learning attitudes were important covariates with academic success, and mobile learning per se was important but not independent from curriculum design and student engagement.

Keywords: mobile learning, higher education, e-textbook, learning management system, tablet computer, iPad.

Introduction and Literature

Much has been made of mobile learning and improved student experience and there is little question that the prospect of anytime, anywhere using small, yet powerful multi-purpose tablet computers is tantilising (Vavoula, Pachler, & Kukulska-Hulme, 2010; Guy, 2009; Kukulska-Hulme & Traxler, 2005). As with all new approaches to teaching and learning, the burden of proof must rest with the innovation, rather than the established approach. Yet, discourse on mobile learning and indeed, uses of emerging technologies in education more generally, readily presents assumptions about learning gains often based on observations of learner, teacher or administrator attitudes without testing the actual learning outcomes related to the technology use.

Belief in the legitimacy of the combined construct, mobile learning, is apparent in the literature including many educators claiming that student use of mobile technologies improves learning (Johnson, Levine, Smith & Stone, 2010). Mulholland's (2011) article, titled, *iPads strengthen education*, extolled the educational advantages of iPads, reported after a full year of use by school children in Chicago Public Schools. In the context of medical education, Sandars (2010) wrote that iPads "could revolutionise the way that we currently use technology to facilitate teaching and learning" (p. 270). Whereas mobile learning is "championed" in the literature, there is clear indication that there is a need to refine the pedagogy (Elias, 2011, p.144).

Consistent with preceding realms of educational technology, the literature establishes the affordances of the technology to a greater extent than evidenced learning outcomes. In other words, the articles establish potential and aspiration rather than actuals and results. Keskin and Metcalf (2011) assumed a link between the affordances of mobile devices and learning. "Mobile learning has come to people's attention because mobile devices are portable, ubiquitous, easily accessible and used by many people. This situation shows that there is great potential to enhance learning with mobile devices" (p. 202). Beetham and Sharpe (2007) privileged technology in their definition of mobile learning as technology driven, miniature and portable, andas facilitating connected classroom learning. Similarly, Motiwalla (2007) focussed on mobility and learner behaviour more than learning per se by observing that mobile devices liberate the learner with anywhere, anytime learning. Wang, Wu and Wang (2009) explained that mobile learning "content is received through wireless Internet and palm-sized computers, and thus m-learning usage can be considered to be a natural extension of computer use" (p. 99). Recognising that a one-to-one relationship between mobile devices and learning cannot be assumed, researchers are beginning to consider the characteristics of mobile learning that potentially make it a positive pedagogy (James, 2011).
Mobility is the term of choice used to connote untethered student experience with smart phones, tablets and netbooks, thereby making student materials light-weight and portable, and internet access allows students to access the content remotely using wireless networks. Writing in the context of English as a Foreign Language, Meurant (2010), for example, wrote that access to the iPad and wireless high-speed Internet connection has radically enhanced education.Such access, combined with germane learning tasks undoubtedly provide for learning opportunities in much the same way as other pedagogical processes are the repertoire of the constructivist educator, engaging the students in hands-on inquiry (David, Yin, & Chalon, 2009; Cavus & Uzuboylu, 2009; Motiwalla, 2007; Chao & Chen, 2009; Chen, Chang & Wang, 2008).

Discourse and research on mobile learning has mainly focused on the use of mobile phones (Johnson, Levine, Smith & Stone, 2010) and handheld computers such as the Palm operating system devices (Finn & Vandenham, 2004) as tools with which students access course content, if not produce work that produces learning outcomes.Kukulska-Hulme and Traxler (2005), for example, discussed the use of e-texts on Windows Mobile operating system phones and personal digital assistants (PDAs) in Open University courses. Their primary focus was on efficacy of mobile devices compared with established tethered personal computers in distance education systems that had relied heavily on internet connected PCs.In a similar vein, Liaw, Hatala and Huang (2010) researched attitudes toward mobile learning with surveys of n=152 university students. The researchers found that positive perceptions toward mobile learning increase when the curriculum is designed for autonomy to facilitate self-managed learning and is highly interactive. Cavus and Uzunboylu (2009) studied 41 undergraduate computer education students who answered attitude and critical thinking measures following use of mLearning devices. The authors questioned whether use of mobile devices promoted critical thinking and whether they had a measurable impact on student creativity, finding that student attitudes toward mobile learning improved significantly and critical thinking improved somewhat as use of mLearning devices increased. It should be acknowledged that the authors did not directly measure the critical thinking in terms of learning outcomes, but instead relied on indirect attitudinal questions of the students.

Chao and Chen (2009) designed an experiment to determine whether there were significant differences when students used paper-based versus mobile learning approaches to reading and note-taking. The researchers then elaborated on the experimental findings with an intensive case study. In their first study, 40 undergraduate students were randomly assigned to two groups of 20 each. The experimental group used mobile devices while the control group did not. In the second study, six participants participated in a follow-up case study in which their mobile learning tasks and device use were studied with system logs, diaries and interviews. The researchers found, unsurprisingly, that students used a blend of paper-based texts, personal computers and mobile devices for learning tasks. There was no significant difference in knowledge retention between the experimental and control groups.

This emerging body of mobile learning research attempts to explore a pedagogical link between mobility and learning, but provides limited empirical evidence that this connection has been established. This state of affairs is understandable inasmuch as research into mobile learning is "maturing" as no "explicit frame exists as yet to guide the choice of research methods and the tools for data analysis" (Pachler, 2009). Park (2011) **wrote that mobile learning is under-theorised . "Despite the many forms of and increasing services offered by mobile learning, it is still immature in terms of its technological limitations and pedagogical considerations" (p. 79).** The protean nature of mobile learning research, then, raises questions not only about its efficacy, but also about the constructs used in discourse about the phenomenon in university teaching and learning.

Even though mobile learning invokes notions of portable educational process, others have observed that the definition of mobile learning cannot be simplified into compounding the two terms (Guy, 2009). The side-by-side arrangement of the two words makes mobile the adverb of the verb learning. Learning connotes a more established or better-understood idea. For example, "learning is always the learning of some particular content" (Ramsden, 2003, p.49). To have learned means that a student has demonstrated a measured component of a set object or curricular domain and it is therefore baffling that mobile learning research has been centered around the feature of mobility as opposed to constructs of critical thinking and development of understanding (Laurillard, 2009).

Indeed, if learning takes place within the subjective experience of the learner, it is, to some extent, always mobile! The carriage of learning tools for decades, if not centuries, has been definitively a mobile process. Thus, while we focus on new tools, educators must also continue their focus on Ramsden's (2003) notion that learning takes place naturally and that the learning of a particular must necessarily be observed to claim the particular has been learnt, regardless of adjectival context of learning. In their examination of early mobile learning trials, Finn and Vandenham (2004) wrote, "while new technologies can offer new and creative modes of learning, the primary educational goals remain the same: to equip students with a set of skills and knowledges that will help prepare them for later life" (p. 32). Research into *learning* through ubiquitous educational technologies envelopes the concept of mobility, whereas research into *mobility* does not assure educators that the technologies are making a difference to *learning.*

In this context, much of the "buzz" around mobile learning appears to be a nascent and collective sense that students need mobile device skills that enable workplace productivity to ensure they have the professional capacity to use mobile tools effectively upon leaving the university education system. Debates about uses of computers and phones in the classroom in the short term may begin to centre on diminishing their use for non-academic and personal social networking and increasing their use for academic and productive use of mobile tools.

Mobile learning research may then re-situate the agenda on the operational definition of best practices in curriculum, pedagogy, teaching and learning (Kukulska-Hulme, & Traxler, 2005), rather than on its distinctiveness from other contexts of learning. In other words, mobile learning becomes nothing more and nothing less than good educational practice involving inquiry-based pedagogy with which students are engaging with real-world content in active processes that resemble those used by industry professionals (Jardine, Clifford & Friesen, 2008).

Moreover, focus on particular technologies is problematic not only in education but in almost any context as long as attention to them is situated in the now and the static rather than in the past, future and context and the dynamic nature of technological change. Early studies such as those cited above have defined mobile learning technologies in the context of the times in which the studies have taken place. As new technologies for mobile work emerge, studies are needed to assess not only the tool and the pedagogical context in which it may be used, but also the attitudes surrounding its adoption and subsequent use. This explains, to some extent, the focus on student attitudes in the literature on mobile learning.

Wang, Wu and Wang (2009) tested the unified theory of acceptance and use of technology (UTAUT) instrument, developed by Venkatesh, Morris, Davis and Davis (2003), with 330 students specifically in relation to mobile learning. The UTUAT is a multi-dimensional scale incorporating eight dimensions used in the field of information technology to assess user acceptance attitudes toward introduced technologies with a particular focus on workplaces. The model argues that acceptance of information technologies in organizations is an interplay between individual reactions to using those technologies, leading to intentions to use them and then having experience and use of said technologies. This model provides a powerful empirical tool with which to examine attitudes toward and use of mobile learning and other educational technologies to determine important correlates of use and subsequent learning or grade performance outcomes.

Wang, Wu and Wang (2009) provided a useful and concise summary of the detailed testing and attitude models tested extensively by Venkatesh and his colleagues.(2003) "UTAUT posits that performance expectancy, effort expectancy, social influence and facilitating conditions are determinants of behavioural intention or use behaviour, and that gender, age, experience and voluntariness of use have moderating effects in the acceptance of it" (pp. 95-96). Although the extensive literature and assumptions behind the UTUAT are beyond the scope of the present paper, it is worth defining the key scales and constructs that make up the UTAUT as provided by Venkatesh and his colleagues.

Performance expectancy is the "extent to which an individual believes that using an information system will help him or her to attain benefits in job performance" (Venkatesh, et al., 2003, p. 447). Effort expectancy is "the degree of ease associated with the use of the information system" (p. 450). Social influence is the extent to which a person perceives that important others believe he or she should use a new information system" (p. 451). "Attitude toward using technology is defined as an individual's overall affective reaction to using a system" (p. 455). Facilitating conditions are "the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system," (p. 453). Self-efficacy is the ability to garner one’s confidence, skills and abilities in order to accomplish a required task. Yang’s (2010) literature review and research led him to conclude “the level of consumer self-efficacy can predict individual consumer’s mobile data service adoption behavior” (p. 119). Anxiety is the evoking of "anxious or emotional reactions when it comes to performing a behavior" such as using a computer (p. 432). Behavioural intention to use the system, based on the Fishbein and Ajzen's (1975, cited in Venkatesh et al., 2003) theory of reasoned action is the self-reported intention to engage in a particular behaviour. In addition to these models, Venkatesh and colleagues argued that experience with a system, essentially the perceived or actual amount of time spent using it in the past, voluntariness of use or "the degree to which use of the innovation is perceived as being voluntary, or of free will (Moore and Benbasat (1996) in Venkatesh et al., 2003, p. 431), were critical variables in determining attitudes toward technologies.

Wang and colleagues (2009) noted that the UTAUT had been developed primarily from research completed in the context of workplaces and did not apply perfectly to the context of higher education and mobile learning in particular. They added to the scales used with UTAUT self-management of learning and playfulness and, in their study, chose not to include use behaviour, facilitating conditions, experience in using the technology system, or voluntariness of use but later wrote, "continued research is needed to investigate... behaviour, facilitating conditions and experience" in mobile learning (p. 113). Perceived playfulness was defined as "a state of mind that includes three dimensions: the extent to which the individual (1) perceives that his or her attention is focused on the interaction with the m-learning (i.e., concentration); (2) is curious during the interaction (i.e., curiosity); and (3) finds the interaction intrinsically enjoyable or interesting (i.e., enjoyment)" (p. 99). Self-management of learning was defined as "the extent to which an individual feels he or she is self-disciplined and can engage in autonomous learning" (p. 101).

Findings from the Wang, Wu and Wang (2009) study investigating the UTAUT in the context of mobile learning demonstrated that students’ intentions to use mobile learning tools were determined in large part by performance expectancy, effort expectancy, social influence, perceived playfulness, and self-management of learning variables. Moreover, they found that age moderated the influence that effort expectancy and social influence had on intentions to use mobile learning. While their goal was to apply the UTAUT to mobile learning, a simple way to extend this research would be to investigate the relationship between components of the UTAUT, perceived playfulness and self-management of learning on the one hand with actual use of mobile learning tools - particularly newly introduced tools - and actual academic performance as a proxy for learning.

The introduction of mainstream tablet computers over the past two years is rejuvenating and extending inquiry into mobile learning. That tablet computers have become more capable and therefore provide untested opportunities for mobile learning raises additional questions about what mobile learning means and how it works to enhance the experience of learners. The introduction of the Apple iPad in 2010, as well as the growth of applications or "apps" for the mobile technology ecosystem of the "iOS" or iPod, iPhone and iPad operating system may well be a part of such rejuvenation. Mainstream publishers of textbooks have begun producing apps for the iOS environment. In the absence of apps, publishers have produced ePub or Kindle formatted textbooks more easily read on tablets than on phones, but importantly compatible simultaneously with both pocket-sized and tablet-sized devices. Learning management system firms, similarly, have introduced applications beyond Internet browser interfaces with which students can access course content. In some ways, and for those with decades of experience in education, the rapidity and hyperbole surrounding mobile devices appears similar to that of the personal computer three decades earlier.

Such buzz reinforces ongoing questions about mobile learning not well answered by the literature to date. For example, to what extent are university students using mobile devices in their learning experience? Do students perceive that the use of mobile devices in their university education makes a difference to their learning? Do those students who use mobile tools demonstrate higher levels of learning, at least in terms of summary academic performance?

Research Questions

Based on the literature, and attending particularly to the need to establish an indication of the relationship between use of mobile learning technologies, attitudes toward their use (e.g., the UTAUT) and academic performance in relation to the latest available mobile learning tools, we sought to answer the following research questions.

1. What mobile learning technologies do students currently bring with them to the classroom?
2. What attitudes toward using mobile learning technologies are demonstrated particularly in relation to tablet computers, e-textbooks and LMS applications on mobile devices?
3. What is the observed relationship between use and attitudes of mobile learning tools and academic performance as a proxy for learning?

Methods

Mobile learning was embedded into the pedagogical design of an undergraduate subject run in two semesters with a total of 135 students. Using design-based research (DBR), an empirical investigation examined iPad use variables, mobile technology use variables, attitudinal variables including the unified theory of acceptance and use of technology (UTAUT) scale, and academic performance variables. Quantitative analysis with PASW Statistics included descriptive, scaling, correlations, partial correlations and ANCOVAs.

Research Design

Design-based research (DBR) was used for this study (Middleton, Gorar, Taylor & Bannan-Ritland, 2008; Wang & Hannafin, 2005). DBR allows a natural symbiosis between research and learning by evolving observation of students in a natural setting. In order to answer the research questions about students' behaviours, attitudes and learning, it was important that the research conditions did not interfere with the integrity of their phenomenology as undergraduate university students. The primary reason DBR was selected for this project was that instead of using artificial experimental contexts, students were volunteer research participants who spent no more time than normally spent engaged in class activities that were what they would ordinarily expect in a university classroom facilitated by their lecturer.

The pedagogical design of this subject was such that the educator used a combination of face-to-face teaching methods such as lecture and tutorial discussion and online methods such as immediate internet search and online formative assessment. Students were invited to use their own mobile devices such as netbooks, laptops, internet-enabled mobile phones and tablets to participate in the mobile learning components of the class.

The only novelty in the experience was that a loan scheme ensured all students had use of iPads pre-loaded with an electronic (e-pub) copy of their normally assigned textbook (converted for the study by the textbook publisher, Oxford University Press) and the Blackboard Mobile Learn application providing easy access to the learning management system (LMS). The iPad loan schedule allowed students to take home and use the device for a one-week period twice during the semester.

In keeping with the DBR method, student use of mobile devices had to be consistent with regular timeframes and locations (Wang & Hannafin, 2005). Use of mobile devices spans formal and informal settings (Sharples, 2009). Therefore, students had natural free reign with the mobile devices during the loan period. They were free to take them home and to load whatever applications they wished during the loan period.

Participants

A total of 135 students who were enrolled in an undergraduate subject titled *Digital Media and Society* in the final semester of 2010 and the first semester of 2011 participated in the study. To meet the requirements for ethics including self-determination, students were not coerced to participate, but were advised of the project through the LMS and a letter signed by the Chief Investigators (CIs) from an appointed postgraduate research assistant who coordinated the participant list and managed data de-identification. Although one CI was the academic responsible for the subject and marked most of the assessment items, a tutor was also involved in marking the minor assessment included in the dependent variable metric and the subject leader CI was blind to the volunteer participant list.

Measures

In total, almost 300 data points informed the measures for this research. As the key data collection instrument of the DBR process, students completed weekly formative and summative assessment tasks including end-of-lecture surveys and quizzes, four written essay assignments that were published as publicly available blogs on services such as WordPress and Blogger, and a podcast published in iTunesU with the students' permission upon completion of the semester. Students also completed an end-of-term final examination required by the University of survey-size major subjects. To answer the research questions, the weekly surveys provided demographics, behavioural and attitudinal data, and the quiz component (usually three questions) provided evidence of weekly knowledge gains. The lecturer has used these surveys for many years as a way to relate group demography and topical information about subject-domain drawn from students' own experiences and perspectives.

Overall subject scores were used as one general metric of learning performance. Students participated in one tutorial group discussion lasting 30 minutes the week following their use of the iPad; research from these sessions has been reported elsewhere and is not included in this report. However, students also completed a survey of their use of borrowed iPads and these results are discussed here.

The substantive measures from the unified theory of acceptance and use of technology, or UTAUT scale (Venkatesh, Morris, Davis and Davis, 2003; Wang, Wu and Wang, 2009), served as the survey questionnaire for the last lecture meeting of the semester. The modified form of UTAUT adapted by Wang and colleagues (2009) including wording related to mLearning was adapted for this research with scale results reported below.

Analyses

Data were analysed using mixed methods (Somekh & Lewin, 2005) for multiple facets of the project. The results reported here were analysed using PASW Statistics Version 18 on both Windows and MacOS computers and sought to include psychometrically valid reporting (Crocker & Algina, 1986; Marshall & Rossmann, 1989). Frequencies, means and similar descriptives were used for demographic and behavioural measures. Scaling analyses included Cronbach's Alpha analysis of the UTAUT subscales. Bivariate and partial correlations were used to assess the relationships among key demographic, behavioural, attitudinal and learning outcome measures and ANCOVAs were performed to assess the impact of iPad use on grades.

Results

Sample Description

Of the 135 undergraduate students who participated in the project, 63% were female. Modal age was 21 years (mean=22, range=19, standard deviation=3.9 years). Sixty percent were enrolled in the subject as required for their major or degree while 25% were enrolled for elective credit and 15% were study abroad students. The final grade distribution for these students was slightly skewed with 40% earning a *Pass*, 28% a *Credit*, 20% a *Distinction*, 7% a *Fail* and 5% a *High Distinction*.

Behavioural Self-reports on Technology Use at University

Use of the iPad was not compulsory and despite the opportunity to use the iPad during the semester, 36% of students decided not to borrow it, 54% borrowed it once and 10% borrowed it twice.

The first research question asked what mobile learning technologies do students currently bring with them to the classroom? The answer is that they come well equipped with a mixture of mobile and computing technologies and services, but tablet computers were in the early stages of adoption in late 2010 and early 2011.

Personal computer ownership among the sample was almost universal (98%) and most of these (92%) being laptops (13% reported using desktops with some indicating ownership of two computers); slightly more (54%) were running a version of the Mac operating system, 45% running a version of the Windows operating system and only one running a version of Linus. Notably, 83% said they also used computers provided in the university labs. Computer use throughout the day was reported by 63%, twice a day by 18%, once a day by 15% with the rest reporting less frequent use.

Almost all (96%) brought a mobile phone to class, and nearly half (48%) brought a laptop to class with only 4% of these being netbooks. Few (4%) brought a tablet computer to class. Mobile phones used by students were mostly Internet enabled (73%). Of those phones with either Wi-Fi or 3G or EDGE Internet access, students reported that 80% were primarily used for social networking, 75% for web browsing and 68% for email.

All but one student came to class stating that they were already subscribed with a Facebook account. Half had a Twitter account and one fifth had Linkedin accounts. Twitter was used throughout the semester with a unique hashtag to encourage community and student engagement. By the middle of the semester, 81% of students reported using it.

Use of mobile phones and laptops were evenly split during class time with half stating they regularly use their phones and half stating they regularly use their laptops. Of the students who stated they bring their laptops to class, half stated that primarily, they used the university's LMS, half that they use their laptops to take notes, half state that they go on Facebook, a third stated that they access Wikipedia. Of those who stated they regularly brought their mobile phone to class, a third reported texting at some stage during class.

Despite these tech-heavy frequencies among this sample of students, only 14% identified themselves as "power users" of information and communication technologies and 36% described themselves as tech-savvy. The majority (46%) said they were merely "tech-users." Tellingly, none self-identified with the label "tech-resister." Screens were used heavily for composing and reading, although e-books were preferred over printed books by few (11%) and only 26% had read an e-book over the course of the past year.

However, the iPad loan appeared to facilitate e-text reading and other productivity behaviours among those who borrowed it. For example, when asked whether they had completed any of the assigned readings from the e-textbook on the borrowed iPad in a given week, 66% said they had; further, 59% said they had completed readings that had been assigned from online resources using the loaned iPad. Late in the semester, when asked the question, “I grew to prefer the e-text over the print edition,” 30% disagreed, 22% neither agreed nor disagreed, but 48% agreed.

More students used the Blackboard Mobile Learn app with 77% indicating they had used it. Only 30% tried to use the iPad to take notes, but 76% used it for email and 88% for Facebook reading and 79% for Facebook status updates. Although invited to install apps, only 43% did so.

Attitudes About Mobile Learning Technologies

The second research question asked what attitudes toward using mobile learning technologies are demonstrated particularly in relation to tablet computers, e-textbooks and LMS applications on mobile devices. In short, although reported attitudes generally affirm Bond University’s policy to support mobile learning and tablet computing, analysis indicated there is little need to rush to satiate student demand.

A large majority of students feel there is benefit in blended learning with internet-connected devices used during class. Only 12% said there was “little benefit” or “no benefit at all” while 43% said there was “reasonable benefit” and 45% said there was “a lot of benefit” in their use. Nevertheless, when asked how much distraction results from using internet-connected devices during class, 27% said “a lot of distraction,” 37% said “reasonable distraction” and 36% indicated “a little” or “no distraction.” Asked whether the iPad motivated them to learn, 22% said it did not, 32% sat on the fence and 46% said it did. Similarly, 48% said the iPad “gave me an advantage in the classroom,” while 17% did not think so and the rest were neutral; 44% said the iPad “improved my study habits” while 21% did not think so and the rest were neutral.

Results of the UTAUT Scale

In general, the modified UTAUT instrument (Wang, Wu & Wang, 2009) provided subscale measures that held up to minimum standards of internal consistency (Table 1). Reliability estimates of the four-item subscales ranged from alpha=0.45 to 0.85. Cases were omitted where students did not complete the activity or in instances where one subscale item was not completed by a participant. These results included modest wording changes along the lines of Wang and colleagues (2009) and invoked reference to tablet computers in particular.

Table 1: Modified UTAUT Reliability Results

Subscale	Cronbach’s Alpha	Mean (7 = Max)	N of Items	N of Cases
Performance Expectancy	.85	4.6	4	105
Effort Expectancy	.80	5.5	4	105
Attitude Toward Using Technology	.85	4.9	4	105

Social Influence	.79	4.6	4	104
Self-efficacy	.57	4.9	4	105
Facilitating Conditions	.62	4.9	4	106
Anxiety	.63	3.8	4	105
Behavioural Intentions	.80	4.5	4	106
Self-managed Learning	.65	5.0	4	104
Perceived Playfulness	.45	4.4	4	104

Students in this study demonstrated a level of mobile and tablet technology self-assurance. Although effort expectancy is high, perceptions of both self-efficacy and university support (facilitating conditions) are similarly high while anxiety is relatively low. Nevertheless, students appear to be lukewarm about the performance gains they would expect from mobile learning in their blended learning environment and believe in their ability to self-manage their learning.

Relationships Among Key Variables

The third research question asked what is the observed relationship between use and attitudes of mobile learning tools and academic performance as a proxy for learning.

Bivariate Correlations

Bivariate correlations of the key demographic, behavioural, attitudinal and performance learning variables indicated on first inspection that age and self-management of learning are obvious important factors in mobile learning outcomes. So too are iPad borrowings and attitudes toward technologies and having a low level of anxiety or, in other words, self-assurance.Table 2 summarises these key relationships.

Table 2: Important Correlates of Mobile Learning with the iPad

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Age	1												
2. No. iPad Borrowings	.17	1											
3. Quiz Average	.00	.24*	1										
4. Overall Grade	.21*	.28*	.51*	1									
5. Perform. Expectancy	.14	.11	.20*	.01	1								
6. Effort Expectancy	.04	.05	.13	-.02	.31*	1							
7. Att Toward Using Tech	.22*	.14	.20*	.09	.83*	.40*	1						
8. Social Influence	.21*	.01	-.01	-.13	.64*	.23*	.60*	1					
9. Self-efficacy	.07	.05	-.02	.06	.50*	.31*	.50*	.37*	1				
10. Facil'g Conditions	.00	.00	.15	.12	.22*	.25*	.24*	.29*	.49*	1			
11. Anxiety	-.36*	-.04	.00	-.36*	-.23*	-.25*	-.15	-.11	-.27*	-.13	1		
12. Behav. Intentions	.08	.08	.15	.05	.65*	.21*	.58*	.39*	.39*	.25*	-.23*	1	
13. Self-mgd Learning	.31*	.01	.11	.38*	.30*	.20*	.38*	.24*	.39*	.18	-.22*	.27*	1
14. Perceived Playfulness	.08	.12	.14	.02	.51*	.22*	.56*	.55*	.29*	.26*	.14	.18	.29*

* p < .05

Partial Correlations

Partial correlations of these relationships demonstrate the importance of state variable such as age. Controlling for age, the relationship between the number of iPad borrowings and grades is reduced to 0.18, falling short of significance. Thus, age is an important covariant in grade outcomes when considering the affordances of tablet mobile computing. However, controlling for self-managed learning, the relationship between grades and iPad borrowings increases the relationship between grades and borrowings to 0.32, $p<.001$. This curious outcome suggests multicolinearity between age and self-managed learning, not necessarily indicated by the bivariate correlation between the two measures. A partial correlation of iPad borrowing and grades, controlling for both age and self-managed learning drops the relationship back to 0.29, still a significant relationship.

ANCOVA Results

To further parse the relationship between iPad borrowing (which may have been none, once or twice) and grades, we submitted a series of models for a univariate ANOVA with age and self-managed learning as the covariates. The model we explored set = iPad borrowings (3 levels) as the independent variable, overall course grades as the dependent variable and age and self-managed learning as the covariates. The results indicated that when controlling for age and self-managed learning, those who used the iPad more, particularly those who borrowed it twice, also had the highest grades ($F=7.32$, $df=4,76$, $p<.001$).

Discussion and Conclusion

Research into mobile learning is exciting both for its student learning potential and as a newly emerging sub-domain in educational research. Because this nascent field is the focus of emerging literature, opportunity abounds for research to make a meaningful contribution. The conditions of the design-based research described here were such that 135 students enrolled across two semesters of an undergraduate class, were invited to borrow iPads for up to two one-week periods. On these iPads were tools related to knowledge domains tested at intervals and at the end of the semester and covered in formative assessment along the way. The three research questions drawn from the literature sought to examine the mobile learning tools students were using upon their arrival to the subject, their attitudes toward mobile learning, particularly with tablet computers such as the Apple iPad, and whether measurable learning gains as measured by overall grades could be observed as a result of exposure to a blended learning environment with tablet computers.

For the 135 students who participated in this research, it appears that the affordance of a new learning tool in a blended learning environment added modestly to their existing tool-chest of technologies and provided stimulus to achieve and warm, if not enthusiastic, attitudes toward the emerging mobile learning platform of the tablet computer, and added something to their performance. Indeed, it seems that those who borrowed the iPad twice had the highest grades after controlling for age and self-management of learning (both of which are positive correlates with grade performance).

There are other meaningful findings to be drawn from this research. That students in the age range of 18-40 have positive attitudes toward technologies as measured by the UTAUT subscale, and that age is positively correlated with attitudes toward technology is at first surprising. However, older, mature students, returning to university with purpose, represent a uniquely motivated and, perhaps, technologically savvy group of learners. The negative correlation between age and the anxiety subscale similarly indicates purpose and self-confidence with age at least up to the maximum age in this sample.

Also worth note is the usefulness of the UTAUT and the internal consistency among subscales. The findings are worthy of a separate paper and the contribution to the present analysis has been of great heuristic and generative value.

These findings are, as always, preliminary and should be treated with caution. On the face of it, the results seem to invoke notions of the Hawthorne effect in which a novel stimulus generates increased arousal and thus, for some, better performance. That those who borrowed the iPad had better grades, is perhaps indicative of the students' motivations and eagerness to learn, eagerness to use technology, and eagerness for innovation and engagement in the classroom. Certainly the results indicate that the ability to use Internet-connected technologies during class is important to students, particularly in a class on *Digital Media and Society*!

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Challenging Perceptions of Blended Learning in an Adverse Learning Context

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The Christchurch earthquakes of 22 February 2011 initiated an extraordinary process of professional development which informed and consolidated changes to the pedagogy and practices of three teacher educators. The fast-tracking of technical capacity led to a questioning of beliefs around effective tertiary teaching pedagogy. The resulting changes to blended learning practices enabled learning to continue during a time of natural disaster. This poster is of particular relevance to those involved in teaching in a blended learning context, focused on developing equitable online learning experiences that engage and motivate all learners.

Keywords: blended learning, tertiary teaching, professional development, pedagogy

Context

The University of Canterbury, College of Education has an established reputation for distance education and a tradition of offering open and blended tertiary programmes. In 2010 *Learn* (Moodle) was adopted as the University's learning management system. While the move to *Learn* is still very much in its early phase, implementation has been enhanced by staff's prior knowledge and experiences in blended learning and their willingness to engage with professional development opportunities. Across the institution, the use of *Learn* has varied. Some lecturers have taught courses entirely online and others have used the LMS to support face to face delivery. The three lecturers involved in this research had varied experience in distance and blended learning. All had attended workshop based professional development, consulted individually with an educational designer, and implemented an initial offering of their course.

On February 22 2011, the second day of the academic year, a 6.3 earthquake struck. Parts of eastern and central Christchurch were badly affected and the city's infrastructure severely compromised. Repercussions from this event, coupled with continuing aftershocks radically influenced the shape of the first semester course delivery. Our focus for 2011 had been to increase engagement with students on our respective *Learn* sites. However despite a forward looking approach, planning had not included the unforeseeable inability to provide on-campus students with traditional face to face delivery. We lost access to our physical resources including offices, materials and teaching rooms. On a personal level, we were living in a state of emergency, with limited access to amenities. On a professional level, we responded by reviewing and addressing of challenges of teaching our respective courses. The aftershocks continue. We face uncertainty as we grapple with challenges and tensions which continually force us to rethink our beliefs about tertiary teaching pedagogy.

Responsive pedagogy and practices

The context provided an 'opportunity' for us to produce and engage in an unplanned process of professional development. The need to rethink the blend of learning experiences offered via our *Learn* sites became apparent very quickly when we realised that all of our campus students were now effectively distance students. Our intuitive actions and responses, drawing on pedagogical understandings of what it means to teach, guide, and facilitate, have assisted in the transition campus teaching to an online context.

Methodology

We reflected collaboratively to identify how we made effective teaching decisions to ensure an equitable learning experience for all students. The processes which we collectively worked through replicated some of the indicators of evidence based effective professional development models which are relevant for initial teacher education contexts. The following represent a brief synopsis of our findings as we compared and contrasted narratives to identify emerging themes and patterns (Mutch, 2005). These have been analysed within a framework of effective professional development which included; engagement with existing beliefs, using iterative cycles of reflective discourse, regard for student viewpoint and voice, use of an inquiry framework, reviewing pedagogical decisions based on the theory-praxis nexus, and challenging understandings within communities of practice (Timperley, Wilson, Barrar & Fung, 2007).

Aspects of an equitable blended learning experience

The following represent blended learning practises that we embraced to support an equitable learning experience for campus students. We recognise that these practises could also enhance the learning experience of our distance students. These included:

- the presentation of online content in a manner that ensured engagement within a socio-cultural framework and which utilized a range of online teaching tools *(eg teaching within a study guide model, scaffolding using graphic organizers, Google Docs, modeling through the use of video clips, audio files, directed academic reading, diagrams, weblinks, drop boxes)*
- the scaffolding of students into blended learning *(eg a weekly structure containing a sequential 'books' structure, weekly 'News' notices, gradual release of content, use of audio files, consistent signposting through the use of text, colour, and icons)*
- the importance of an initial teacher presence and engagement to foster an effective learning community *(eg an introductory letter, responding to student posts in a timely manner)*
- ensuring course teachers were constantly aware of their roles and responsibilities in the virtual classroom. *(eg in the context of regular purposeful online interactions, timely responses to forums, letting go of the need to 'see' students, and being mindful of the importance of 'stepping back' to allow students to take responsibility for forum queries and discussion)*
- introducing, modeling, and leading the use of differentiated and asynchronous forums for a variety

of purposes *(eg one course had forums for purposes that included weekly discussion on course content, assessment tasks, and a book club, and another course had forums on developing personal content knowledge, and identifying online resources)*
- the development of tools and expectations which empowered students to take responsibility for their own learning. *(eg optional weekly webinars which provided direct interaction and dialogue about specific course content, and timed released of assessment, measured response to forum posts)*
- the establishment of a wider community of practice across disciplines enabling greater transparency and in-depth learning within a professional learning community.

A consequence of being forced to challenge the assumption that face to face delivery might be 'better' and more engaging from the learners' perspective, was to incorporate a wider range of online teaching tools which we had previously not used with the on-campus cohort.

Conclusions

On reflection, we were actively participating in a process of teacher inquiry, utilizing instructional design experts, and our own evidence based practice knowledge to support our new blend of teaching. This required a deliberate engagement with our pedagogical beliefs to ensure equity of experience across all delivery cohorts. Despite the 'reactiveness' of our response to this extreme situation, our actions, and subsequent reflection upon our actions, have contributed to significant and sustainable changes to the ways in which we teach, advantaging both the students and ourselves as effective tertiary educators.

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Engaging in online postgraduate education as means of professional learning.

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With enrolments in higher education becoming a competitive market, through the removal of caps in 2012, the equitable access to postgraduate education is raised. Postgraduate education, provided through higher education institutions, is an important aspect of career development for professionals. Professionals working outside of the metropolitan area are increasingly seeking postgraduate education opportunities that will be delivered online, at a distance. In this research study, data collected from the teaching profession, has culminated in a model that will ultimately improve access to professional learning. This research paper aims to highlight the important role that higher education providers play in the delivery of postgraduate education to professionals working in regional and remote areas of Australia. Although this paper focuses on the realm of education, the model of connectedness, where synchronous and asynchronous technologies are used, can be adapted and applied to any profession that requires equitable access to professional learning.

Keywords: equitable access; regional and remote education; professional learning; online learning

Introduction

Professional learning for teachers in Australia must be considered in terms of the substantial changes and reform occurring in education. A number of Government strategies, including the Australian curriculum, digital revolution and transformation through national professional teaching standards, have been thrust upon teachers within this reform. Whilst teachers source professional learning through a range of opportunities, without doubt, enrolling in postgraduate courses are certainly a highly regarded option.

On a broader level, postgraduate education for all professionals working in regional and remote areas must be considered in terms of access and equity. The use of the internet and technology to engage and support professionals in learning opportunities is not new, however, many are still not utilising such approaches to their full potential.

In this paper, the author presents the importance of postgraduate education as a form of professional learning and the necessity to engage in using ICT to be able to provide equitable access to those who live outside of the metropolitan area. Further, a conceptual framework is presented, through the development of a model, where synchronous and asynchronous technologies support professional learning at a distance.

Background

A convincing body of evidence has been accumulated to indicate that the attraction and retention of human service professionals to regional, rural and remote areas both in Australia and internationally is a challenge (Herrington & Herrington, 2006; Human Rights and Equal Opportunity Commission, 2000; Miles, Marshall, Rolfe & Noonan, 2003; Pegg, 2007; Roberts, 2004; Wallace & Boylan, 2007). The link between retaining teachers in these areas and the importance of access to professional learning have been highlighted by a national study conducted by the National Centre of Science, ICT and Mathematics Education for Rural and Regional Australia (SiMERR). The research by SiMERR generated a report to the Department of Education, Science and Training (DEST) from which the recommendation "that education authorities, in partnership with schools and school communities, universities, and professional organisations meet the continuing needs of teachers in rural and regional areas through a range of strategies that ensure equitable access to ongoing quality professional learning" (Lyons, Cooksey, Panizzon, Parnell & Pegg, 2006, p. xiii). Inequitable access to professional learning was reported under the broader theme of professional connectedness and isolation. A substantial finding that "primary teachers in remote areas indicated a significantly higher unmet need for professional development opportunities such as mentoring, release time for professional development and collaboration with colleagues than teachers did elsewhere (Lyons et al., 2006, p. 85)", identifies the importance of further research to identify a framework for best utilising technology to support such an initiative.

In order to provide learning environments that offer flexibility required by higher education students, more higher education providers are turning toward the notion of e-learning. The use of asynchronous communication in distance learning is certainly not new, however, the idea of engaging students in a real-time environment to enhance their learning is less well documented.

The successes of online education (including K-12, undergraduate and postgraduate) where web conferencing and virtual classroom software considerably enhanced the learning experiences of external students has been documented in recent literature (Broadley & Pelliccione, 2010; Crump & Boylan, 2008; Crump, Twyford & Littler, 2008; Devlin, Feraud & Anderson, 2008; Lonie & Andrews, 2009). Further, Broadley and Pelliccione (2010) found that higher education students were enthusiastic about participating in collaborative, interactive, synchronous learning environments. The software used were real-time virtual classroom environments that allowed for communication through Voice over Internet Protocol (VoIP) and web conferencing, along with a large number of collaboration tools to engage learners. Students could access the online environment from any location that had a computer and an Internet connection either through physical cable or satellite connections. Broadley and Pellicione's (2010) study indicated that synchronous software provided a supportive environment through lecturer/student relationships, enhanced learning experiences and a positive impact on assessment that were not found in a purely asynchronous environment. A survey of the online students showed that 87.1% believed the synchronous software enhanced the quality of their online learning experience. Similarly, Lonie and Andrews' (2009) study found that web conferencing enhanced learning experiences of regional students and this learning approach provided an active learning experience that potentially reduced the discrepancy between regional and metropolitan student access to a collaborative learning environment.

Broadley and Pelliccione's (2010) work highlighted the role of synchronous technologies in undergraduate courses, however, it is important to note that higher education institutions are also providers of professional development for teachers in terms of postgraduate study. Lonie and Anderson's study (2009) supports the notion of postgraduate education courses being provided through these technologies. Teachers (60%) within Lonie and Anderson's study indicated the value of university postgraduate courses as a professional development opportunity and as a result the trial of synchronous software within Broadley and Pelliccione's study could inform the delivery of postgraduate units.

A study by Harvey (2005) in Queensland determined that career path and pedagogical content were motivating factors for teachers to undertake postgraduate study. Of the 178 respondents surveyed across five schools within this study, 15% were enrolled in postgraduate study. There is no evidence of whether these were regional or remote teachers; or if they were enrolled in a face to face or online medium. This was considered vital information in the context of the current study, to identify if access to higher education in the form of professional learning was reported as a significant factor for regional teachers.

In December 2008, Professor Denise Bradley AC delivered the Final Report into the Review of Australian Higher Education (Commonwealth of Australia, 2008). This report highlighted the importance of targeting under-represented groups currently accessing higher education including; those from low-socio economic backgrounds, regional and remote areas and Indigenous students. In order to increase participation the report states:

> An additional allocation of $80 million per year to develop innovative, collaborative, local solutions to provision of higher education in regional and remote areas is recommended. As well, serious consideration should be given to the development of a university with special expertise in provision of higher education across regional and remote Australia (Commonwealth of Australia, 2008).

An important recommendation essential to a more flexible and adaptable system of regional provision is found in Recommendation 16 indicating that “funding to develop innovative local solutions through a range of flexible and collaborative delivery arrangements in partnership with other providers such as TAFE” (Commonwealth of Australia, 2008, p. 112).

Similarly, further investigation into access of higher education was undertaken in 2009, as the Senate conducted a national Inquiry into Rural and Regional access to Secondary and Tertiary Education Opportunities (Commonwealth of Australia, 2009). A substantial number of submissions (n=759) from organisations and community members cemented the foundation of the need for equity and access to quality education programs. A seminal submission by the Society for the Provision of Education in Rural Australia outlined two significant points including the need for policy makers to apply a rural lens whilst developing education policy (Wallace & Boylan, 2007) and that secondly, sustainable rural communities are built on the foundation of a local delivered education to its youth (Society for the Provision of Education in Rural Australia, 2009). Further, this organisation acknowledged three main factors that impacted on non-metropolitan education; thus being distance, low socioeconomic status and aboriginality. Figure 1 exemplifies the connectedness between the three factors and illustrates the need for a holistic approach to address these challenges.

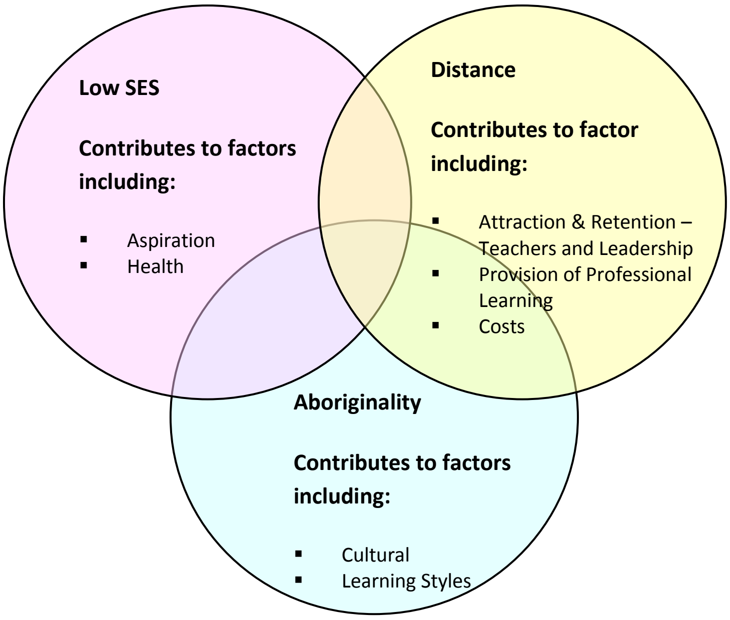

Figure 1: Significant factors contributing to educational disadvantage in rural and regional Australia (SPERA, 2009).

It is clear from recent literature in this area that many professionals working in regional and remote areas have limited access to professional learning opportunities within the higher education sector in the form of postgraduate study.

Method

This study incorporated three distinct phases. Phase One aimed to provide an extensive review of the literature in order to position this study in the context of the previous research and identify the gaps in the literature. Phase Two included two stages of data collection. In Stage One, quantitative data were collected through surveys to provide a general picture of the research problem, followed by qualitative data collected through interviews to further refine the general picture document regional and remote teachers' perceptions of their access to professional learning in Western Australia. Furthermore, in Stage Two of this phase, data were collected to describe current practice in the Department of Education and other professional learning providers in order to document the technologies currently available to support professional learning in an online environment. Phase Three included data analyses, findings and the formulation of a conceptual framework to facilitate the implementation of a professional learning community through the application of synchronous and asynchronous technologies.

A proportionate stratified random sampling of the regional (Country Teaching Program) and remote (Remote Teaching Service) teaching programs in the Department of Education (WA) was undertaken to ensure that a balanced proportion from both programs were surveyed. In 2009, at the time of the data collection, the total number of schools in each program were CTP schools (n=118) and RTS schools (n= 43). It was decided to include a total of 50 schools in the survey sample. In order to undertake a stratified sample of 50 schools over both programs, the sample consisted of 37 schools from the CTP and 13 schools from the RTS, all were a diverse range of size and district locality. Within the 37 CTP schools the sample allowed for a large number of teachers to respond to the survey, inviting a possible 549 teacher responses. From the 13 RTS schools, 169 teachers were invited to participate in the survey. Of these, almost 15% (n=106) of teachers responded to the survey. In situations where respondents returned the survey, but had not responded to the questions, frequency distributions of the data were undertaken to highlight these occurrences. Frequency distributions showed that two respondents had not answered any of the questions and as a result these surveys were removed from the final dataset. The final number of respondents for the survey sample was 104. A total of ten teachers were willing to participate in follow up interviews conducted by email, telephone and where possible, in person. Of these ten participants, four identified as classroom teachers and six were administrators in the role of principal or deputy principal within a school. Six participants were females and four were males. These teachers were employed in schools that ranged from employing a teaching staff of three to thirty staff. Experience working in a regional location ranged from four months to twenty years.

Results

A range of data collected, within this study, quantified the necessity for higher education institutions to consider their role in equitable delivery of postgraduate education to those living outside of the metropolitan area. These themes include: teachers working outside of their qualified area; professional learning valued by teachers and the access to technology in order to undertake online learning.

Teaching Outside Qualified Area

From the findings of this current study, it was evident that teachers working in regional areas were often required to work outside of the area they were originally qualified to teach. Additionally, they were required to teach a combination of differing levels of education within their position. For example, a primary trained teacher working in a small remote community school may be teaching a classroom that engages children from kindergarten through to Year 10. This has implications for teachers and their dynamic need for professional learning.

From the data, those qualified in Early Childhood Education (ECE) accounted for 13.5% (n=14), however 15.4% (n=16) indicated they were currently teaching in the Early Childhood field. This shows that two respondents working in Early Childhood were teaching outside of their qualified field or in a combination of ECE and another field. The Primary qualified respondents represent 57.7% (n=60) of the total participants. In contrast 40.4% (n=42) are currently teaching in Primary teaching positions. These data indicate that 18 teachers who were originally trained to teach in Primary positions are now teaching outside of their original area of qualification or in a position that requires them to teach over a combination of teaching positions. A total of 24% (n=25) reported being Secondary qualified teachers. Those currently teaching in Secondary positions accounted for 21.2% (n=22). From these data it is evident that three teachers who originally were Secondary qualified are now teaching in other roles. The remaining respondents from the original teaching qualification data comprise 4.8% (n=5) and reported their qualifications as Other. From the survey data it was found that Respondent 20 had a Bachelor of Education, Bachelor of Arts and Graduate Certificate in *Teachers of English to Speakers of Other Languages (TESOL) and was teaching Languages Other Than English (LOTE); Respondent 21 was originally trained as a special needs teacher and was now teaching K-12; Respondents 76 and 77 held a Graduate Diploma of Education and although they had trained in middle school education were now teaching primary and secondary; similarly Respondent 83 had a Graduate Diploma of Education and although trained in middle school education was now teaching in the primary years.* These data shows 6.7% (n=7) indicated their current teaching position as Other. After conducting further analysis of the surveys it was found that Respondents 20 and 21 had selected Other due to the reasons described above where their category was not clearly defined. Additionally, Respondents 25, 58, 65, 78 and 74 all reported they were currently teaching in positions other than ECE, Primary or Secondary, but did not provide further details to offer an explanation of what the current work involved. It is important to note that two teachers (1.9%) reported they were currently teaching a combination of ECE, Primary and Secondary areas. Similarly, 14.4% (n=15) of respondents indicated they were currently teaching a combination of two areas. A comparison of the respondents' original qualifications with their current teaching position is shown in Figure 2.

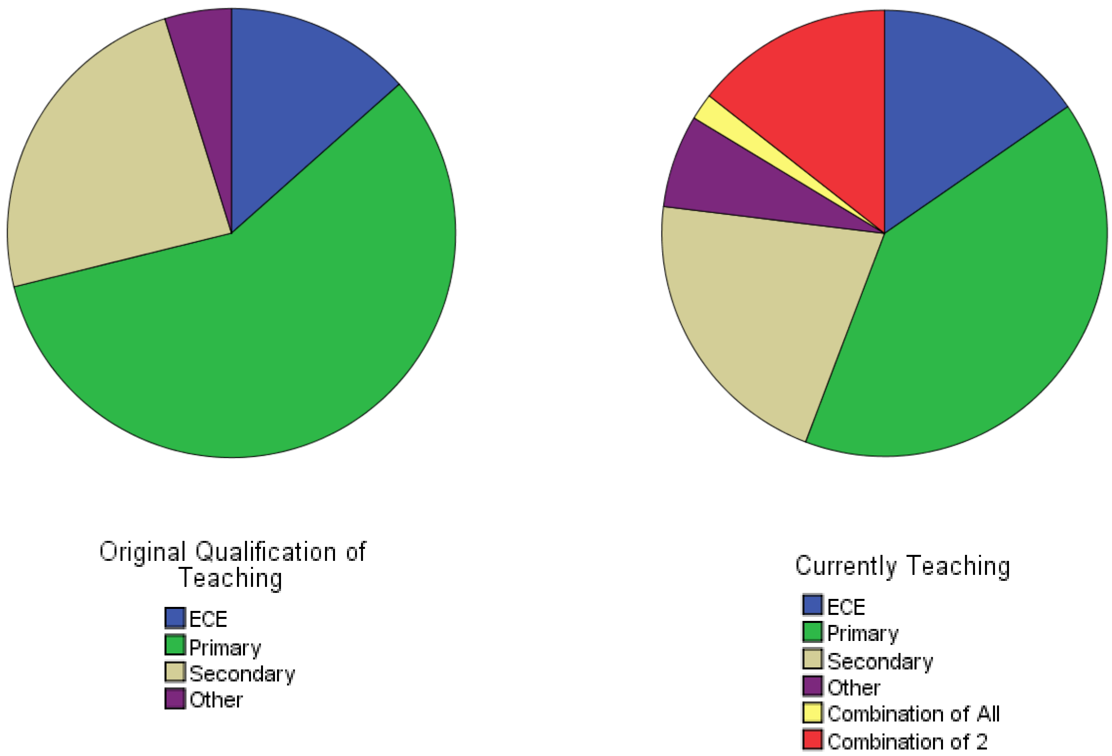

Figure 2: Comparison of original teaching qualification and current teaching position.

These data indicate there are teachers working outside of their qualified areas and as a result it is imperative they have access to professional learning to enable them to effectively implement an appropriate curriculum.

Professional Learning Valued by Teachers

Both informal and formal types of professional learning are undertaken by teachers. In terms of the types of professional learning valued by the participants within this study, university postgraduate courses were reported as the fourth highest mean (2.68) with 60% of participants selecting this form of professional learning to be regarded in high or very high value. Of some concern, reporting the lowest mean (2.22), 13.5% of participants in this study believed reading professional literature provided the least value in terms of professional development.

Table 1: Value of PD Approaches

	Little or no value	Moderate value	High value	Very high value		
Item	%	%	%	%	Mean	SD

Learning with and from your work colleagues including mentoring	0	14.4	43.3	42.3	3.28	0.70
Regional workshops	1.0	13.5	56.7	28.8	3.13	0.67
Conferences or involvement with professional associations	4.8	19.2	56.7	19.2	2.90	0.76
University postgraduate courses	5.0	35.0	47.0	13.0	2.68	0.76
DoE initiatives (ie, Graduate Teacher, Senior Teacher modules inc. face to face and online)	11.7	28.2	48.5	11.7	2.60	0.84
TAFE courses or other training organisations	8.0	38.0	50.0	4.0	2.50	0.70
Reading professional literature	13.5	53.8	29.8	2.9	2.22	0.71

Using ICT to Access Professional Learning

Participants in this study were surveyed as to their perceptions of using technology to access to professional learning. Videoconferencing technologies were underutilized with only 13.7% of participants having used such technology to access effective professional development. Similarly, only 11.1% of participants agreed that web conferencing software (such as a virtual classroom environment) is effective in accessing professional learning at a distance. Of importance to this paper, 75.8% of participants were uncertain about web-conferencing which might indicate the majority of participants in this study had not had the opportunity to experience learning through this technology. While 37.9% of participants believed that technology and ICT is assisting in the equitable access of professional learning for those working outside of the metropolitan area, just as many (36.9%) were uncertain this was the case. An important aspect of using any technology, particularly new technologies, is the support provided to users. Over half (55.4%), of participants in this study, indicated they had adequate support in their workplace that would allow them to feel confident in accessing professional learning in an online mode. Additionally, 70.8% reported they were confident and capable of accessing online professional learning if required. These data might indicate that attitudes and support for using technology to access professional learning are in place, however, opportunities that provide such an initiative have been limited for some professionals.

Table 2: Use of Technology/ICT

	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree		
Item	%	%	%	%	%	Mean	SD
I have used videoconferencing for PD and this was effective.	6.3	7.4	38.9	31.6	15.8	3.43	1.05
Web conferencing software (such as Elluminate, Wimba,Webex, Centra7) is an effective way for teachers to access PD.	4.0	7.1	75.8	7.1	6.1	3.04	0.74

In my opinion, technology and ICT are making PD more accessible for regional teachers.	6.8	31.1	36.9	22.3	2.9	2.83	0.95
The support for ICT and technology is adequate within my school, so that I would feel confident to access online PD.	14.6	40.8	14.6	21.4	8.7	2.69	1.21
I am confident in using technology and am capable of accessing online PD if required.	29.1	41.7	10.7	15.5	2.9	2.21	1.12

The use of technology in order to access PD from regional and remote areas was also posed to participants through semi-structured interviews. While many could see potential uses of the technology and thought it may alleviate some of the access issues; there were issues posed by others with regard to costs associated with doing so:

> *Will be more accessible (T4).*

> *With budget restraints, it is an option but would still involve travel and accommodation as most small schools do not have the conferencing equipment needed (P2).*

Participants were questioned on how technology might affect the way that regional teachers access PD in the future. It was interesting to note how different teachers used the term technology. While some talked in more broad terms of technology, three discussed videoconferencing and one discussed the social networking site of Facebook. The use of videoconferencing and its effectiveness was posed:

> *With regard to video conferencing, we recently installed these facilities in our school (in the past 12 months). They have been used for one PD that I was a part of which was mandatory (child protection) (T1).*

> *Video conferencing was good while it worked but start-up time was impacted as the technology failed. There are time delays with speech which can be frustrating. As technology improves video conferencing will continue (T4).*

> *If you were using technology it would want to be video conferencing at this point in time. I don't think the online deliveries – you mentioned Elluminate before – and there's a range of them – I don't think that we in Australia have the bandwidth capacity to make them as good as they could be (P6).*

> *We have discussed what we're going to do in terms of hooking up via videolink for me because I have said that it's ridiculous that I'm travelling. We can do it, but we need to have from my end the infrastructure that we need. Whether its videoconference or through IP, I would do either (P5).*

Discussion

The need for professional learning for teachers in regional areas has been highlighted by a range of challenges. Findings from this study have provided evidence that teachers are being challenged to work outside of their qualified area, find it difficult to leave their school to attend professional development or undertake postgraduate courses, value postgraduate education as an effective form of professional learning and although uncertain about the use of virtual classrooms, many are confident with using technology. For regional and remote professionals to gain access to a range of postgraduate opportunities, technology offers the most convenient and affordable option to do so.

Additionally, technology offers a medium to connect professionals regardless of their geographical location. In line with the literature, the author proposes the concept of delivering professional learning and accessing professional learning from regional and remote areas be reconsidered. This research lies at the nexus of one key issue. Teachers as professionals must adopt a continuous cycle of improvement within their workplace and thus require a learning support network that underpins that cycle. In the case of regional and remote professionals, the only logistical possibility is to provide this through technology that offers synchronous and asynchronous communication.

The model in Figure 3 provides a conceptual framework for facilitating professional learning through an online learning community to deliver just-in-time (JIT) and individualised support to teachers in their local context. The teacher is the key element at the core of the model and understanding their individual professional needs is essential. In line with the findings, the second layer ensures the professional learning allows teachers to be situated in their local context; yet engage with other professionals within their schools, within their districts and across boundaries of districts. Ideally, a variety of learning opportunities would be made available that include just-in-time (JIT) support and meetings that are planned on a regular basis. For this to occur, the third layer of the model requires a vision from the principal at the school level to ensure the professional learning, although catering for teachers professional needs, is ultimately linked to the school priorities and the student needs within the individual school. The fourth layer of the model provides the technology that is available to support such an initiative. The use of both asynchronous and synchronous technologies is necessary to cater for those who prefer to collaborate and learn within a real-time environment. Those who are unable to join at specified times in the synchronous environment would access asynchronous communication tools. Building on the notion of situated practice and community cohesion, the outer layer of shared repertoire, mutual engagement and joint enterprise, teachers have access to a purposeful learning community where they can share practice, engage in collegiality and develop knowledge. It is envisaged the community be established by the need of the teachers and include other professionals that would value-add to the community. These professionals might include curriculum consultants from district or central offices, university lecturers in the specific field of expertise, industry experts if applicable to that field of expertise and others as required by the teachers within that community.

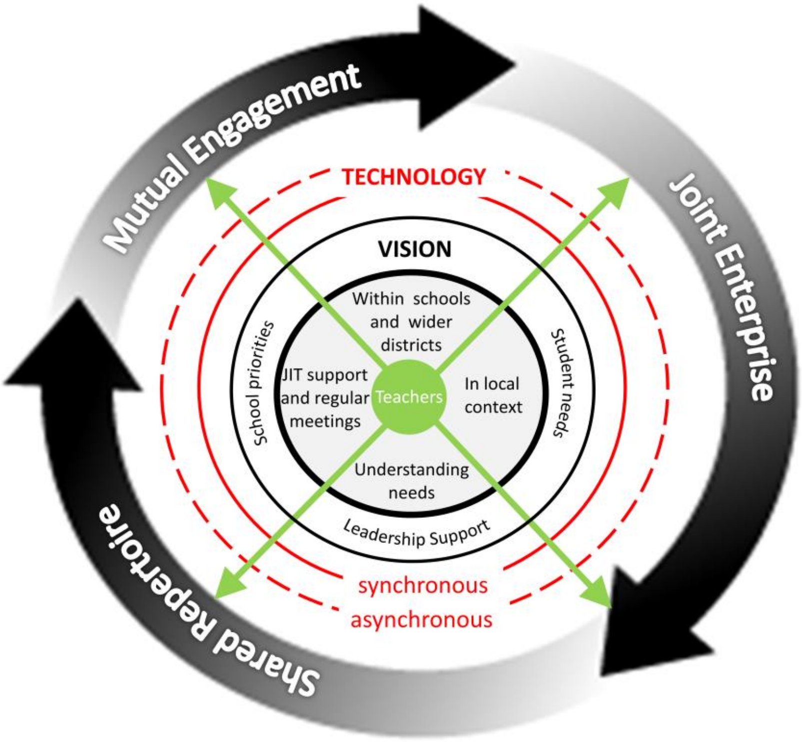

Figure 3: Rethinking connectedness model.

This model, constructed for the needs of teacher professional learning, can be applied to the realm of teachers or other professionals accessing postgraduate education at a distance. The use of asynchronous and synchronous technologies is highly beneficial for effective online teaching and learning.

Conclusion

Postgraduate degrees are a valued form of professional learning and as such, higher education providers need to ensure equitable access to all students regardless of geographical location. Through the application of a model, such as the *"Rethinking connectedness model"*, focusing on the needs of the individual and the vision of the organization within which they work, higher education providers can ensure that postgraduate education can be tailored to suit the requirements of professionals working in regional and remote areas of the nation.

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Lights, camera, action: Gathering experiences of first time distance learners

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This paper reports 'research in progress', which investigates the experiences of first-time distance learners with a strong phenomenological dimension. It takes place against a backdrop of challenges facing distance education in Australasia in which issues of recruitment, attrition (retention) and completion rates have come into sharp relief. This study will go beyond the current literature by producing a set of research-led deliverables that will enhance the supports and services available for first-time distance learners. The project is framed by an audit of initiatives designed to enhance the success of distance learners at two Australasian universities. The primary investigation gathered reflective video diaries from 20 first-time distance learners during Semester 2, 2011. The paper describes the methodological challenges of collecting learner stories through video and shares some of the preliminary qualitative data from this phase of the study.

Keywords: Distance education; learner engagement; reflective diary

Introduction

There is a wealth of literature exploring the individual, social and organizational factors which impact on student recruitment, attrition (retention) and completion rates in higher education. As Zepke and Leach (2007, p.237) observe, 'Improving retention rates in post-school education has become a focus for policy-makers and researchers throughout the western world'.

Student retention has been linked to learner engagement. There are three 'dimensions' of learner engagement that are used in educational research (Bull et al., 2010). The first is 'behavioural engagement', which is demonstrated by students who are involved and participating, meaning that they are likely to be on task and following instructions. The second is 'emotional engagement', which manifests as signs of interest / enjoyment and means that students find the learning sufficiently worthwhile / challenging to give it their attention and effort. Lastly, 'cognitive engagement' manifests at a surface level through a student's ability to describe what they have learned or to complete a task accurately. However, at a deeper level, a student who is cognitively engaged is likely to initiate self-directed investigation or setting and solving related challenges.

A number of Australasian studies have investigated learner engagement in tertiary education (James et al., 2009; Kift, 2009; AUSSE, 2010). In brief, we know from previous research that:

- The first year experience is critical to learner success and, during this time, institutions have the influence to enhance the student experience and, in turn, which students succeed (Kift, 2009);
- A high proportion of students consider dropping out of university in their first year. However, only a few indicators suggested that distance students were less engaged than on-campus students (AUSSE, 2010).
- More students than ever are studying by distance, which has been augmented by new digital technology. Students now expect technology to be a central feature of their learning experience (James et al, 2009).

Internationally, Simpson (2009) is one of the leading scholars whose work focuses on learner engagement and retention in the context of distance education. He claims there are many possible interventions available that have been known to successfully support the engagement and retention of distance learners. However, these interventions are often applied in a seemingly 'ad hoc' manner or what he describes as a 'goulash approach' to distance learning (Simpson, 2009). To overcome this problem, MacKay et al., (2010) adapted an 'intervention framework' for distance learners as part of a major externally funded project to enhance distance learner retention. The framework is based on a combination of the 'intervention pyramid' by Wilson (2009), which identifies the different needs of different learners; and on the student life-cycle published by the Higher Education Funding Council for England (2001).

Building on this work, the current research has been designed to answer the following question: What are the overarching principles for engaging students in distance learning and, to that end, which are the most effective intervention tools, supports and resources during the early stages of the study lifecycle?

Methods

First phase

The first phase involved an audit of initiatives designed to enhance the success of distance learners at two Australasian universities. The audit framework adopted the six stages of the study life cycle (HECFE, 2001; MacKay et al. 2010), against which initiatives were recorded:

1. Thinking about study – Initiatives that encourage a variety of people to participate in higher education by raising their aspirations, while helping them begin to understand the learning and teaching methods used;
2. Making choices, e.g. Tools that assist potential students actively gather information, which may help them self-assess their readiness, suitability and capacity for study via distance;
3. Enrolment – A well designed admissions process can not only help to reduce stress but also contribute to retention, as the student is better informed and more aware of the expectations within higher education;
4. First weeks – In addition to initiatives surrounding orientation, this stage incorporates retention and engagement strategies relating to the first 6 to 8 weeks of study via distance;
5. Progression – Initiatives that provide ongoing support for student success and review the appropriateness of teaching and learning approaches during and beyond the first semester;

6. Completion – Interventions that prepare students for life after their current distance paper(s), which may include strategies to support students as they make the transition to the working environment.

Second phase

The second phase adopted a mixed methodology with a strong phenomenological dimension. This meant that the experiences of learners were recorded from their own point of view using Sony bloggie™ video cameras for data collection . Approval to conduct the second phase of the project was granted by the University's Human Ethics Committee.

Recruitment
The recruitment of first-time distance learners was enabled by the Director of Student Management who granted the project permission to access enrolment data for students studying via distance for the first time in Semester 2, 2011. The primary method of recruitment was by email invitation from the Project Leader via inyourownwords@xxx.ac.nz to all potential participants at the point when their enrolment had been approved. For further information, the email invitation included a 'Participant Information Sheet' along with a link to a participant-facing website: http://inyourownwords.xxx.ac.nz. A notable feature of the website was a video introduction from the Project Leader and Project Manager using the same Sony bloggie™ video cameras that were provided to participants.

The Information Sheet explained that the greatest benefit of participation was likely to be the activity of self-reflection, which is known to enhance learning outcomes. In addition, it was highlighted that participant data will be disseminated across the distance education community to help improve the learning experience for future students. To compensate participants for their time, the Information Sheet explained that a token of our appreciation (koha) would be extended upon receipt of participants' final diary episodes.

Sampling
The recruitment campaign reached more than 750 potential participants, of which 140 first-time distance learners volunteered. The sampling process was based on the decision to select 20 participants who broadly represented the demographic and geographic diversity of distance learners. The profile of diversity was informed by a demographic analysis of the University's distance students during the 2010 academic year. Although more students volunteered, the funding and feasibility of the study restricted the sample size. Selection criteria included: age, gender, ethnicity, geographic location, subject of study, level of study, entry qualification, along with prior or current experience of tertiary study on-campus. Twenty successful volunteers received an email request to confirm their agreement to participate by signing a 'Consent Form'. Those 120 volunteers not selected received a transparent explanation.

Data collection
Upon receipt of signed Consent Forms participants were sent a Sony bloggie™ video camera via courier to their home address. Upon receipt of the bloggie™, participants received an orientation document via email, which was designed to support each participant in becoming sufficiently confident with technology to participate effectively, i.e. operating the camera then uploading and submitting data files. Those who required additional assistance were contacted by the Project Manager. As part of the orientation process, participants were asked to record a practice diary in response to some initial reflective questions.

Reflections were gathered using a video diary technique adapted from previous studies. Riddle and Arnold (2007) used the 'Day Experience Method' to investigate everyday life situations. They required participants to record written answers to specific questions sent at irregular intervals (between 30 and 90 minutes) between 8am and 10pm on three separate days. In contrast, Cashmore, Green and Scott (2010) adopted a free-form approach to video diaries in a longitudinal study with undergraduate students at the University of Leicester. The present study adopted an approach that struck a balance between a structured approach and free-form approach.

The initial expectation was for five minutes-worth of video footage per week; although this expectation waned given that the greater issue was not one of duration but 'forthcomingness' of information. Of the twenty participants, six presented some concern around their willingness and/or natural ability to reflect deeply on their distance learning experience. Simultaneously, three participants capable of speaking at length (>10 minutes per week) presented a challenge in the limited depth and breadth of their dialogue. The research team faced the challenge of accommodating diversity while maintaining enough consistency across participants to prevent the data becoming skewed. In response, a 'reflective prompt' protocol was designed to encourage 'free-flow' reflections whilst providing 'fish-hooks' to elicit targeted categories of information in a lightly structured manner. Within 48 hours of receiving a participant's video file, the Project Manager would respond via email with a set of reflective prompts, which were based on the following framework:

- What's on your mind at the moment?
- Fish-hooks for deep, strategic and surface learning indicators
- Fish-hook for support indicators
- Is there a word that sums-up your study this week?
- What's on your plate next week?
- Are there things you'd like to continue, start and/or stop?

Exceptional data was collected during the first half of Semester 2. During semester-break, participants were given the opportunity to continue or conclude their involvement in the project. Eight participants chose to conclude, while twelve chose to continue until the end of semester. The research team were mindful of any sense in which the students felt abandoned on conclusion of the study.

Data management
To mitigate any participant concerns about being identified via their video recordings, data was handled solely by the Project Manager. Upon conclusion, participants were given the opportunity to review their data before deciding whether to authorize its release for the purpose of academic dissemination. Participants were given the option to release a transcript of their data under and alias identity and withhold their video recordings.

Reporting data
Data analysis is scheduled to take place in November 2011. The analytic method will be thematic analysis, which is a method for identifying, analyzing and reporting themes within data. A theme captures something important about the data in relation to the research question, and represents some level of patterned response or meaning within the data set (Braun & Clarke, 2003). In this study, thematic analysis will follow a 'realist' method in which the experiences, meanings and the reality of participants are reported. An inductive approach ('bottom-up') will be applied, which means that themes will arise from the data. Thematic analysis follows a six-step process: Familiarization; Generating initial codes; Searching for themes; Reviewing themes; Defining and naming themes; Reporting content of themes (Braun & Clarke, 2003).

Third phase

An invitation to participate in an anonymous, online survey was extended to all 160 first-time distance learners who volunteered to participate in the second phase. The survey was not extended to the potential pool of 750+ first-time distance learners at the university because it was assumed that their preference not to participate was implicit in their rejection of the initial invitation to participate. The invitation was sent via email from the Project Leader and accompanied by an Information Sheet. Approval to conduct the online survey was granted by the University's Human Ethics Committee.

The pre-semester survey comprised two sections: a reflective section followed by a demographic section. The reflective section was structured horizontally around the concept of deep, strategic and surface learning taken from the Approaches and Study Skills Inventory for Students used by (Anderson, B., 2011); and vertically around the Equivalency of Interaction Theory of student interaction with other students, staff and content (Anderson, T., 2003). This strategy aimed to gather insight in to preferences around interactions by students who indicated tendencies towards deep, strategic and shallow learning; and then to triangulate these finding with demographic data. The survey generated 65 responses. The end-of-semester survey adopted the same vertical and horizontal lines of investigation while reflecting on the preceding 12 weeks. Results of the survey were analyzed using Statistical Package for the Social Sciences (SPSS Inc., Chicago, USA).

Conclusion

Preliminary analysis has highlighted four points: (A) Hearing from students in their own voice was the original raison d'être of this project. Reflective video diaries opened a window in to the lives of twenty participants as they embarked upon their inaugural journeys in to the realm of distance education. From this privileged observation platform, the extent to which stories add flesh to what it means to be a distance learner has become evident. Thus, the value gained from the video diary protocol far outweighed the challenges that arose along the way; (B) Distance education is the mode of choice for 21st century learners who are empowered by the flexibility to assimilate tertiary study around life's less flexible commitments; (C) Digital literacy is hugely variable among distance learners, which presents a challenge as distance education providers transition to online delivery; (D) It is important to make explicit tacit knowledge of what's required to be successful as a distance learner from the outset. Support services for distance learners must be mobilized and advertised at the point of need; and must appreciate the unique challenges that they face in contrast to internal students.

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Auditing education courses using the TPACK framework as a preliminary step to enhancing ICTs

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The *Teaching Teachers for the Future* (TTF) project is a Department of Education, Employment and Workplace Relations (DEEWR) project that involves all 39 Australian teacher education universities. This study uses the TPACK framework and focuses on future teachers to ensure they are afforded the best learning opportunities in an increasingly online world. Specifically, the project supports the ongoing development of information and communication technology (ICT) proficiency of graduate teachers across Australia by building the ICT capacity of teacher educators and through the development of appropriate resources. This paper focuses on the initial auditing and mapping of the electronic course profiles (unit outlines) that occurred at The University of Queensland's School of Education which in turn provided a basis for the specifics of the project. The initial findings of the mapping process indicate that generally, course coordinators under-represent the technology components in their courses.

Keywords: TPACK, pre-service teacher education, Australian curriculum.

Introduction

Teaching Teachers for the Future (TTF) involves all 39 universities that are involved in teacher education in Australia and is a $7.8 million DEEWR funded project which is part of the Australian government's Digital Education Revolution initiative. This project aims to "embed ICT into everyday classroom learning by transforming the delivery of teacher education" (Department of Education Employment and Workplace Relations, 2010). This project takes the notion that teachers who are expert at teaching ICT will assist universities to transform their teaching courses to include more ICT that improves pre-service teachers' technological knowledge and thereby empowering the next generation of school teachers with the necessary skills to make ICT integral to their classroom pedagogy.

While the research indicates that there is a lack of theory and conceptual frameworks that actually guide esearch in the area of teaching with technology (Angeli & Valanides, 2005; Koehler & Mishra, 2008; Mishra & Koehler, 2006; Niess, 2005), the TTF project is underpinned by the *Technological Pedagogical Content Knowledge* (TPACK) framework. This paper specifically addresses the auditing and mapping of university courses which all universities were required to undertake as part of their implementation plan. The mapping task audited the current state of all teacher education courses (units/subjects) in each university with regards to technology implementation. Results from this one university provided more data than expected as well as some unanticipated strengths in current teacher education courses.

Technological pedagogical content knowledge (TPCK, also TPACK) forms the basis of "good teaching with technology" (Mishra & Koehler, 2006, p. 1029). This component identifies the knowledge teachers' use when integrating technology into their subject area. This understanding emerges from the interactions among content, pedagogy, and technology knowledge (Koehler & Mishra, 2009). They stress that good teaching is not simply a matter of "adding technology to the existing teaching and content domain" (Koehler & Mishra, 2005, p. 134). Mishra and Keohler (2006) explain that good teaching with technology requires an understanding of the concepts of technology. As such, Mishra and Keohler (2006) believe that developing technological pedagogical content knowledge should be a critical goal of teacher education. The TTF project focuses on this dimension of TPACK.

Methodology

The electronic course profiles that were analysed were identified as core units for each of the Bachelor of Education (Primary and Secondary) programs, with science and mathematics being specifically targeted. A total of 22 core profiles were reviewed for the Bachelor of Education (Secondary). These comprised of 13 compulsory core units incorporating education theory and professional practice, and curriculum. With regards to the curriculum courses, there are a total of four maths and five science courses. The program also consists of teaching specialisation courses. There were 26 core units identified in the Bachelor of Education (Primary), however, only 17 of these were downloaded and analysed as the Bachelor of Education (Primary) is a new degree and the remaining nine profiles were either not available until semester 2 or not offered until 2012. The course profiles were audited to determine the technological, content and pedagogical knowledge (T, C and P) evident throughout. The following sections of the course profile provided the basis for categorising the course material into the various areas: general course information, aims and objectives, learning resources, teaching and learning activities, and assessment.

Results

The technological knowledge that was evident in lectures, tutorials and assessment in the course profiles has been summarised in Table 1. The knowledge is divided into straightforward uses and complex uses. The straightforward uses were identified as low-level tasks that did not require comprehensive technology skills while the complex uses where identified as those requiring high-level processing skills and technology knowledge. Studies in the United States indicate that while teachers are using technology, it is predominantly used for low-level tasks such as word processing and internet research (Ertmer, 2005) and presentation software and management tools (Harris, Mishra, & Koehler, 2009). Nor should it be assumed that graduate teachers enter the teaching profession with an appropriate level of technology capabilities (Jamieson-Proctor, Finger, & Albion, 2010).

Table 1: Technological knowledge used in teaching (T) and assessment (A)

Straightforward uses	Complex uses	Complex uses continued
Blackboard for information dissemination, delivery of learning modules, submitting assignments (T, A)	Blackboard discussion boards and online quizzes (T, A)	Technology workshops and clinics, Online technology-based activities for students (T, A)
Videos (T)	Concept mapping (T)	Peer teaching (T)

Video taping (T)	IWB flipcharts –developed by students (T, A)	Graphics calculators (T)
Email communication (T)	IWB flipcharts – developed by lecturers (T)	Robotics (T)
Web searches – literature, research material (T, A)	Digital storytelling (T)	Digital literacy (T)
Digital images (T)	Wikis and creating them (T, A)	Online Blog (A)
Online activities (T)	Mobile learning (T)	Wequests (A)
TurnItIn T)	Second Life (T)	Evaluation of digital resources (A)
Internet resources (T)	Web 3.0 (T)	Digital portfolios (A)
Presentations (T)	CMS for website development (T)	Literacy profile (A)
Word processing (T)	Electronic journals (T)	Produce a learning object and develop online games (A)
Multimedia lab sessions (T)	i-Lectures and Podcasts, Slidecasts (T, A)	Form an online learning community (A)
Complete online certification courses (A)	Video Production (A)	
Analyse technology (A)		

When focusing on the complex uses of technological knowledge, the outcomes are advantageous to both the pre-service teachers and the lecturers. While the development of technological knowledge and skills equips the pre-service teachers with the tools that are necessary for the successful integration of ICTs, it also creates a pathway for the integration of technological knowledge and skills within the students' subject area. Further, the students gain practise in developing technologically-rich learning experiences that enhance learning outcomes.

A number of examples identified in this paragraph elaborate on the benefits of integrating complex uses of technology into the teacher education courses. In one course, the students' course evaluation feedback identified over two consecutive years and since the courses inception, received positive feedback and high ratings which "affirmed the value of the highly interactive and experiential lectures and workshops" (The University of Queensland, 2011). This course had a significant technology focus and incorporated many complex uses of *technological pedagogical content knowledge*. In another course, the lecturer runs technology workshops where the students research and design a project that uses complex ICTs and present these to their peers. One of the student presentations in a previous year demonstrated the use of Google Earth software for integration in mathematics classes. The lecturer is now taking steps to become familiar with the software application and incorporate it into that particular mathematics course. Assessment activities also promoted higher order thinking, in both technological and content knowledge, for example the development of online games, and acknowledged real-world experiences, such as preparation of material for a YouTube Channel. While no definitive claims are being made, at the initial mapping stage, it appears as though technology-rich pedagogy enhances the teaching and learning experiences of both staff and students.

A range of technological knowledge is evident in the course profiles, however, following meetings with the course coordinators and lecturers of the audited courses to discuss the mapping, it becomes apparent that the course profiles under-represent the degree of technological knowledge demonstrated in most courses. For example, in one course, which is mandated for study across all three degrees, little or no technological knowledge is acknowledged on the course profile. The course profile identified Blackboard and videos as the only technology used in the course. An informal discussion with the course coordinator revealed that social networking was a central component to the learning that occurred in this course. The School of Education is now investigating this phenomenon further and looking at ways of improving statements of ICT usage in course profiles.

Conclusion

The results indicate that the School of Education courses are both creative and innovative in relation to technology integration. Ferdig (2006) explains that "innovation must contain authentic, interesting and challenging academic content" (p. 750). As the discussion on lectures, tutorials and assessment identified in the course profile will attest to, many of the complex uses of technology (see Table 1) demonstrate the innovative practices in technological knowledge. Further, Ferdig (2006) suggests that teaching and learning practices need to have "authentic, real-world problems, because they are interesting and meaningful to the students and thus engaging" (p. 750). Innovation and creativity was found in the mapping of many of the course profiles and in particular, in the assessment practices of many of the courses. Banas (2010) explains that teachers need to move from a level of "no technology use" to one of "learning from" technology and finally through to a "learning with" technology level (Banas, 2010, p. 126). With many of the complex uses of technology identified in this study, it is hoped that many of the pre-service teachers begin their practice at the "learning with" level (Banas, 2010, p. 126).

The results from the mapping and auditing components of the study suggest that there is a diverse range of technology used across courses in both learning activities and assessment. As a result of the informal conversations with the course coordinators that following the mapping and auditing phase, we became acutely aware that the staff were also using other technologies in ways that have not been identified in the course profiles and consequently not mapped during the audit. This is perhaps a unique situation for an Australian university with further research in this area a future possibility.

This mapping divided technology usage into straightforward and complex uses. After completing the TTF project, this university will have an extensive repertoire of complex technology related teaching and learning experiences for use with primary, middle years and secondary courses. The anticipated changes will be post-tested at the conclusion of the project with another mapping task, where the results will enable a comparison and measurement of the change. Any improvement would benefit graduating pre-service teacher and enable them to commence their careers as individuals who are able to "learn with" (Banas, 2010) technology while also integrating and evaluating technology, for its content and pedagogical appropriateness (Niess, et al., 2009), thereby enabling their *technological pedagogical content knowledge*.

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Changing practice: Does the LMS matter?

Helen Carter

James Meek

Vanessa Warren

What are the key drivers to change in teaching practice as they relate to the use of a learning management system? Is one system inherently better than another or is it teacher experience that matters most? Are we expecting academic staff to become 'experts in educational technology' and taking the focus away from developing their discipline expertise? What role do educational designers play in facilitating change in practice? What role does the institution play in supporting change in practice? This paper is meant to provoke discussion around these questions and asks you to consider how this might relate to your own experience and circumstance.

Keywords: LMS, teacher experience, educational design

Introduction

In Australian universities over the last couple of years there has been a noticeable change in the learning management system (LMS) landscape. Increasingly, universities are opting to utilise alternatives to proprietary learning management systems to instead use open source systems. This change is sometimes being coupled with a move to outsourcing the hosting and / or user support of these systems. What are some of the drivers behind these changes and is this making any difference to teaching in higher education?

At first glance this change in the LMS landscape might only seem significant in terms of university management and governance arrangements around how they work with open source systems and in some cases, outsourced hosting of such systems. Certainly these are both issues that need to be considered but does the choice of LMS matter in terms of the approach to teaching? Is there a difference in how teaching staff go about using an open source system and particularly those who have moved from a more constrained proprietary learning system environment?

Open source systems are perceived to be easier to use, not only at the user level but also at the system level; should we be examining the intrinsic affordances that developing a unit of study in an open source system might facilitate, compared to being developed in what might now be seen as a more traditional, proprietary system? This paper seeks to highlight some of the key questions to ask about the role of the software, teacher, educational designer and the organisation – and the relationships between each of these – when examining the impact of the LMS on teaching practice in higher education.

Does the LMS matter?

"…we shape our tools and our tools shape us" (Boettcher, 2007)

The recent change in the learning management system landscape in Australia suggests dissatisfaction with the extant proprietary learning management systems. Bersin (in Aberdour 2008) lists low satisfaction with proprietary learning management systems due to lack of: out of the box functionality; management reporting; ease of customisation; flexible data models and architectures; and vendor service and support. A number of open source systems have emerged as viable alternatives allowing greater customisation and different support models ostensibly facilitated by less up front costs.

Some attributes of an LMS may help or hinder with change in teaching practice, such as basic architecture and 'mood', or emphasis, of supplied functions, and what these suggest. Some of our university teaching staff have just managed to get their head around web design guidelines:having at least the first screen of content (landing page) kept to a single screen of information; of using icons to represent areas of logical organisation, such as lecture content in one spot, assessment items in another, discussion forums in another, and so on; and the importance of white space and uncluttered sites, consistency of naming and layout. There are now many teaching staff who have spent several hours crafting their sites in an effort to achieve these ideals and there is a certain clean logic to dividing a unit of study into these components. Indeed, many proprietary LMS work on the basis of a set of tools that a teacher can use, so consequently sites get developed on this basis. A typical site is established with 5 or 6 icons in the main menu, representing: lecture topics; readings; assessment activities; quizzes; forums and links to resources. Although this might seem the logical way to develop a curriculum for a unit, the focus tends to be on content delivery and one-way communication through seemingly disconnected content and forums. Certainly the design of learning activities have generally not been the prime drivers for the development of such sites.

Other attributes which may help or hinder with change in teaching practice as they relate to the use of a learning management system are its ease of use, predictability, approachability, help materials supplied and any special features. Educational designers would not generally consider themselves to be educational technology experts but they certainly need to understand the possibilities and limitations that might be associated with any particular LMS. Table 1 below provides a potential matrix of factors for consideration in the acceptance of an LMS from the perspectives of teacher, educational designer and the organisation.

Table 1: LMS Acceptance Factors (adapted from Al-Busaidi and Al-Shihi, 2010)

Teacher factors	• Self-assessment of ability to complete tasks using technology • Attitude towards e-learning • Experience / exposure to use of the technology • Teacher Style, from teacher-led to student-led • Personal innovativeness or tendency to experiment with and adopt new technology
Educational Designer considerations	• Purposes for use • Expertise to draw on • Support to learn the mechanics • Support around creative use • Institutional motivation/policy • Institutional guidance/attitude • Time on task for learning, conceptualising and building • Both personal and institutional workload management

Organisational factors	• Organisational support by senior executive • Technology alignment with goals of the organisation • Technical and professional support • Training, using varying formats and approaches • Motivators or incentives provided to support change

The role of the teacher

"When faculty feel that they have greater control over the learning environment, there appears to be increased acceptance of the LMS." (Sclater 2008)

A paper by Oliver and Moore (2008) discusses a number of studies which look at academic use of learning management systems and conclude that as usage of LMSs has continued to increase over time, so too the breadth of tools that are used by academic staff in their teaching has increased. Although initial development of teaching sites will focus on dissemination of information, as confidence grows so too does the use of interaction and communication tools by the teacher. These trends are influenced by the level of study and also the nature of the delivery but does an open source system necessarily afford a different design of learning or is it teacher experience that counts?

The primary paradigm for teaching in Universities has been the delivery of information to students often via the lecture. A lecture may be good for inspiring, motivating and perhaps passing on information through listening but not necessarily good for active engagement. For many years now there has been a move to redefine the role of the teacher as a facilitator of learning and there are more recent moves to put the emphasis once and for all on the learner and learning environment as central by situating the role of the teacher as that of a designer of tasks. These tasks become activities that students undertake in ways that make sense to them. Goodyear (2009) suggests that thinking up good tasks – ones that align with intended learning outcomes – is not easy.

There are a number of ways of encouraging the teacher as the designer which requires acknowledging and supporting the teacher as a professional. This approach is not always easy to pursue, especially with pressures on staff time and energy and resources but this is essential to effectively support change in practice. There also needs to be the backing and understanding of the University executive that teacher development takes time. If units of study are assigned a workload, which is described in terms of lectures and tutorials, then changing practice will be difficult. Enabling staff to change is not just about providing educational design support but also about giving them permission to change. How can we transfer light bulb moments into academic development? (Johnson, 2010) Developing and resourcing appropriate support models to work with staff is important, as attitudes and agreement on what works and what doesn't are many and varied.

The role of the educational designer

"It is now too much to expect academics to be subject experts and experts in education technology. It is too sophisticated. It is unfair, if your field is mathematics then there is another specialist who can take your stuff and put it on the online environment." interview with vice-chancellor Jim Barber in reference to outsourcing of online course delivery to Pearson (Blackwell, 2011).

Many teachers have found ways to bypass or limit their involvement with the 'tools of trade' (as Oliver, 2010 puts it); often investing time and energy into improved learning in the classroom is simply a low priority for busy staff. Even good teachers can assume technology is enough. Technology will not change teaching as we know but designing courses for learning might. Educational designers will ask what blend of pedagogical strategies and technological affordances are most effective for learners?

Educational designers come from a variety of backgrounds and disciplines and there is no formal course of training that can prepare you to be one. In the modern university they have become a staple edition to supporting teaching staff when developing teaching curricula and associated approaches and materials, particularly when coupled with the introduction of a new LMS. They often have to consider quite a broad range of factors, when working with staff, such as: purposes for use; expertise to draw on; support to learn the mechanics; support around creative use; institutional motivation/policy; institutional guidance/attitude; time on task for learning, conceptualising and building; and both personal and institutional workload management.

Does the specific LMS platform matter to a teacher or to an educational designer? How much? What else influences the way they proceed in their work?

The role of the organisation

> "... there is something so seductive about (an) LMS that, despite their complexities and risks, almost every university seems compelled to have one." (Wise and Quealy, 2006)

Expectations of the role and value of learning management systems can be significant from the governing bodies of universities. With the removals of caps on student places in 2012 and greater focus on equity in tertiary education in Australia, the practices of teaching and learning are under continued pressure to change. These pressures to change may or may not reverberate throughout the institution depending how well they are seen to be supported by the senior executive and how well they align with the technological goals of an organisation. Institutionally-run programs that support staff to change their teaching practices and practical incentives to motivate change, demonstrate to staff the value of investing time and effort in changing their practice. How well is this explicated in organisational plans, particularly those relating to learning and teaching and quality improvement frameworks? How well understood is the role of the LMS in supporting change in teaching practice?

Conclusion

The change to any new LMS provides an opportunity to think differently, both from a systems approach, such as using external hosting as a way to creating opportunities, and from a professional development standpoint, by supporting staff to try something different. Anecdotally, staff who have adopted an open source system in their teaching, report changing their approaches but is this just about the tools that an open source system provides that makes the difference? Is it something about a mindset change – a *'just try it'* attitude – but why hadn't teachers done this previously? Some proprietary systems have imputed an attitude of *"here's what you've got – deal with it"* but does this inflate expectations with open source systems that are purportedly able to be extensively / endlessly customised? Does this also mean having to take extra care about how to manage expectations with open source software?

Is it unfair to expect teaching staff to be able to effectively use technology such as a learning management system and should we instead be employing educational technology experts to manage it for them? Should we expend more effort on models of staff development (Zhou & Xu, 2007) that better support our staff needs? Can changing learning management systems really make that much difference to how we teach in universities? There are many issues to consider with the choice of an LMS and considerable time and effort is often expended in making this decision; are we even asking the right questions? There is a need for further research and examination of these questions, particularly in the early stages of LMS transition projects, or applying approaches to existing LMS.

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Contextual Course Design with Omnispective Analysis and Reasoning

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In this paper, we present a novel approach to contextualize course design by the application of the Omnispective Analysis and Reasoning (OAR) framework to map the goals and intent of a course to its design and delivery. Effective design and delivery of courses requires alignment between planned learning activities and learning outcomes. However, it is generally not trivial to translate learning outcomes into course design, particularly so when using a Learning Management System (LMS). This is further compounded by the differences between the language of teaching theory and that used by the LMS. Thus, there is a need to effectively capture the rationale for design decisions in a course and map them to desired outcomes. We illustrate the application of the OAR framework with a process for translating a learning objective into course design using the Moodle LMS.

Keywords: Context, Course Design, Moodle, Omnispective Analysis and Reasoning

Introduction

Teaching a course requires planning learning outcomes and goals. These are then mapped to existing educational technologies to deliver the course. However, current learning management technologies often require significant effort to design and organize courses. As a result, teachers are forced to concentrate their efforts on the quirks and methods of the underlying technological platform and this takes their focus away from the goals and outcomes of the course. The activities of online assessment and evaluation tend to become more of a chore, rather than means to support the goals and objectives of a course. This also makes it difficult to share ideas and educational objects across courses and adapt them in a reusable manner.

These difficulties can be overcome by adopting a process that will enable us to:

1. Formalize the implicit rationale in learning outcomes for a course and program of study.
2. Better manage the *intellectual effort* (underlying concepts, ideas and theories) in the design and implementation of a course.
3. Explicitly capture and manage the learning *context* associated with the effort.

To this end, we utilize Omnispective Analysis and Reasoning (Chemboli, 2010a) to develop a reusable specification (recipe) in order to enable flexible organization and management of courses using a learning management system such as Moodle. First, learning objectives and outcomes of a course are captured using an enhanced model of curriculum design. These concept level concerns are then expressed as *model level* concerns in terms of existing educational models in the form of a specification, which conforms to and is in terms of the concept level concerns. Finally, the design decisions of a course are implemented using a learning management system and associated educational technologies, enabling a two way mapping between the educational goals and resources in the underlying technological platform. This will not only enable teachers to map their course outcomes to the underlying educational technology, but will also facilitate evaluation of the effectiveness and suitability of various teaching goals and outcomes.

The remainder of this paper is organized as follows. In the following section we discuss the issues encountered in translating learning outcomes to course design, especially when using a Learning Management System (LMS) for course delivery. Next, we present an overview of the Omnispective Analysis and Reasoning framework, highlighting its main features and approach to concern and context refinement. This is followed by a discussion of the OAR process for contextualizing course design. We illustrate the application of the OAR framework with a process for translating learning outcomes into course design using the Moodle LMS, with particular focus on one learning objective to provide further detail. In the end, we give summary and conclusions and indicate direction of future work.

The Problem of Translating Learning Outcomes to Course Design

The application of Biggs' theory of constructive alignment (Biggs, 2003) to design course content results in an effective approach to course delivery. Constructive alignment requires that the teacher align the *planned learning activities* with the *learning outcomes* (Houghton, 2004). However, one often encounters mismatch and difficulty in mapping the *language of the learning outcomes* to the *resources* and *processes* of the Learning Management System (LMS). This mismatch is mainly because of the different natures of the domains of course design and learning outcomes and the LMS. For instance, while learning objectives for a course may be formulated in terms of the desired goals and means for assessment and evaluation of effective learning, the implementation of the course in an LMS is undertaken in terms of LMS resources such as lessons and exercise blocks, and widgets like buttons and checkboxes, accompanied by participatory student activities such as discussion forums, quizzes and chats. Therefore there is a need to provide a link between the pedagogical concepts and their implementation in an LMS such as Moodle (Rice, IV, 2007). Online instruments will further help this linking of Moodle activities and resources to learning outcomes.

Developing Outcomes for a Course

Courses are driven by outcomes and objectives. Developing an effective course requires answering the following questions:

- What are the learning outcomes for the course?
- What is rationale of the learning outcomes?
- What objective measures can be formed to assess student learning?

These learning outcomes are usually expressed as a *course description statement*.

Difficulty and Disconnect in Mapping Outcomes of Activities / Resources in a Learning Management System

We encounter the following difficulties while translating the intent and learning outcomes of a course into activities and resources in an LMS implementation:

- Resolving the differences between language structure and terminology used in defining learning outcomes

and the Moodle implementation.
- There is an apparent disconnect between stating goals of a course and developing a course in Moodle.
- Lack of an effective means to capture the *rationale* for design decisions in a Moodle implementation (which activity / resource is chosen and why, what are the tradeoffs in using different resources to achieve the same outcome).
- Communication and collaboration issues that emerge in the interaction between course designers, lecturers and LMS developers.

Learning Outcome Rationale

The preliminary process of understanding the rationale for learning outcomes begins with identifying relevant *concerns* of interest in the course under consideration. We apply the Omnispective Analysis and Reasoning (OAR) framework to analyze the desired learning outcomes against accepted exemplars (*external prototypes*) presented by Ramsden (1992) and Biggs (2003) as applicable to the context of research-based education (*constraint factor*) at the ANU (Strazdins, 2007). We elaborate the process of linking this analysis in the example discussed later in this paper. This results in capturing the basis for course design in a repeatable manner which can be mapped to the outcomes of the course.

The Omnispective Analysis and Reasoning (OAR) Framework

The OAR framework has been developed to address the problem of capturing and reusing the intellectual effort in scientific workflows (Chemboli, 2010a). In this framework, a scientific workflow is defined as any logical and repeatable inquiry, investigation and set of actions.

The main features of OAR are:

1. Omnispective: The framework provides an outward looking rich context perspective for analyzing and reasoning about the underlying concerns in a problem situation.
2. Epistemic: Provides explicit support for evidential validation in a repeatable manner.
3. Managing intellectual effort: Capturing and reusing theories, concepts, interactions and constraints in recipes and prototypes. Exploratory domain concepts, scientific models, representation of theories and process specifications are represented in recipes (prototypes, archetypes and constraints).

Managing Concerns in OAR

In OAR, all the concerns that are identified in the problem domain are collected and managed at three levels – the concept, model and execution levels. Figure 1 illustrates the idea of hierarchical concern management in the OAR framework.

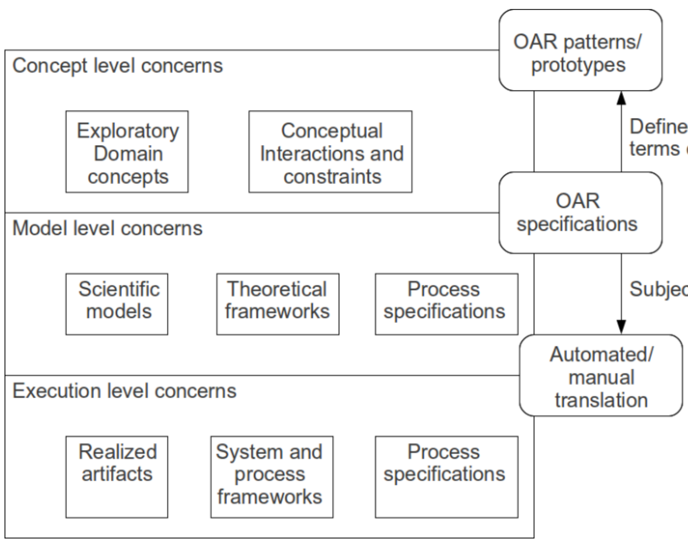

Figure 1: Hierarchical concern management in Omnispective Analysis and Reasoning

All individual concerns that emerge from an analysis of the domain of the present investigation (Scientific Activity) are extracted as recipes. At the *concept level*, these include exploratory domain concepts and the interactions and constraints between them. These aspects of the domain are represented in recipes (OAR patterns and prototypes). Each OAR prototype encapsulates the identified knowledge for a concern in the domain to varying degrees of firmness. At the *model level*, we describe physical and logical systems in terms of formalisms incorporating physical theories and paradigms. These are abstracted in mathematical and analytical models, vocabularies, data sets, natural language representations, ontologies and process guidelines. These abstractions (OAR specifications) are *defined explicitly in terms of and conforming to* the OAR patterns and recipes which have been identified at the model level. Since the OAR specifications are always defined exclusively in terms of OAR patterns, they will be easy to verify and validate for conformance and well-formedness. Finally, at the *execution level* the OAR specifications are implemented by automated/manual translation utilizing different available process specifications, system and process frameworks and known implementation platforms while *satisfying the requirements* of the OAR patterns/recipes which constitute the specification detail. Thus, the hierarchical nature of the OAR framework will ensure an end-to-end coordination between individual concept level concerns, their model representations and the corresponding implementation and execution in terms of available platforms, technologies and frameworks.

Concern Refinement

Depending on the degree of *firmness* and relevance, we categorize OAR recipes in three types – *prototypes, archetypes* and *constraints*. A *prototype* is any OAR recipe that is available in a given domain without particular consideration of its applicability, degree of formalism or robustness for any fitness or purpose. Thus, a prototype can encapsulate either nascent or well-formed domain concerns that may be available to support the analysis of any problem situation with the OAR framework. An *archetype* is a prototype that can be considered an *exemplar* or a *best practice* recipe for a concern in a particular domain. The choice of an archetype is dependent upon the analysis of the problem under consideration and influences our net understanding of the problem domain. A *constraint* is a special instance of an archetype which is identified to impose strict criteria on an OAR specification. A *valid* problem solution is required to *sufficiently satisfy* all requirements of the constraint without exception, and is often subject to rigid conformance.

Individual concerns (recipes and patterns) in OAR are managed in collections known as a *shelf*. A shelf is simply an unordered collection of recipes categorized by domains and their relevance to any problem under consideration using the OAR framework. As illustrated in Figure 2, OAR recipes (prototypes, archetypes and concerns) are organized in three categories of shelves – *external*, *problem domain* and *solution*.

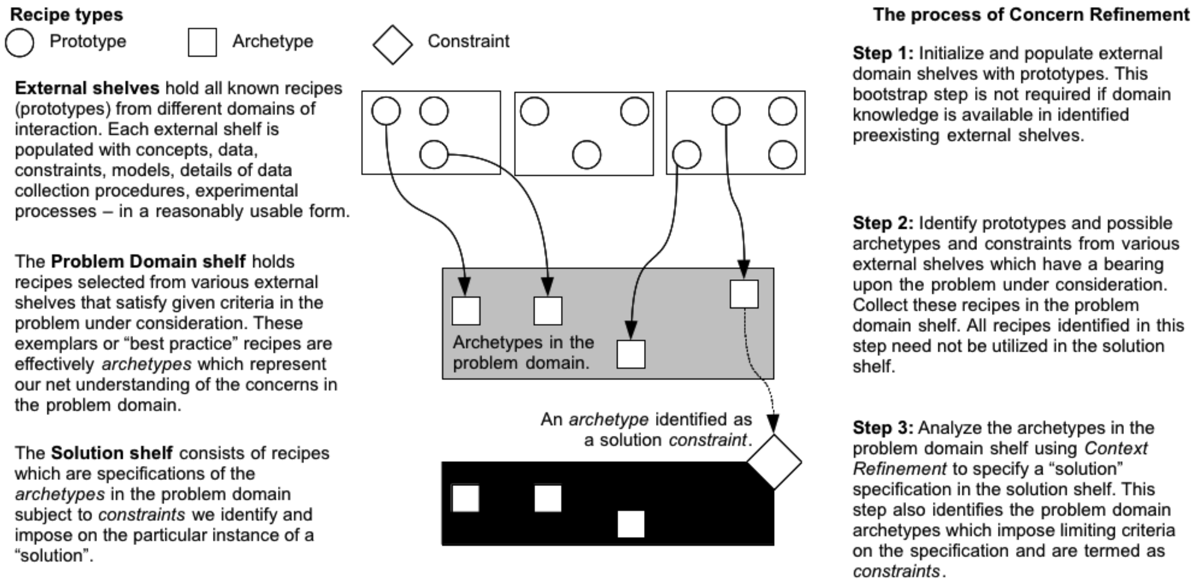

Figure 2: Managing concerns with recipes and shelves in the OAR framework

Context Refinement

The determination of which recipes are relevant to a problem domain is carried through the process of context refinement. Context specifies the degree of relevance of individual recipes in the problem domain. We manage context in the OAR framework by utilizing an enhanced model of context which extends the foundations proposed by Alshaikh and Boughton (2009). In the OAR framework, we consider context as a function of two dimensions: *firmness* and *influence*.

Firmness is a measure of the degree of wellformedness of the recipe (prototype) under consideration in a shelf. If the prototype is ambiguously defined, vague, or peppered with implicit characteristics, the knowledge encapsulated in the prototype can be considered to be quite *pliable*. On the other hand, an explicitly defined and well-formed prototype can be considered to be *firm*.

Influence is a measure of the effect exerted by the prototype in the analysis of the problem domain. If a prototype in an external shelf is identified as relevant to the problem domain, then the prototype exerts a non-trivial influence on the analysis. If it exerts a *strong* influence on the analysis, then the prototype is identified to encapsulate "exemplar criteria" or "best practice" for the problem situation, and can be considered as an *archetype* in the problem domain. If the prototype does not affect the problem domain, but may still be considered relevant, it is identified as exerting *weak* influence.

Considering these two dimensions, OAR recipe context (C) is defined as a function of *influence* (I) and *firmness* (F) (illustrated in Figure 3) as C = f(I, F).

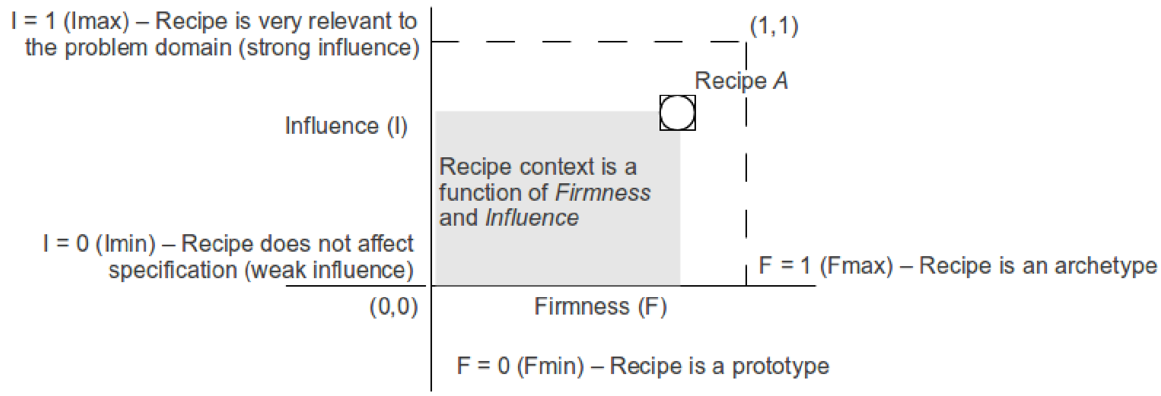

Figure 3: OAR context recipe as a function of Firmness and Influence

At the outset, all recipes are assumed non-contextual and not relevant to the problem under study. If analysis suggests the use of a particular recipe, then it becomes contextually relevant for the problem. In addition, if the recipe falls under the category of an "exemplar" or "best practice" in the discipline, then it becomes both relevant and contextually explicit for the problem under consideration. Consequently, the specification composed from the selected recipes will become increasingly *firm* as situational and imposed constraints are satisfied. Though OAR recipe context is a continuous function of two dimensions, in most circumstances, recipe context can be conveniently tagged by discrete labels of the function f(I, F) affecting prototype selection:

1. C(I=0,F=0): a context state corresponding to weak influence and low firmness.
2. C(I=0,F=1): a context state corresponding to weak influence and high firmness.
3. C(I=1,F=0): a context state corresponding to strong influence and low firmness.
4. C(I=1,F=1): a context state corresponding to strong influence and high firmness.

The process of context refinement (Figure 4) is used to determine the relevance and influence of the recipes to a problem domain.

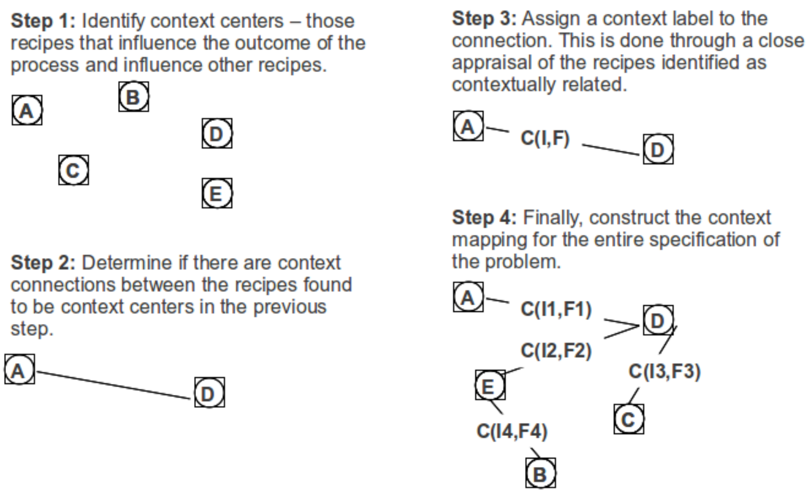

Figure 4: Context refinement in the OAR framework

The first two steps of context refinement in Figure 4 may be carried out recursively to obtain a complete mapping of the context relationship in the final specification.

The OAR Process for Contextualizing Course Design

In this section, we demonstrate the application of Omnispective Analysis and Reasoning for developing a contextual specification of course design. First, learning objectives and outcomes of a course are captured using an enhanced model of curriculum design. These *concept level* concerns are then expressed as *model level* concerns in terms of existing educational models in the form of a specification. Finally, the design decisions of a course are implemented using a learning management system and associated educational technologies, enabling a two way mapping between the educational goals and resources in the underlying technological platform.

After identifying the learning outcomes for the course, we execute the following steps:

1. Choose an outcome for the course.
2. Identify the characteristics of the outcome.
3. Using an online instrument (Chemboli, Kane, & Johns-Boast, 2010) to identify the Moodle resource/activity or associated technology which supports the development of these characteristics.
4. Develop the Moodle activity/resource to satisfy the outcome.

Translating Learning Outcomes for COMP8120

COMP8120 was a mandatory course in the Master of Software Engineering Program at The Australian National University. The Master of Software Engineering was aimed at updating and equipping software and systems engineering professionals with a repertoire of best practices and paradigms, empowering them to make informed decisions and evaluate their impact in a measured and systematic manner.

Learning Objectives for COMP8120

1. **[LO-1]** The students will develop an appreciation of past, contemporary and emerging software/systems analysis and design techniques.
2. **[LO-2]** The students will be able to evaluate and understand the scope, applicability, limitations and extensibility of software/systems analysis and design techniques.
3. **[LO-3]** They will be able to apply and expand the methodologies to accommodate appropriate multidisciplinary knowledge, and inform decisions affecting problem situations.
4. **[LO-4]** Students will use the approaches learnt to identify necessary improvements and inform recommendations about their realization using appropriate and well-informed inputs from multiple sources of knowledge and expertise.
5. **[LO-5]** The students will reflect, inform and communicate the issues in the integration approach identified

for improving a problem situation to the satisfaction of all stakeholders identified.

Analyzing Context for [LO-1] and [LO-2]

It is assumed by the designers of the course that students may not be conversant with system/software development methodologies (*ssdm*), or their application to specific problem situations (*ps*). We express this in the following context statement:

student C(I=0,F=0) *ssdm* C(I=0,F=0) *ps*

Students are introduced to subject matter pertaining to the detail and process of various methodologies, *without concern* for specific usage scenarios. Following this activity, students will now possess the requisite knowledge of system/software development methodologies even if they may still not be aware of areas of application of specific methodologies. Thus, students will acquire *explicit* knowledge of methodologies, although they may still be unable to contextually apply them to targeted problem situations. This can be expressed as:

student C(I=0,F=1) *ssdm*

Analyzing Context for [LO-3]

The students participate in guided learning exercises concerning the development of understanding and evaluation of problem situations while developing informed recommendations *without particular emphasis on solution strategies*. This phase of learning is governed by efforts to *credit local knowledge*.

student C(I=1,F=0) *ps* C(I=0,F=1) *ssdm*

Analyzing Context for [LO-4]

The students now undertake activities to iterate through *constraints* that bear upon a particular problem situation and formulate and develop *implementation processes* in accordance with all identified aspects of the problem domain. An early design decision by the course organizers required that the students employ the Aspect-Oriented Thinking (AOT) framework (Flint, 2006) for this purpose. Consequently, the choice of the AOT framework is a firm constraint (no alternatives are considered).

student C(I=1,F=1) *ssdm* C(I=1,F=1) *ps* C(I=1,F=1) *AOT*

Analyzing Context for [LO-5]

The students are to undertake activities to effectively *communicate* and *collaborate* in order to actively arrive at an agreement on the identified intervention in a problem situation.

student C(I=0,F=1) *communication and collaboration*

Solution Specification for [LO-5]

As a further illustration, we now discuss the OAR process for formulating a solution specification for implementing communication and collaboration for [LO-5] using the Moodle LMS (Chemboli, 2010b). Although the process for defining solution specifications for the other learning objectives is not presented here, they are defined in a similar manner.

Initialize External Shelves

We identify the following external shelves (Figure 5) with prototypes for designing the specification for realizing [LO-5].

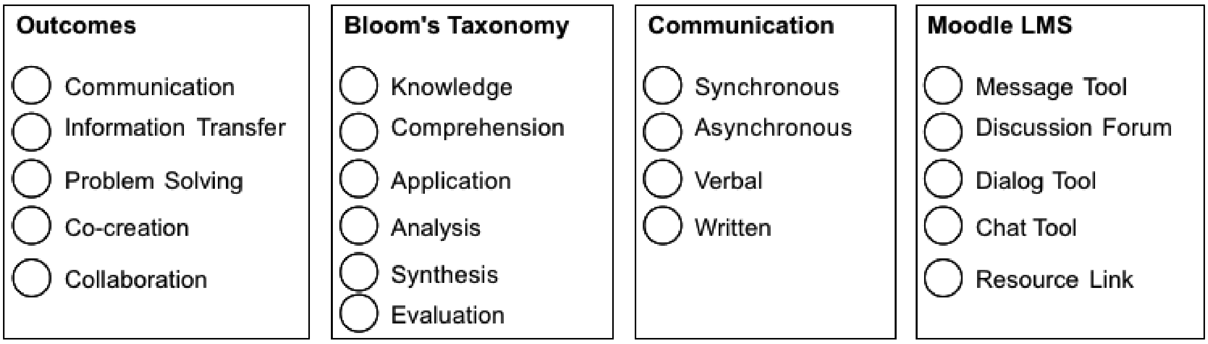

Figure 5: External shelves and prototypes

We utilize Bloom's taxonomy in order to align the learning outcomes of COMP8120 with assessment criteria. Hence, we identify the prototypes for assessment modes in Bloom's taxonomy as relevant recipes for consideration. The Outcomes external shelf presents us recipes for the activities pertinent to [LO-5]. Written or verbal communication between students can either be synchronous (in real-time) or asynchronous. These recipes are collected in the Communication external shelf. Since, we intend to implement [LO-5] using the Moodle LMS, an external shelf with resources and activities supporting communication and collaboration in Moodle is considered.

At the time of designing this course, we used Bloom's taxonomy (Bloom, 1963). There is nothing inherent in the OAR framework which mandates the kind of taxonomy used. The revised Bloom's taxonomy (Churches, 2008) can be incorporated in a straightforward manner as another external shelf which provides additional prototypes for consideration in the solution specification.

Identify Relevant Archetypes and Constraints

Next, we perform concern refinement for [LO-5] in order to select the specific prototypes which can be imported into the problem domain shelf. [LO-5] states the requirement for *active* communication and collaboration. The recipes for Communication and Collaboration are selected from the Outcomes external shelf. We also identify two constraint recipes – *Synchronous* and *Written* from the Communication external shelf. The students are required to communicate and collaborate in a synchronous fashion using written tools (these constraints are imposed by the course designers). Utilizing Bloom's taxonomy, we can align [LO-5] with assessment of Application skill. The students are required to utilize the communication platform to execute stakeholder engagement. Finally, we also select the prototypes for the activities in Moodle which support communication in a written form. The resultant problem domain shelf is illustrated in Figure 6.

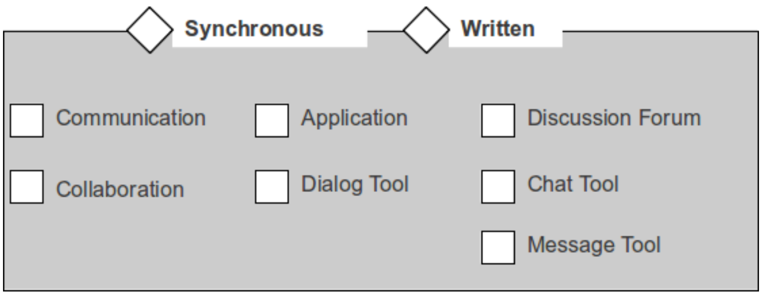

Figure 6: Archetype and constraint identification for [LO-5]

Solution Specification for [LO-5]

We now undertake the process of Context Refinement to define the solution specification for [LO-5] (Figure 7). The process is outlined in the following specification statements.

[SS-1] The *Communication* archetype needs to be implemented in a *Synchronous* and *Written* fashion. *Synchronous* C(I=1F,=1) *Communication* C(I=1,F=1) *Written*.

[SS-2] Although the Dialog Tool, Discussion Forum and Message Tool can be used for synchronous communication, they are not particularly suited for interactive text exchange between participants. Therefore, only the Chat Tool satisfies the requirement of synchronous communication, and is imported in the solution shelf.
Synchronous C(I=1,F=0) *Chat Tool*.

[SS-3] The Chat Tool was selected because it is a writing tool.
Written C(I=0,F=1) *Chat Tool*.

[SS-4] The use of the Chat Tool will satisfy the requirement for assessing how the students apply the skills learnt via [LO-5] because the course coordinators can assess the chat logs for significant contributions. Thus, we can state this as:
Chat Tool C(I=0,F=1) *Application*.

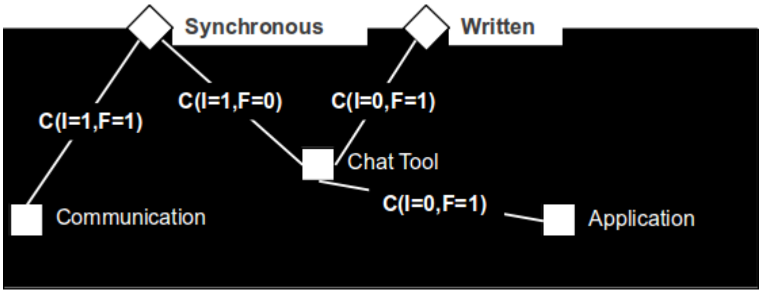

Figure 7: Solution specification for [LO-5]

Implement Solution Specification

Finally, we implement the solution specification for setting up a chat tool for satisfying [LO-5]. This is achieved through either manual or automated translation using the information provided by the archetype for the chat tool. In this case, we utilize a Moodle workflow for setting up the chat activity in the LMS (Chemboli, 2010c), which is specified in the chat tool recipe that was imported from the Moodle external shelf during the process of concern refinement. The use of the chat tool satisfies the design requirement for [LO-5] (synchronous and written communication) which is specified in Figure 7.

Summary and Conclusions

In this paper, we have presented the application of the Omnispective Analysis and Reasoning (OAR) framework to contextualize course design by mapping the goals and intent of a course to its development and delivery. This is a novel approach and we expect this will support the development of courses which robustly satisfy their learning outcomes. We align the learning outcomes of a course with activities related to teaching and assessment by explicitly capturing the context of course design using an enhanced context paradigm. We have illustrated this process by the example of a specification to satisfy a learning outcome for synchronous and written collaboration between students in a software engineering course using the Moodle LMS. We expect that adding support for capturing and incorporating context and rationale using the OAR framework will greatly aid the process of course design. Though we have not explicitly addressed the idiosyncrasies of learners and instructors in the example presented, these can be incorporated by adding prototypes from relevant external shelves. As a further extension to the work presented in this paper, we are currently developing a "Context Plugin for Moodle". This is an OAR workflow plugin to capture and represent the intellectual effort in course design and manage its context within the Moodle LMS itself.

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Fostering institutional change through learning leadership – a study of stories of adaptation in blended and flexible learning and distance education.

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This paper discusses the significance of a research project between Charles Sturt University (CSU) and Massey University (MU) which aims to build knowledge and understanding of the impact of distributive leadership approaches to transforming teaching and learning in relation to distance education. Authentic, situated approaches to change offer a powerful conduit for building “street level leadership”, the sharing of knowledge, skills and information within and between schools and as a basis for whole-of-institution cultural change driven through practice. This research provides an opportunity for evaluation of authentic, situated approaches as a mechanism for institutional renewal of learning and teaching practices in relation to distance education (DE). Such a

reorientation of practice affords CSU and MU a chance to increase the equity of student experience and engagement in learning through blended and flexible delivery.

Keywords: Distributive Leadership, Institutional Change, Distance Education, Blended and Flexible Learning, Case study research

The changing environment

The Higher Education Sector faces many challenges in the 21st Century, especially in respect to the quality of learning and teaching in the digital age. Academics remain focused on the development of new knowledge and discipline expertise, yet students increasingly demand high quality learning and teaching expertise. Consequently, changes in learning and teaching practices need to be achieved to counteract this divergence. Gourley (2010) argued these "new dynamics in higher education require a fundamental shift in the way in which institutions conduct their affairs, from leadership and strategic thinking to management and fundamental operations" (p. 34). Professional Development (PD) is recognised as one means of facilitating this transformation (see for example, Stes, Clement & van Petegen, 2007; Spillane, Halverson & Diamond, 2004), however, "effective staff development of academics remains a challenge" (Kerr, 2010 under blind review). This raises the question of what an institution can do to foster innovative learning and teaching approaches?

Addressing these changes

The University Sector has adopted a wide range of strategies in an attempt to foster change in learning and teaching in response to these new times. Charles Sturt University (Australia) and Massey University (New Zealand) wanted to collaboratively understand and learn from insights about their respective strategies, and to this end in 2010 was successful in gaining funds from DeHub to support two research projects. Through change, both institutions seek to transform the student experience, leading to quality and equitable outcomes for students. Both institutions have a history of DE that reflects the generational models developed by Taylor (1995) – the Correspondence Model, Multimedia Model, Telelearning Model, and the Flexible Learning Model based on online delivery via the Internet. In reality, all four models co-exist, in various ways, at the partner's institutions. The speed of change has posed significant challenges in generating "qualitatively different teaching-learning environments, pedagogical practices and organisational infrastructures" necessary to shift from first to fourth generation DE (Taylor, 1995). To complicate matters, both institutions have entered a "fifth generational" phase, where a focus on innovative and transformative learning design based on blended and flexible learning has evolved. In response to these challenges, both universities have sought institutional renewal through shifting cultural practices associated with conventional distance education towards blended and flexible learning. Knights, Myer and Samson (2007, p. 237) proposed that "rich workplace learning" (in their case, team-teaching) offered greater opportunities to achieve sustainable change in learning and teaching practices than "formal programmes of professional development for academics, particularly in the early stages of their teaching careers". The premise of the PD approaches taken at CSU and MU is that one way of achieving this "fundamental shift" is by adopting strategies that aim to build learning leadership capacity and local agency.

In their review of the literature, Southwell and Morgan (2009) reported to the Australian Learning and Teaching Council (ALTC) that "academic development initiatives are seldom studied systematically" and that the ALTC needed to "fund projects that specifically focus on quality teaching for learning through the development of leaders" (pp. 3-4). We know that PD can transform learning and teaching and impact on the quality of student learning opportunities (see for example, Stes et al., 2007; Spillane et al., 2004), however "effective staff development of academics remains a challenge" (Kerr, 2010 under blind review). Tynan et al. (2010) argued that "successfully embedding change of instructor practices for enhancing student learning in distance education modes" requires a number of support mechanisms including "institutional readings", "an institutional response to professional development" and the development of "impact evaluation indicators". Thus, these findings illustrate the need for systematic research, such as that proposed by the research project, to evaluate the strategies and impacts of initiatives that support academic development.

Substantial effort has been expended at the partner's institutions in pursuing cultural change in learning and teaching practices in relation to DE, open and distance education. Both institutions have adopted authentic, situated approaches that provide mechanisms of support for individual academics, and teams, to develop genuine solutions to learning and teaching challenges. Scott, Coates and Anderson (2008, p. 99) proposed that developing "learning leaders" was an essential component in institutional change, which aligns with the body of knowledge (for example, Sergiovanni, 2000; Knight & Trowler, 2001; Spillane et al., 2004; MacBeath, 2005) that proposes "distributive leadership" approaches to change provide institutions with an opportunity to foster leaders *in situ*. Jitse, Nelson, Billsberry and van Muers (2009, p. 767) argue that "one of the defining principles of distributed leadership is that it arises from the interactions of diverse individuals in a setting where expertise is a dispersed quality" (See also Keppell, 2009; Spillane et al., 2004; Gronn, 2002). Distributive leadership is not about "delegated headship", rather it is about situated leadership regardless of rank or role, where decision-makers understand their locus of control, the forces that drive and constrain it, and innovate or transform the learning and teaching spaces within, and where possible, connected to, their "situatedness".

Distributive leadership and cultural change at Charles Sturt and Massey Universities

Charles Sturt and Massey Universities had separately and independently adopted institutional and professional development strategies designed to engage academics in change at "the sharp end" of practice. The general approach taken by both Universities was a capacity building one that "on the ground" appeared to bear some of the characteristics of DL. The characteristics of "distributive leadership" were identified. Distributive leadership in this research was defined as "the distribution of power through a collegial sharing of knowledge, of practice, and reflection within the socio-cultural context of the university...through a "faculty scholar model" (Lefoe et al., 2008, pp. 1-2). Distributive leadership is characterised by the building of trust, creation of a learning culture and the sharing and dissemination of information (Brown & Littrich, 2008) an is supported through a number of domains, such as growing, reflecting, enabling, engaging and networking (Lefoe et al 2008, p. 3) and "gives quality time" (Schneider, Applebee & Perry, 2008, p. 898) to institutions to enable them "to investigate, learn, experiment and develop better solutions if they wish to become effective learning organisations" (Fullan, 2006, p. 121). It assumes situated leaders are able to generate change, not only in relationship to their immediate locus of control, but also through impacts generated through professional networks, collegiality and communities of practice.

Methodology

A qualitative research methodology was adopted, using a case study approach. Through descriptive case studies, "stories of adaptation" in blended and flexible learning, open and distance education will be developed in three domains of activities - institutional, course-based and individual. This research conceptualised institutional change as a consequence of strategies and interventions used to encourage resilience, innovation and adaptation. The idea of institutional change was largely tied to changes in learning and teaching practices, such as practice experimentation, changes to pedagogy and changes achieved through course design, rather than to institutional change such as Senate policy or workload agreements. The cases therefore included insights into practice experimentation as the source of locally mediated leadership and institutional change connected to widening circles of influence. Eight cases were identified (six at CSU, and 2 at Massey) of strategies that had been introduced by the respective institutions to foster change in learning and teaching. Three of these cases (at CSU) were explicitly developed using a distributive leadership approach; the remaining five (CSU and Massey) were developed to build learning and teaching leadership. Development of the case studies was informed by the literature concerning successful leadership and capacity building through distributive leadership. In summary, these characteristics included (Lefoe et al 2008, p. 1-4):

1. Formal leadership training & professional development activities
2. Authentic learning activities that are situated in real contexts
3. Engagement in reflective practice
4. Opportunities for dialogue about leadership practice and experiences
5. Activities that expand current professional networks
6. Leadership encouraged regardless of formal position
7. Strong institutional support
8. Leadership negotiated rather than delegated

The case studies as stories of adaptation

Of the eight case studies, only three were explicit examples of distributive leadership. Five were examples of capacity building in learning and teaching that aimed to develop learning leadership; and were characterised by at least five of the eight characteristics identified by Lefoe at al (ibid). The case studies are as follows:

Organisational Domain	**Case Study**
Institutional	• Annual, internal Learning and Teaching conferences (CSUEDs) • The introduction of Stream (MU) • The introduction of ePortfolios at CSU • The Teaching Fellowship Scheme (CSU)
Course-based	• The introduction of Course team Symposiums (CSU) • The redesign of Sociology in the Faculty of Business (MU)
Individual	• In-depth case study: Teaching Fellow 1 • In-depth case study: Teaching Fellow 1

The case studies are being developed with the following common focus areas:

1. Overview
2. Background
3. Visions and Aims
4. Strategies and Activities
5. Outcomes
6. Reflective practice and practice experimentation
7. Connections, collegiality and networks
8. Reflections on leadership development

The “background” of each case study will be informed by the driving and constraining forces (Lewin, 1951) operating at the respective institution For example, in the CSU context numerous institutional elements will act as drivers of course-based planning – Senate requirements, Course Directors, Common Teaching Standards, B&F Learning principles, Learning Management Systems and approaches to PD at CSU and MU. Two of the cases (of Teaching Fellows within the Flexible Learning Institute) include journey and conjecture mapping (Sandoval, 2004, Westbrook, Coiera, Gosling & Braithwaite, 2006) to provide a structure to understanding the different levels of granularity in the educational designs that emerged during the study.

Current activities

By December 2011, a literature review will be completed, and the conceptual framework and methodological approach will have been refined. Six case studies will have been largely developed, with two to be developed in early 2012. A project web site has been developed, and the findings of the study will be published as a wiki.

Lessons Learnt

The original research plan referred to "design based research" and proposed that the cases studies would be examples of "distributive leadership". Field work has lead to revision of both. Firstly, six of the case studies are largely being developed retrospectively, drawing on secondary data. As such they take the form of descriptive, historic cases that do not involved participants in the development of participatory research. Two of the cases studies (in-depth, of the Teaching Fellows at CSU) are partially auto-biographical, involving reflection about their learning and teaching decision-making. As such, the research is being conducted as case studies, and do not involve design-based research.

Secondly, while three of the cases are of strategies that were explicitly developed as distributive leadership (related to the Flexible learning Institute Teaching Fellowship Scheme, CSU) five were not. Therefore, rather than conceptualizing the case studies as examples of distributive leadership, the cases will be interrogated from the perspective of the *characteristics* of DL as these find meaning in the aspirations of both institutions in terms of the development of learning leaders. Through this lens, the research will identify its current strengths, and establish a framework for future systematic improvements, informed by distributive leadership approaches.

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Singapore student teachers' intentions and practices in integrating technology in their teaching

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The purpose of this study is to investigate the development of student teachers' intentions and practices in integrating Information and Communication Technology (ICT) into teaching. Data was collected before and after the ICT course on their intentions to use ICT in future teaching, and after the two practicum school attachments to find out their practices in integrating ICT during their student teaching. The results showed that student teachers' intentions to integrate ICT were positive before and after the ICT course. There was a significant decrease in their practices to integrate ICT as an administrative tool and a student learning tool during the first practicum attachment. However, there were significant increases in their ICT practices during their second practicum attachment. The student teachers also reported positive overall attitude towards the use of ICT in teaching throughout their two-year teacher education programme.

Keywords: technology integration, intentions, practices, practicum attachments

Introduction

Integrating information and communication technology (ICT) into the classrooms has been a major initiative worldwide. Many research studies in ICT integration focused on student teachers' attitudes, beliefs and perceptions (Phelps & Maddison, 2008; Swain, 2006). However, limited studies have investigated the student teachers' intentions to use ICT in their future teaching and their practices in using ICT during their teaching.

Ajzen and Fishbein (1980) defined intention as an anticipated outcome that guides a person's planned actions or behaviour. It could be a measurement of the likelihood that a person will engage in a given behaviour in the future. Therefore, in this study, the student teachers' intention is defined as their likelihood to integrate ICT in their future teaching. On the other hand, the student teachers' practice is defined as their behaviours in integrating technology during their five-week Teaching Assistantship and ten-week Teaching Practice attachments. Recent studies reported that student teachers have positive intentions to integrate ICT in future teaching (Choy, Wong, & Gao, 2009). The new generations of student teachers seemed to have higher confidence and self-efficacy in integrating technology in their teaching (Wang, Ertmer, & Newby, 2004). However, most of their ideas about technology integration remained superficial because they perceived that using ICT tools to present and capture their students' attention were considered using ICT effectively (Choy et al., 2009).

Constructivist learning theory was adopted as the theoretical framework of this study. Student teachers construct their own meaning about integrating ICT in teaching through the interactions of what they already know with the new ideas and activities which they experience (Brophy, 1991). This study investigated the student teachers' intentions to integrate ICT after they completed a course related to ICT pedagogy and their practices in ICT integration during their practicum attachments.

Background

The student teachers in this study were enrolled in the Diploma in Education programme. This programme was designed for those who have graduated from high schools or Polytechnics. During their two-year study, all student teachers are required to complete an ICT pedagogy course. There are two practicum attachments in this programme. After completing their first year of course works, the student teachers are sent to different schools for their five-week Teaching Assistantship (TA) attachment. During the TA attachment, the student teachers observe their cooperating teachers (CTs) for two weeks and begin to co-teach with their CTs in the last three weeks. At the end of their teacher education programme, they have to complete a ten-week Teaching Practice (TP) attachment where they have to plan and teach lessons independently.

Methodology

The purpose of this study is to investigate the development of student teachers' intentions and practices in integrating Information and Communication Technology (ICT) into student teaching during their teacher education programme. There are four data collection points in this study. The student teachers' intentions were measured before and after they completed the required ICT pedagogy course. Their practices during practicum attachments were measured at the end of their two practicum attachments, namely the five-week Teaching Assistantship (TA) and the ten-week final Teaching Practice (TP).

The research questions are:

1. What are the student teachers' intentions to integrate ICT in their future teaching?
2. What are the student teachers' practices to integrate ICT in their practicum attachments?
3. What are the changes in their intentions and practices?
4. What is their overall attitude towards ICT integration in teaching?

The participants of this study were student teachers who were enrolled in the two-year Diploma in Education programme at the National Institute of Education, Singapore. Ninety-one out of 327 participants were included in the data analysis, indicating a return rate of 27.8%. Missing data was replaced with means score and surveys with substantial missing data were omitted for analyses. The average age was 24.5 years (Std. Dev. = 4.9) and 56% were female participants. Although the response rate is low, we believed that it is acceptable as it took two years to complete the data collection.

The survey instrument used in this study was adopted from a previous study (Choy et al., 2009). As the objective of this study was to investigate the intentions and practices of the student teachers during their school attachments, only 22 out of the 38 items were adapted from the existing instrument. The survey used a 4-point

Likert scale, which ranged from 4 = "*all the time*" to 1 = "*never*" to measure intentions and practices. In addition, seven items were added to the survey to assess student teachers' overall attitude towards integration of ICT in teaching. The items in the survey were the same throughout the four data collection points. However, slight changes were made to the wording of the items to measure the intentions and the practices of the student teachers at different data points.

Data Analysis and Results

Exploratory factor analysis was conducted to analyse the data collected. Using SPSS 18.0, factor analysis with Varimax rotation showed three factors that carried eigenvalues higher than 1.5. The factors were labelled as: ICT as administrative tool; ICT as teaching support tool; and ICT as student learning tool. Each factor had five to seven items. The reliability for the whole survey was high (0.98) and the reliability coefficient for all three factors ranged from 0.77 to 0.90, which showed that the instrument was reliable.

In order to compare the means of the student teachers' intentions and practices from before their ICT course to the end of their TP attachment, multiple analyses of variance (MANOVA) for repeated measures were used to analyse the data. MANOVA results showed that there were significant differences in all three factors when comparing the means across the four data collection points (see Table 1). In addition to MANOVA, t-tests for repeated measures were used to compare the changes at different stages.

Table 1: Student teachers' change in perceptions and practices in technology integration

Factors	Before ICT intentions (std dev)	End of ICT intentions (std dev)	End of TA practices (std dev)	End of TP practices (std dev)	Wilks' Lambda
ICT as administrative tool	2.83 (.54)	3.00 (.58)	2.29 (.67)	2.63 (.69)	25.93**
ICT as teaching support tool	3.05 (.50)	3.11 (.56)	3.29 (.50)	3.40 (.50)	11.16**
ICT as student learning tool	2.74 (.57)	2.91 (.58)	1.72 (.71)	2.17 (.81)	65.50**

(*p-value < 0.05; **p-value < 0.01)

As seen from Table 1, the means of the three factors showed different changes in the student teachers' intentions and practices in integrating ICT in their teaching. Before the ICT course, their intentions to use ICT as an administrative tool, a teaching support tool and a student learning tool were generally quite positive. After they completed the ICT course, their intentions to use ICT further increased. For ICT as an administrative tool, the means increased from 2.83 to 3.00. For ICT as a teaching support tool, it increased from 3.05 to 3.11. For ICT as a student learning tool, the means increased from 2.74 to 2.91 out of the 4-point Likert scale. T-test analysis showed that the increases in ICT as an administrative tool (t = -2.60, p-value <0.01) and student learning tool (t = -2.52, p-value < 0.01) were statistically significant (see Table 2).

Table 2: T-tests comparisons for preservice teachers' change in perceptions and practices

Factors	Before ICT vs. End of ICT	End of ICT vs. End of TA	End of TA vs. End of TP
ICT as administrative tool	-2.60**	8.39**	-3.51**
ICT as teaching support tool	-0.88	-2.93**	-1.97*
ICT as student learning tool	-2.52**	13.18**	-4.92**

(*p-value < 0.05; **p-value < 0.01)

At the end of their five-week Teaching Assistantship (TA) attachment, their practices changed when compared to their intentions at the end of the ICT course. For ICT as a teaching support tool, it significantly increased to 3.29 at the end of TA ($t = -2.93$, p-value < 0.01). On the other hand, their practices to use ICT as an administrative tool and student learning tool decreased significantly. The means for ICT as an administrative tool decreased from 3.11 to 2.29 ($t = 8.39$, p-value < 0.01) and for student learning tool from 2.91 to 1.72 ($t = 13.18$, p-value < 0.01).

At the end of the ten-week final Teaching Practice (TP) attachment, their practices increased significantly for all three factors when compared with their practices during their TA attachment. Use of ICT as an administrative tool increased from 2.29 to 2.63 ($t = -3.51$, p-value < 0.01 as a teaching support tool from 3.29 to 3.40 ($t = -1.97$, p-value < 0.05) and as a student learning tool from 1.72 to 2.17 ($t = -4.92$, p-value < 0.01). The results showed that the student teachers had more opportunities to practise ICT integration during their TP as compared to during their TA attachment.

At the end of each survey, seven items were included to ascertain information about the student teachers' overall attitude towards ICT integration to compare if there were any changes in their attitude before and after the ICT course, at the end of TA and TP attachments. As can be seen from Table 3, the overall attitude towards the integration of ICT in teaching was very positive. The means ranged from 3.20 to 3.30 at all four data collection points on the 4-point Likert scale. Even though there were significant decreases in their practices in integrating ICT as an administrative tool and student learning tool during their TA attachment, their attitude towards ICT integration in teaching remained positive. MANOVA results also showed that there were no significant changes in their attitude from before the ICT course to the end of the TP attachment.

Table 3: Student teachers' attitude towards ICT integration in teaching

Factors	Before ICT	End of ICT	End of TA	End of TP	Wilks' Lambda
Attitude towards ICT integration	3.30	3.20	3.27	3.27	1.12

Discussions and Conclusion

The purpose of this study is to investigate the development of student teachers' intentions to integrate ICT in their future teaching before and after their ICT course and their practices in integrating ICT during their five-week TA and ten-week TP attachments. Exploratory factor analysis showed that the 22-item survey was categorized into three main factors: ICT as administrative tool, ICT as teaching support tool, and ICT as student learning tool.

Changes in student teachers' intentions before and after the ICT course

The student teachers' intentions to use ICT as an administrative tool and as a student learning tool increased significantly after they completed the ICT course. The increases may be because they gained more pedagogical knowledge about how to use ICT in the classrooms from the course. The student teachers were exposed to student-centred pedagogies such as problem based learning and collaborative learning, and also how to integrate ICT tools to promote such pedagogies in their teaching. They gained hands-on experience in using ICT tools such as WebQuest, Web 2.0 tools, and Interactive Whiteboards during the course. They were also required to design student-centred learning activities and integrate ICT tools into those activities. These learning experiences could have resulted in the increase in their intentions to use ICT as a student learning tool at the end of the course. Student teachers were not taught how to use ICT as an administrative tool. However, they were exposed to the use of ICT tools to support administration through their course instructors. For example, the instructors used a Learning Management System and email to communicate with the students on a regular basis. As a result, the student teachers were able to learn from what the instructors practised during the course (Wang, Ertmer, & Newby, 2004).

For the use of ICT as a teaching support tool, the increase at the end of the ICT course was not significant. This could be because the emphasis of the ICT course was not to use ICT as a teaching support tool. The new generation of student teachers tend to feel comfortable using ICT and their ICT skills level was already high to begin with (Markauskaite, 2006). As the participants of this study were relatively young, many of them would have seen their teachers using technology to support teaching when they were students. As a result, it is not surprising that the student teachers' already intended to use ICT as teaching support tool before their ICT course, and thus their intention remained high after the ICT course, resulting in no significant increase in their intention to use it as a teaching support tool.

Changes in student teachers' intentions after the ICT course and practices after the five-week TA attachment

There was a significant increase in their practices in using ICT as teaching support tool, which showed that during the five-week TA, the student teachers were able to use ICT to present complex information, support their explanations of concepts and capture students' attention. On the other hand, their practices in using ICT as an administrative tool and a student learning tool decreased significantly. One of the reasons for the decreases could be because of the limited time for teaching. During the five weeks TA attachment, student teachers started to co-teach with their cooperating teachers only in the last three weeks. As a result, they did not need to handle much of the administrative work. When they started to teach, they may not feel comfortable to use ICT to conduct collaborative learning activities as they were only getting to know their students. Studies have shown that beginning teachers focused more on their own needs (e.g., completing the syllabi) rather than on the students at the beginning years of teaching (Gilles, Cramer, & Hwang, 2001). Therefore, it is not surprising that the student teachers shied away from integrating ICT into more student-centred learning activities during the TA attachment.

Changes in student teachers' practices between the end of TA and the end of TP

The student teachers' practices significantly increased in all three factors during the ten-week TP attachment when compared to their practices during the five-week TA. As the TP was longer than the TA attachment and student teachers were responsible for teaching 20 – 24 lessons per week independently, they had more opportunities to interact with their students and integrate ICT into their teaching in various ways.

The results of the study showed that student teachers' intentions to integrate technology remained high before and after their ICT course. Their practices in using ICT during their five-week TA decreased significantly, which could be because of the lack of time and opportunities to use ICT and to interact with their students. As they gained more autonomy in the classrooms and had more time to explore ICT resources and to interact with students during their TP attachment, their practices in using ICT as teaching support tool, student learning tool and administrative tool increased significantly. Some qualitative information was collected from selected participants through focus group interviews to find out the reasons for the student teachers' changes in intentions and practices. This information is being analysed and findings will be shared during the presentation at the conference.

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Lecturer engagement in the use of interactive tools in learning management systems. A Swedish case study.

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Abstract: In this paper the authors argue that although Higher Education researchers have been largely responsible for the creation of the Internet, university lecturers have been far less innovative and active in their use of this form of Information Communication Technology (ICT). To support our case we use our own research to show the manner and extent to which a Learning Management System (LMS) is used by a sample of teachers from an Engineering Department in Sweden. We also analyze the use of interactive LMS tools by lecturers who undertake staff development courses. The teachers in our two samples make very little use of online asynchronous discussions (OADs) either as teachers or as students. We use logic and the literature to explain this phenomenon and make some recommendations for improving the scholarly, innovative and pedagogical use of LMS in both staff development and mainstream university courses.

Keywords: Learning Management Systems; blended learning; evidence-based practice.

Higher Education and the Internet

In chapter two of a recent book called *Viral Loop. The power of pass-it-on* (2010) Adam Penenberg inadvertently shows the extent to which university researchers affected the development of the Internet. Paul Baran, who worked for the Rand Corporation, is credited with conceiving the idea of an Internet when he suggested it in 1959 as a robust communication network for US military commanders. However it was university researchers, students and graduates, who created a functioning, searchable Internet. In the early1970s Vin Cerf (a Stanford university researcher) and Bob Kahn from UCLA designed the transfer control protocol (TCP) and the Internet protocol (IP) that facilitate online file transfers. They baptized this new information communication system 'The internet' and in 1992 founded the Internet Society. Tim Berners-Lee, a physicist, created another series of protocols that made it even easier for academics to exchange research papers with colleagues around the world. Marc Andreesen, a computer science student, together with Eric Bina created the first effective web browser (Mosaic) in 1993. Andreesen's mission was to make the Internet more useful for a wider public, since, for its first twenty years, it was mainly the domain of university researchers. University researchers continue to be both active and creative in their the of the Internet and ICT. In this paper we argue that university teachers have been less engaged, especially in their use of LMS, and in particular, the interactive tools within LMS such as online asynchronous discussion (OAD) forums.

The use (or lack of use) of interactive tools in LMS

The first case study was carried out in 2005 and published by Garrote in 2006. Garrote investigated the extent to which lecturers in his department made use of different tools in a LMS called WebCT. He was responsible for both the technical maintenance of the system and for providing pedagogical advice on the use of the system. Although introducing the system had been expensive, management felt its use might be one way to arrest a worrying drop in new enrollments and the failure of many students to complete their studies. A similar drop was noted in the United States and the use of ICT was seen as one possible way to avert the problem (Klobas & McGill, 2010; Paulsen, 2003; Weaver et al., 2008; Hopperton, 1998). Irwin and Berge (2006) argued, for instance, that well-run online forums could help create communities of learners where individuals could meet for both scholarly and social purposes.

In his 2005 investigation of LMS use at the University of Borås (UB) Garrote developed a spreadsheet which enabled him to examine 107 courses that were given at the school of Engineering. What Garrote and other researchers have found is that interactive tools, such as asynchronous LMS are under used compared with tools for distributing documents. Teachers for the most part use LMS to upload course programs, required reading and PowerPoints of their lectures (Bongalos et al., 2006; Garrote & Pettersson, 2007; Phillips, 2006). One might expect that as lecturers became more familiar with a LMS and how it was used they might be inspired to begin to use it in a more interactive and creative way. It seems, however, that the pattern noted in 2005 deteriorated over the next 5 years and that LMS use, instead of improving in terms of quantity and quality was used less interactively in 2010 than in 2005 – often by the same teachers (Garrote, Pettersson and Christie, 2011, under review).

The results of the case study undertaken at the University of Borås in 2005 and the longitudinal comparison carried out in 2010-11 exemplify findings from other research. A number of researchers show that high hopes were held for the pedagogical use of LMS in both compulsory and non-compulsory schooling (Blin & Munro, 2008; Bush & Mott, 2009; Findik et al., 2010; Ubell, 2000; Wilson, 2004; Brill & Galloway, 2007; Browne et al., 2006; Czerniewicz & Brown, 2009; Marshall, 2004) but that in the university world, at least, these hopes are still to be realized. Today, many lecturers continue to use a LMS as a means to distribute documents. The failure to use LMS more pedagogically is hard to explain, as is the resistance of many lecturers to embrace new ways of reaching and engaging students via digital media. According to some researchers more staff training is required in order to change this lack of insight and unwillingness to change one's practice (Blin & Munro, 2008; Selwyn, 2007).

Our second case study looks at what happens when teachers themselves are in the position of students. Do they engage in OADs when encouraged to do so? This case study is based on an analysis of OADs in a course for supervisors of PhD students that was run twice a year for researchers at Chalmers University of Technology. The first author has given 10 such courses between spring 2006 and autumn 2010. In total 320 supervisors have taken the course. They attend four full days of course work in addition to doing take-home tasks, for example interviewing an experienced supervisor and posting a transcript of the interview on an OAD. They are asked to read and comment on one another's interviews prior to discussing them in small group work at the course itself. They are also asked to post, on another discussion forum, a proposal concerning an aspect of their supervision that they wish to improve on. The idea is that they will carry out some sort of simple research – by using the internet for example, or by surveying colleagues in the course or in their own departments. The final report, which is discussed in small groups on the last day, must also be posted on the 'Improving my supervision' OAD in the last week of the course so that colleagues can provide and receive feedback on all the projects.

The courses are given in English to non-native speakers. Course delegates include both Swedes and other nationalities. A third OAD is made available on the course site and is aimed at mutual support for the writing of conference abstracts. This last OAD is offered as a service by the course facilitator who is a native English speaker. Those who post abstracts are guaranteed feedback from the course facilitator but everyone is encouraged to read the abstracts and contribute by offering editing and other advice – in other words this OAD is a type of peer review forum (Lefoe et alia, 2009). Posting an abstract on this OAD is not a required part of the course. Course participants are aware of the course design before they apply and are specifically told about the face-to-face discussions and OADs in the letter of welcome that is sent out informing them of their acceptance into the course. In other words, commenting on each others' texts in the OADs and joining in an online discussion about them, is strongly encouraged but does not affect whether or not one passes the course.

An analysis of activity in these OADs from 2006 to 2011 reveals a common pattern. Apart from one or two cases where delegates are forced to drop out off the course or postpone completing it until a later date, all participants upload their interviews as well as their proposal and final report for their mini projects. Comments and discussion of interviews and projects varies from year to year but on average there is no more than two persons per course (2 in 32 or just over 6 %) who actually engage in the proposed online discussion. The chance of this happening is far greater for the 'Interview' OAD which must be posted before the course begins, than for the 'Improving my supervision' OAD.

Explaining the lack of use of LMS by university teachers

Our case studies and current literature in the area indicate a number of reasons why university lecturers (even when engaged as students in a staff development course) so not use OADs. When teachers in higher education are asked to identify barriers to the use of educational technology lack of time and lack of support are the most common answers (Al-Senaidi et al., 2009). The lecturers' perceived shortness of time and lack of support is directly linked to the perceived ease of use. The most plausible explanation for the difference in using these two functions is that teachers perceive the consequences of distributing documents to be far less time consuming and intellectually demanding than setting up a discussion forum that may need to be monitored or assessed (Lonn & Teasley, 2009). To commit oneself to a well-run discussion forum not only depends on one's perception about how much time it will take, but also on how one perceives the usefulness of such a teaching and learning method. If lecturers believe that a non-monitored discussion will result in students pooling their ignorance they are unlikely to use it. If they think that monitoring a discussion will not result in enough teaching and learning benefits to warrant the invested time, they will also be wary of using such a tool. On the other hand if they think that online asynchronous discussions (OADs), whether monitored or not, could contribute to the learning of subject-specific and generic competencies, then there is a greater chance that they will be willing to invest time in setting up and maintaining an OAD. Lecturers whose approach is mainly teacher-centered and whose principal concern is how a tool may facilitate his or her work within a set frame of teaching practices and institutional traditions, will be less likely to use OADs. Those who consciously or intuitively practice a more student-centered and active learning approach, on the other hand, are more likely to commit the time and effort to set up and monitor OADs. The latter approach will take more time initially but may have, according to the literature, substantial long-term benefits for the students by creating a community of practice and promoting collaborative learning (Ladyshewsky & Gardner, 2008).

Whether a lecturer uses a discussion forum or not usually depends on the lecturer's perception of the OAD's contribution to a specific course. If the OAD is considered to be sufficiently useful there is more chance the lecturer will commit time and effort to running it well. Murphy argues that 'the higher-level processes related to collaboration in an online asynchronous discussion (OAD) may need to be more explicitly and effectively promoted in order to counteract a tendency on the part of participants to remain at the level of individual rather than group or collaborative effort' (Murphy, 2004. abstract). Although more research is needed, it seems that time and effort spent on introducing and supervising an OAD can ease the lecturers´ workload in other areas. For example the use of OAD may decrease the demand on time needed for counseling students, since they are able to exchange information and ideas about the course as part of the OAD experience.

Since so much depends on how teachers perceive the usefulness of OADs, convincing arguments that demonstrate their benefits for the development of both specific and generic competencies, are important. In most educational institutions both lecturers and students are under pressure to produce results. In an environment where most teachers realize that good research is more likely to benefit their career than good teaching, putting effort into developing a well functioning OAD may be undervalued. Similarly, if students are strategically focused on activities that will result in the best grades, time spent on an OAD that does not give a grade or improve their assessment chances may be seen as irrelevant. As Lonn & Teasley (2009 p. 92) point out 'As long as students fail to see the relevance of interactive tools for their learning or for instructors' teaching, they are likely to continue to view IT as merely a quick and accessible means to retrieve course documents and get messages from instructors'. The use LMS to distribute documents or send out notices to students are functions that replicate the more onerous tasks of copying lecture notes or emailing lists of students. Using them is often saves time and paper. The use of OADs is another matter. In traditional courses in engineering education, for example, there is very little interaction between lecturer and student. It is the teaching assistant (often a PhD) who works with smaller groups of students in the tutorial room or laboratory. Lecturers who are unused to dealing with group discussion in the real world are not necessarily the best at dealing with them in a virtual world. Lecturers need both technical and pedagogical support if they are to make better use of OADs. For both teachers and students in Higher Education the way forward in the more active and productive use of LMS and OADs is to weave continuous assessment into the use of such tools. This is important not only in the areas of subject specific knowledge, skills and attitudes but also in the generic competencies that we aspire teach.

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‘Because I said so’: A Teacher-Centred Approach as a Scaffolding Technique to Accommodate International Distance Learners in a Student-Centred Environment

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At the SUNY Empire State College’s Center for Distance Learning (CDL), the majority of students come from the State of New York, whereas international distance learners were historically a tiny fraction. This is currently being changed, with the ongoing rebranding of the College as New York’s Open University. Seeking to enhance its curriculum to better accommodate international distance learners, CDL has engaged in the development of bridging bilingual/bicultural courses such as “International eLearning Skills for Russian Speaking Students”. The course designed and taught by bilingual/bicultural professors helps students overcome linguistic, cultural, technological, and organizational barriers and adapt to the North American learning environment. In this paper, I will briefly describe the project, problems discovered and solutions found, including the use of scaffolding techniques, such as teaching-centred pedagogy.

Keywords: international distance learning, virtual acculturation, teacher and student centredness

Introduction

SUNY Empire State College (ESC) was established in 1971 to provide adult learners and working professionals with an opportunity to earn associate, bachelor`s and master`s degrees from the State University of New York (SUNY). The College employs a mentoring approach where students design individualised degree programs under guidance of faculty mentors. The College’s Center for Distance Learning (CDL), a founding member of the Sloan-C consortium, is a national leader in online learning. The Center employs LMS “ANGEL”, video-conferencing tool “Elluminate”, lecture capturing software “Accordant”, and widely uses Web 2.0 tools and virtual worlds. Historically, CDL has been primarily serving domestic students. This is currently being changed, with the ongoing rebranding of the College as New York’s Open University. To promote and coordinate global learning, CDL uses an international distance learning (IDL) faculty group. Among other things, the IDL group is involved in designing and developing dual degree programs with foreign universities. Students from partner universities, similarly to domestic students, can take one or several online courses [=units] at CDL or even assemble and complete an entire undergraduate degree program. Until recently, international students, being a small minority in CDL courses, have been receiving equal treatment with domestic students under the assumption that if they wish to study at an American online college, they (or their home institutions) should be fully responsible for their preparation. A study of joint programs between CDL and three Russian universities (Chukhlomin, 2009; 2010a; 2010b) revealed that despite the efforts undertaken by partner universities incoming Russian students weren't sufficiently prepared for immersion into the virtual environment of CDL. To better accommodate international distance learners, the IDL group suggested using bridging bilingual/bicultural courses; this approach was described by Chukhlomin & Deshpande (2011) as the "3B Framework". The central idea of this approach is to design educational planning studies helping new coming international students to transition into the new environment by using scaffolds, such as bilingual/bicultural instructors, materials, discussions with peers, and employing teaching methodologies that are more familiar to students.

Barriers to International Distance Learning

Since 1998, SUNY ESC has been running a dual degree project in partnership with Omsk State University, a large nationally accredited Russian institution, located in Siberia. Initially, the project employed an international distance learning (IDL) format. To earn a SUNY bachelor's degree in business, Omsk students were supposed to transfer up to 75% credits obtained at their home institution, while completing remaining 25% credits at ESC through IDL. Notwithstanding substantial organizational efforts undertaken by both sides in 1998-2003, this initial program design was found not feasible. Omsk students were facing significant and sometimes insurmountable barriers that included: 1) organizational barriers; 2) communication barriers associated with language, culture, and differences in academic systems; 3) insufficient subject matter knowledge and skills; 4) a lack of experience in studying at a distance. To alleviate barriers, the initial program design was significantly changed; in particular, the following improvements were made: 1) instead of advanced level courses, only lower level American courses were offered through IDL; 2) a blended learning approach was employed where American professors annually travelled to Russia to conduct face-to-face classes; 3) advanced level American courses were conducted on-site only, through an offshore ESC's unit located in Prague, Czech Republic, where Russian students were required to travel to complete the degree; 4) additional courses taught in English by expatriate faculties were added to the Omsk curriculum. In this largely redesigned form, the Omsk dual degree program was re-launched in 2004; since then it has been successfully producing 12-15 graduates at the bachelor's level and 15-25 graduates at the associate's level every year. In 2010, the improved program design has been successfully replicated by another Siberian university located in Novosibirsk.

Eventually successful, the Omsk and Novosibirsk projects didn't provide a suitable model for online delivery of dual degree programs in Russia, without the need for either students or professors to travel internationally. Meanwhile, with the arrival of new learning technologies, such as Web 2.0 tools, videos, lecture capture, and videoconferencing, some of the barriers to IDL have apparently become easier to overcome [Maloney, 2007]. To investigate whether the new ESC's virtual learning environment has made it easier for international students to study online, the IDL faculty group initiated a series of new projects with Russian universities. In particular, in 2007 ESC engaged in a new project with a polytechnic university located in Tomsk, Siberia. Tomsk University was interested in replicating the initial design of the Omsk project where some of the students studying in Tomsk full time would be able to simultaneously complete a SUNY bachelor's degree through IDL. For this project, Tomsk University obtained funds from the Russian government. After conducting several pilot courses in 2007-08, the partners discovered that, similarly to the Omsk case, Tomsk students were experiencing serious problems with IDL. Namely, they: 1) found it difficult studying without face-to-face interactions with professors; 2) were mostly exposed to a teacher-centred pedagogy; 3) were largely not familiar with the concepts and terminology used in advanced level CDL courses; 4) were lacking some critically important skills, including English academic writing, communication skills, teamwork, and time management skills. Also, they were found to be: 5) not familiar with the American online classroom, for example, reluctant to participate and inexperienced in debating things; 6) reluctant to communicate with CDL technical personnel and student services; 7) not used to using the information provided for students on the ESC student website; 8) not familiar with the contextual information used by American course developers and instructional designers to design CDL courses that had been developed with primarily domestic students and adult learners in mind. On the other hand, it was also noticed that the Tomsk students very quickly learned how to use LMS "Angel", synchronous video tools and other learning technologies (Chukhlomin & Deshpande, 2011).

Virtual Acculturation

In recent time, the theme of virtual acculturation has received a growing amount of attention of researchers and practitioners from around the world (http://www.acculturation.nl). A literature on virtual acculturation provides theoretical foundation for the design and development of bridging courses aimed at alleviating barriers to IDL. Acculturation has been defined as "those phenomena which result when groups of individuals having different cultures come into continuous firsthand contact, with subsequent changes in the original cultural patterns of either or both groups" (Redfield et al, 1936. p. 149). Recently, with the advent and increasing popularity of online education in the US and the global context, students from various countries are attracted more and more towards a US online degree (Pittinsky, 2003). With an increase in diversity in online classroom, there is a need to help learners acclimatize to the complexity of the virtual environment and to develop a culturally responsive pedagogy helpful to all learners (Gollnick & Chinn, 2002). Particularly, in an online context researchers have reported high stress among foreign international students exposed to their first virtual experience (Kyungbin *et al*, 2010). Bridging courses if designed adequately help learners successfully assimilate to the foreign educational culture and context. Literature has often highlighted the importance of such courses for incoming foreign students and has called for research in this area (Peelo & Luxon, 2007; Evans & Northcott, 1999). Particularly, in an online context, this becomes extremely important for international learners as they do not have the opportunity to actually "see" and experience the host culture. The benefits of such courses are significant. For instance, such courses provide students with an opportunity to learn about foreign country's educational setup and requirements. In addition, such courses provide students with cultural understanding and norms of the host country (Peelo & Luxon, 2007). When dealing with homogenous bilingual communities and student groups, the use of the learners' native language and bilingual instructors was found to have great potential (Taggart & Martinez, 2002; Werner-Smith & Smolkin, 1995).

International eLearning Skills: a bridging bilingual/bicultural course

This online study developed in 2008 serves as a bridging course aimed at providing remotely located, Russian-speaking students with a smooth way to transition into the American virtual learning environment. The main objectives of the course are to: 1) provide Russian-speaking students with an introduction to American culture and American education; 2) help them learn how to navigate the CDL's virtual learning environment; 3) learn how to use virtual resources, conduct research and present results; 4) learn about student-centered environments and introduce "the American way" of online discussions, collaborative teamwork, reflecting learning, using technology, finding help. The 8 week course is conducted by bilingual/bicultural faculties in LMS "ANGEL", with the use of lecture capture, video conferencing, e-portfolio, wikis, blogs, and a bilingual study guide. By the end of the course, students are expected to learn how to: 1) select and independently register for online courses at CDL; 2) make necessary arrangements for transferring credits and ordering textbooks; 3) use appropriate technologies and helpdesk; 4) use virtual library and style guides; 5) access the ESC-owned island in 'Second Life'; 6) master ESC-specific tools like 'Degree Planner'; 7) develop the first draft of their individual degree plan and write a rationale essay; 8) use 'Smarthinking' and peer tutoring support; 9) use wikis and e-portfolios. In addition, students are introduced to academic writing, library helpdesk, and peer tutoring and virtual career planning resources. Even more importantly, they are guided to develop (or, at least, create awareness of) such critically important skills, as communication, time management, self-guidance, and teamwork.

In 2008, a group of 8 Russian students took a pilot version of course and since then the course has been regularly offered by CDL. In 2009, Tomsk University sponsored a group of 10 professors to take the course as part of their faculty development training. In 2010, the course template was used to conduct professional development courses for groups of Russian-speaking educators sponsored by the Open Society Institute.

On the use of scaffolds

Scaffolding, grounded in Vygotsky (1978), is often seen as a conceptual framework for learners' support in online courses (Ludwig-Hardman & Dunlap, 2003; McLoughlin & Marshall, 2000). Also, scaffolding is found to be a useful technique in international education (Evans & Northcott, 1999). As an instructional tool, a scaffold enables a learner to solve a problem, carry out a task, or achieve a goal that she cannot accomplish on her own; this tool can be easily removed when no longer needed (Puntambekar & Hubscher, 2005; Wood et al, 1976). In the context of international distance learning, scaffolding can be organized with the help of bilingual/bicultural instructors and peers, and also through the use of bilingual instructional materials in the form of books, articles, video lectures, presentations on "YouTube", etc.

In the above mentioned course, all announcements and most of the content guides are provided in Russian, including an introductory video lecture captured with the use of 'Accordent'. In the opening 3 weeks of the course, the instructor who teaches the course should establish rapport with the students by following a 'traditional Russian' teaching style as if the course were taught in their home university. In other words, the instructor is obligated to tell the students what exactly they should do, very much like it is normally done in Russian universities. During that time, students learn about the use of LMS 'ANGEL', the College website, a virtual library, a videoconferencing tool 'Elluminate'. Also, they read about American education, classroom structure, the differences in learning and teaching styles between Russia and the U.S., and expected behaviors in an "all American" online setting. Then, in the middle of the course, the instructor is required to switch his/her communications with the students to mostly English using Russian as a means of clarification only. When communicating in English, the students are required to practice learning behaviors "as in the US". During that time, the instructor's role is to explain how online courses are taught in the US and to demonstrate examples.

Conclusion: from teacher-centred to student-centred learning

International learners studying at CDL remotely can simultaneously be exposed to very different pedagogies; to succeed in both the American college and their home institution, they should be provided with assistance. Students from predominantly teacher-centred environments like Russia (Burry-Stock et al, 2001) tend to be reflective theorists (Mitsis & Foley, 2009); they usually expect their teachers to tell them where to go and how; at home, this strategy serves them very well. At the same time, in a student-centred environment like CDL, they are expected to take the lead. But how can a student do this if she or he has never done it before? The problem is aggravated by the fact that learning is taking place at a distance; in a foreign language; in a new cultural and academic environment. Perhaps, it is a logical and natural solution for teachers to lead the way one last time and invite students to follow just because the teacher said so.

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The CAT amongst the pigeons: A reflective framework approach to personalised professional development in open, flexible and networked learning.

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Reflective-frameworks are designed to assist educators to critically reflect on their professional practice. In essence individuals make meaning from their professional experiences in relation to accepted best-practice. This paper will explore the use of a reflective-framework in open, flexible and networked learning. The development of a competency assessment tool ,the CAT, to help educators reflect on their current use of e-Learning applications and the pedagogy of their practice, is decribed. By working through the CAT individuals can identify areas of strength and examine areas requiring development. The result of this critical evaluation is the generation of personal learning plan (PLP) in the effective use of e-learning. How the reflective framework operates as an *empowerment* approach to professional development is explained in detail. This paper argues that the use of the CAT extends the repertoire of teaching skills, improves professional practice and ultimately enhances the learning environments of learners and teachers.

Keywords: personal learning plans, professional development, reflective practice

Background

Historically, educators in the tertiary sector have generally been employed for their depth of knowledge of a specific discipline rather than their expertise in teaching practice. Success was measured by learner acquisition of discipline knowledge and mastery of identified skills. However, driven by fiscal restraints and the need to remain globally completive in an increasingly knowledge-based, networked world, a number of Governments have introduced a raft of educational reforms. In the New Zealand tertiary education sector these reforms have focused on firstly, improving performance and efficiency ensuring more learners from a broader ethnic, cultural and educational background can complete higher qualifications at an affordable cost (Maori Tertiary Reference Group, 2003: Ministry of Education, 2010) and secondly, increasing the organisational integration of e-learning systems and Information and Communication Technology (ICT) applications for administrative purposes and teaching and learning (Ministry of Education, 2004). As a consequence of these reforms, tertiary institutions have widened entry criteria and greatly increased enrolments. In essence they have created a cohort of culturally diverse learners that hold multiple-views of phenomena and has multiple-meanings for words that have proved to be useful to them in making sense of the world that surrounds them (Clayton, 2009). In the learning environment created by this cohort, it is an expectation educators will adapt teaching strategies and content to meet the educational, social and cultural needs of this diverse audience (Zimmerman & Schunk, 2001). Educators can no longer rely on their depth of discipline knowledge, they need to critically reflect on their current professional practices and from this reflection identify how they can extend their repertoire of teaching skills. An identified risk inherent in this self-reflective approach is the dependence on individual educators having the requisite ability to meaningfully reflect upon their current professional practice and have sufficient depth of pedagogical knowledge to then create a personalised learning plan. To mitigate this risk, it is argued a self-reflective framework approach, where educators are able to make meaningful connections between their current professional practices and established standards in teaching and learning, is required (Clayton, Elliott, & Saravani, 2009).

Context

The rapid advancement of Information and Communication Technologies (ICT) has been referred to as the third revolution in the public dissemination of knowledge and in the enhancement of teaching and learning. The first revolution being the creation of a written language and readable records and the second the development of movable type and the publication of books (UNESCO, 2008). To participate successfully in this new "knowledge age" individual New Zealand educational institutions and successive Governments have increased their investments in infrastructure, hardware and software applications (Ham, Gilmore, Kachelhoffer, Morrow, Moeau, & Wenmoth, 2002). However, institutions and governments are aware physical technologies on their own will not meet national goals. They acknowledge that the level of competence and confidence of staff in the educational use of ICT will directly impact on the capacity and capability of institutions to positively engage their learners in ICT-supported learning environments (Clayton, Elliott & Saravani, 2009a).

In 2010 the Waikato Institute of Technology recognised the need to provide professional development (PD) in ICT for staff to meet both the needs of its increasingly culturally diverse student population and institution aspirations. The Certificate in Open, Flexible and Networked Learning (COFNL) consists of 5 modules based on identifiable Unit Standards registered with the New Zealand Qualification Authority (NZQA, 2011). Basing the certificate on these registered standards ensured the institute was following best national practice and aligned institutional PD delivery with national goals.

The CAT: A Reflective Practice Framework

The concept of reflection has been widely debated in educational circles for a number of years (Kreber, 2004: Brockbank, & McGill, 2007). To advocates of reflective practice, deep-learning is dependent on individuals making meaning from their experiences through reflection (Sugerman et al, 2000). To engage participants in reflective practice and to aid them in making connections between identified pedagogical standards in ICT and their previous experiences, a self-reflective competency assessment tool (The CAT) was created for prospective candidates of a certificate in Open, Flexible and Networked learning (COFNL). The CAT was designed to enable prospective candidates to assess their current competencies against defined standards. The CAT interface provides the prospective candidates with a series of statements relating to each of the five modules within the COFNL. The statements within each module are classified within three categories: Understanding, Evidence and Moderation. The three categories are defined below:

- *Understanding:* This division prompts the learner to reflect on their personal knowledge of the defined area of open flexible and networked learning specific to an individual module.
- *Evidence:* This division asks the prospective candidate if they can provide evidence of their understanding of the defined area of open flexible and networked learning, specific to an individual module.
- *Moderation:* This division asks the prospective candidate how the evidence they indicate they can provide, has been evaluated.

Candidates are asked to reflect upon and then respond to individual statements within each category using a 'drop-down' menu. The menu has four possible responses to each statement: Disagree, Partially agree, Agree, Strongly agree. The CAT interface is illustrated in figure 1 below.

Examine the relationships between participants in OFNL.	
Understanding	
I have a good understanding of the relationships (such as direct, indirect, active, passive, interactive, independent, and interdependent) that exist in open, flexible and networked learning environments.	Partially agree
I have evaluated the impact different relationships between participants in OFNL (such as direct, indirect, active, passive, interactive, independent, and interdependent) have on student learning in different contexts.	Strongly agree
Evidence	
I can provide digital evidence of my understanding of the relationships (such as direct, indirect, active, passive, interactive, independent, and interdependent) in open, flexible and networked learning environments.	Partially agree
I can provide digital evidence of how my understanding of the relationships between participants in OFNL (such as direct, indirect, active, passive, interactive, independent, and interdependent) has been used in my practice in different contexts.	Agree
Moderation	
My understanding of the relationships (such as direct, indirect, active, passive, interactive, independent, and interdependent) in open, flexible and networked learning environments has been peer reviewed.	Select
Practical application of my understanding of the relationships between participants in OFNL (such as direct, indirect, active, passive, interactive, independent, and interdependent) has been peer reviewed and assessed.	Select

Figure 1: Categories, statements and responses

Personalised Learning Plans

As candidates progress through the CAT, their answers affect the indicator colour on the main index page. The indicator colours are based on the familiar "traffic light" theme;

- *Red:* This indicates to the candidate they have limited knowledge and/or experience of the identified standards. It also indicates how these limitations can be addressed.
- *Yellow:* This indicates the candidate has some knowledge and/or experience of the identified standard. It also indicates how this existing knowledge/experience can be built upon.
- *Green:* This indicates to the candidate that they meet the requirements of the identified standard. It also indicates how they can continue to build knowledge and experience in other areas.

As the prospective candidate progresses through the categories and statements for each module, their responses provide a pictorial 'carpet'. This visual carpet enables individuals to select, which module(s) they need to review, which competencies they need to develop, what evidence they need to provide and how they should evaluate their practice. The reflective framework and visual carpet is illustrated in figure 2 below.

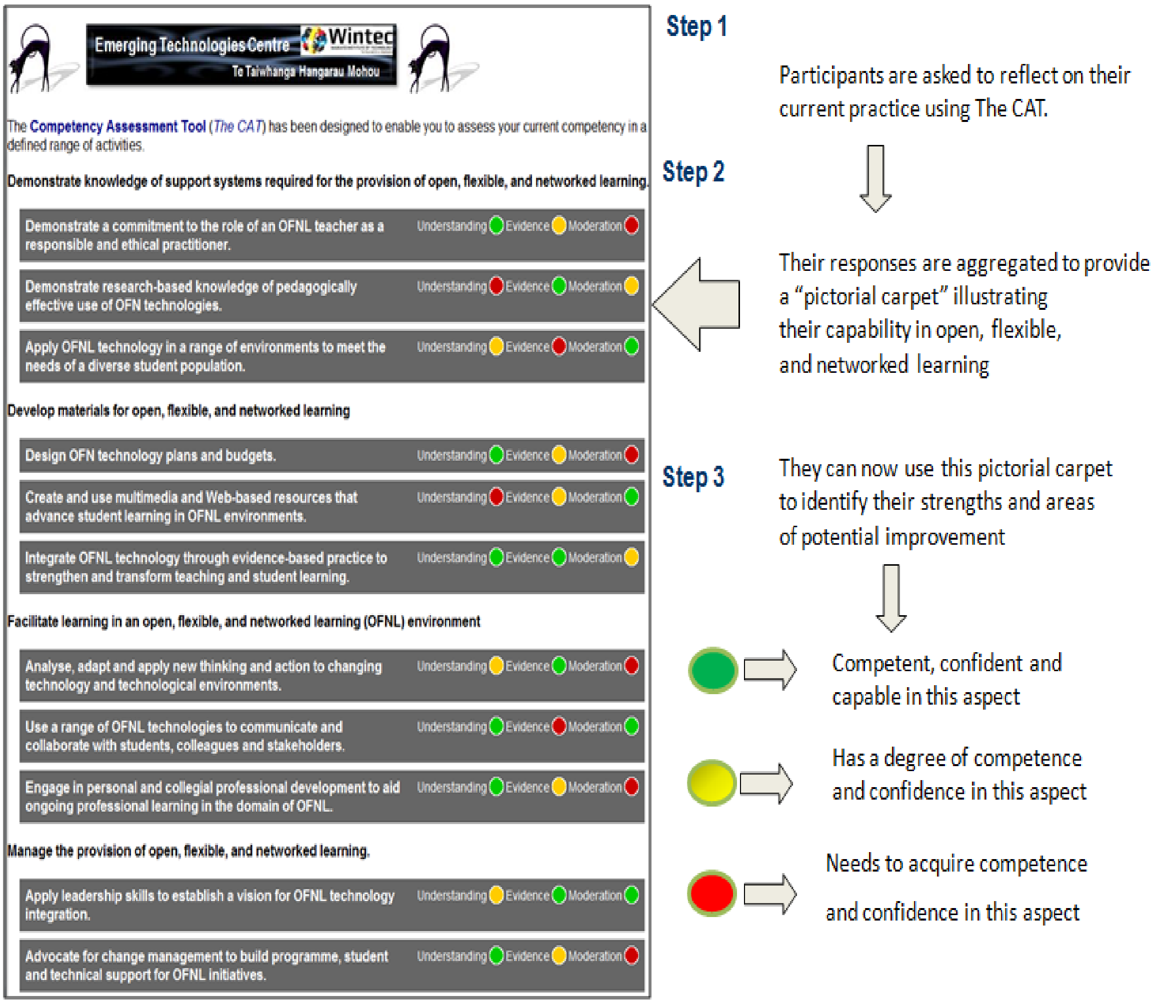

Figure 2: The Cat providing a visual carpet.

The visual carpet produced from candidate engagement with the CAT provides individuals with:

- An assessment of their current knowledge, experience and understanding of individual aspects of the domain.
- An indication of a range of potential points to begin their personalised learning journey, and
- Navigational tips to map a learning route from starting point to intended achievements.

In essence engaging with The CAT assists the learner in the creation of a personalised learning plan (Ward, & Richardson, 2007) enabling them to become self-regulated learners (Zimmerman, 1990).

Discussion and Conclusions

This paper has argued recent reforms have encouraged the creation of diverse cultural cohorts and the integration of e-learning applications in course delivery. As a consequence, educators are now engaging with increased numbers of culturally diverse learners in ICT environments they are unfamiliar with. Educators are encouraged to reflect on their prior experiences, acknowledge the influence of learners' prior experiences on the learning process and engage in the design of learning events to meet the needs of this diverse cohort of students. This requires a fundamental shift in educators' existing perceptions of teaching, learning, the curriculum and the use of e-learning. However, this shift places extra demands upon individual educators. An inherent risk is the dependence on individual educators having the requisite ability to meaningfully reflect upon their current professional practice and have sufficient depth of pedagogical knowledge to then create a personalised learning plan. To mitigate this risk, it is argued a self-reflective framework approach, where educators are able to make meaningful connections between their current professional practices and accepted standards in teaching and learning, is required. This reflective-framework approach enables educators to work independently, manage time effectively, and think self-critically. It empowers them as professionals.

This paper argues the effects of empowerment models of learning, driven by reflective-frameworks such as The CAT will be positive. This approach will enable educators to both make meaning from their experiences and actively learn from engaging in a reflective process.

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mLearning: Why? What? Where? How?

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This paper explores the state of play of mlearning in education. Mlearning bridges pedagogically designed learning contexts, enables learner generated contexts, and content, while providing personalization and ubiquitous social connectedness. The researcher makes a case for the impact of mlearning to act as a catalyst for transforming pedagogy informed by the implementation of over 30 mlearning projects, and reflects upon example implementations of mlearning within a variety of contexts.

Keywords: mlearning, mobile web 2.0, student-generated content, student-generated contexts.

Introduction: Why mLearning?

Worldwide ICT statistics (Acharya & Teltscher, 2010) provide a compelling argument for investigating the potential of wireless mobile devices (WMDs), and in particular mobile phones and smartphones, as these devices have by far the highest ownership of any computing or connected devices (see Figure 1). Figure 1 provides approximate worldwide averages for access to a range of ICT technologies garnered from the International Technology Union 2010 report.

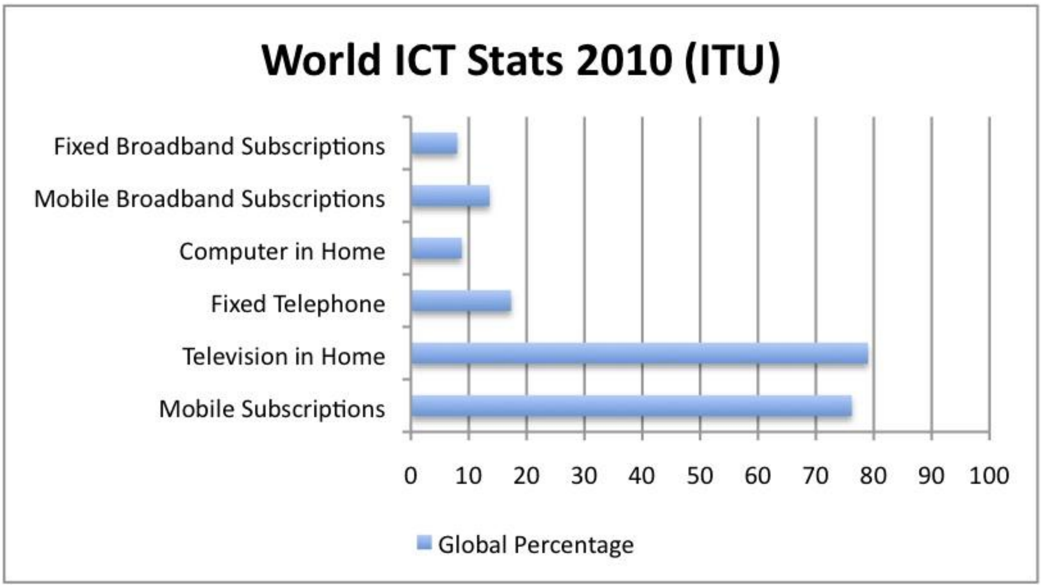

Figure 1: Average World ICT statistics taken from the 2010 ITU report (Acharya & Teltscher, 2010).

The unique potential impact of WMDs on education is founded upon their rise to almost ubiquitous ownership (ITU, 2009) and their primary functionality as ubiquitously connected communication devices. These two characteristics of wireless mobile devices enable their use as disruptive devices to act as catalysts for pedagogical change by mediating student-generated learning contexts and sharing student-generated content as key elements of social constructivist learning or Pedagogy 2.0 (McLoughlin & Lee, 2008). The 2010 JISC mobile review (Belshaw, 2010) concludes that mobile learning presents the potential to drive innovation in education.

> Mobile learning may mean different things to different people, but it is the dialogue that an institution begins with itself, its' staff, its' learners, its' community - that matters. It is certainly not time for 'business as usual'. It is time to define and start driving innovation. (p. 63)

This potential for innovation is both driven and hampered by the rate of change in mobile technologies. Although the rate of change of mobile technology is very high the choice of a pedagogical framework and foundational pedagogical theory can guide the appropriate pedagogical use of future WMD developments. The rise of mobile application ecosystems (for example: the iTunes Store for dissemination of iOS WMD applications and media, the Android Market for Android WMD devices, and the Nokia Ovi Store for Symbian based WMDs) that bridge information, content and productivity with laptop or desktop computing via web 2.0 platforms, has created a mobile learning framework that can be easily appropriated by a wide range of educators without requiring specialist computing skills, creating the potential for mainstream adoption of mlearning in tertiary education. WMDs can be utilized as content creation devices for students' online eportfolios, and for establishing a digital identity that can become a key element of their on-going professional careers. WMDs can also be utilized as communication and collaboration tools within an increasing range of social networking tools. Mobile Learning (mlearning) has moved beyond the realms of fantasy to become a viable platform for contextual learning that bridges formal and informal learning environments in and beyond the classroom. Kukulska-Hulme (2010) emphasises the catalytic nature of mlearning:

> With its strong emphasis on learning rather than teaching, mobile learning challenges educators to try to understand learners' needs, circumstances and abilities even better than before. This extends to understanding how learning takes place beyond the classroom, in the course of daily routines, commuting and travel, and in the intersection of education, life, work and leisure. (Kukulska-Hulme, 2010, p. 181)

It is the ability of mlearning to act as a catalyst for pedagogical change that has interested the author and formed the basis for developing a design framework for mlearning that is based upon a social constructivist pedagogy that enables learner-generated content and learner-generated contexts. Thus rather than being technology centric, the author sees the impact of mlearning in regards to the potential for pedagogical transformation.

> Mobile learning - as we understand it - is not about delivering content to mobile devices but, instead, about the processes of coming to know and being able to operate successfully in, and across, new and ever changing contexts and learning spaces. And it is about our understanding and knowing how to utilize our everyday life-worlds as learning spaces. Therefore, in case it needs to be stated explicitly, for us mobile learning is not primarily about technology. (Pachler, Bachmair, & Cook, 2010, p. 6)

Background: What

One of the key realizations of previous large mlearning projects (for example: MOBILearn) was that it is the learner that is mobile, and the learners interact continually throughout the day facilitated by mobile devices. Therefore focusing on the mobility of the learner is central to mlearning (Sharples, 2010). While technology continually changes, how learners learn and interact, and what educators want our student graduates to be able to achieve is persistent. Mlearning by nature involves interaction with continually changing technologies, but rather than being eventually assimilated into traditional computing, the researcher argues that mlearning is reinventing and transforming computing from a tool to integrating computing into our lifestyles. Two-thirds of the world's population already own and carry a cellphone (ITU, 2009). Mlearning is not just the miniaturization and convenience of portable computing, but is transforming how we conceptualize and interact with computing and our environment, communicate, and create and manipulate information (Cheney, 2010; Pachler, et al., 2010). Mlearning is about ubiquitous social connectivity, instant information access, and enhancing how we view the world through digital augmentation (Cook, 2010a). It is empowering for learners, who can become content and context generators within authentic learning environments (A. Herrington & Herrington, 2006, 2007) rather than simply consumers of transmitted content in classrooms. Additionally, emerging touch and voice interactivity with mobile computing will change our expectations of how learners interact with computing.

Therefore, mobile learning, as defined by the researcher, involves the use of wireless enabled mobile digital devices (Wireless Mobile Devices or WMD's) within and between pedagogically designed learning environments or contexts. Mlearning can support and enhance both the face to face and off campus teaching and learning contexts by using the mobile wireless devices as a means to leverage the collaborative use of web 2.0 tools. The WMD's wireless connectivity and data gathering abilities (for example: photo blogging, video recording, voice recording, and text input) allow for bridging the on and off campus learning contexts – facilitating "real world learning" (Unitec New Zealand, 2010). It is the potential for mobile learning to bridge pedagogically designed learning contexts, facilitate learner generated contexts, and content (both personal and collaborative), while providing personalization and ubiquitous social connectedness, that sets it apart from more traditional learning environments. From an activity theory perspective, WMD's are the tools that mediate a wide range of learning activities and facilitate collaborative learning environments (Uden, 2007). However, the use of

Wireless Mobile Devices (WMDs) as part of the teaching and learning environment requires changes in pedagogy and integration into the teaching and learning processes. Mlearning enables learner-generated content and learner-generated contexts. Figure 2 is the author's Mobile Web 2.0 Concept Map that attempts to represent the interactions between multiple learning contexts and web 2.0 tools enabled by mobile devices.

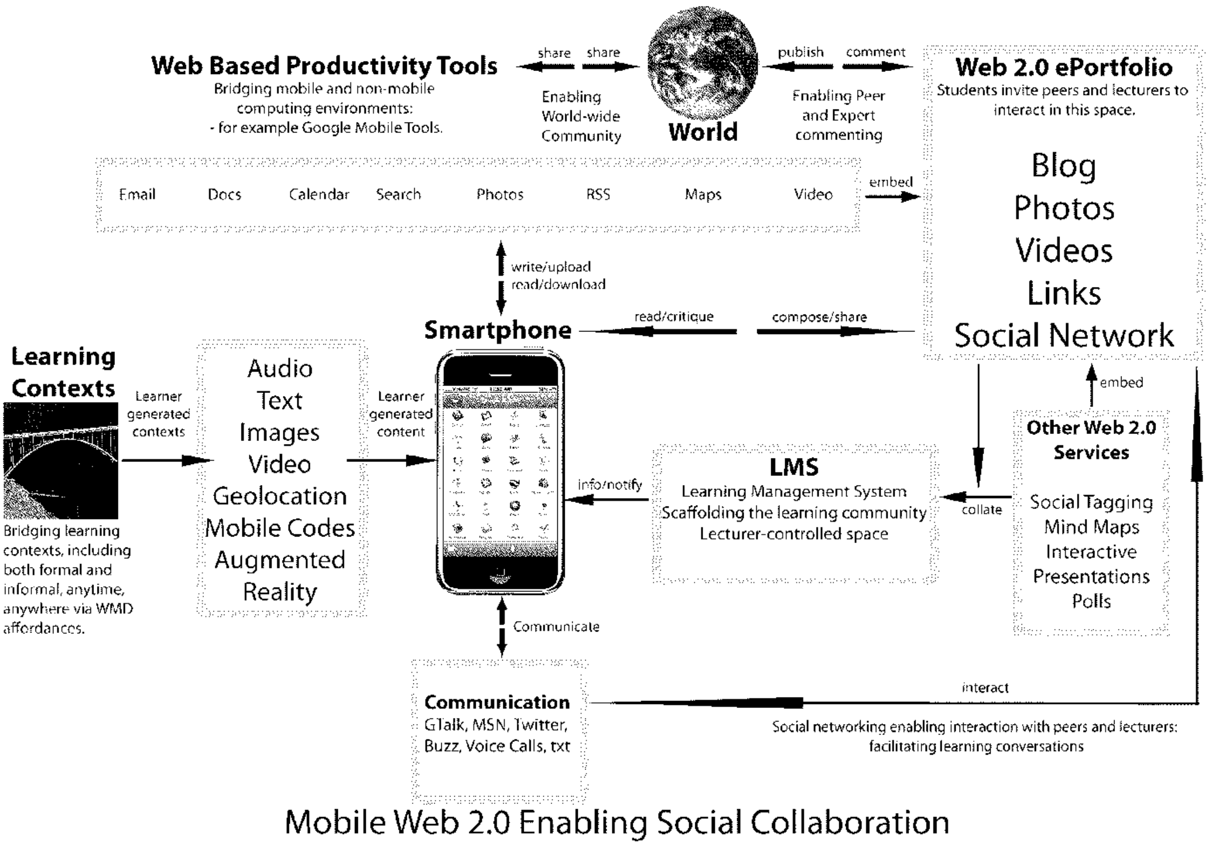

Figure 2: Mobile Web 2.0 Concept Map.

Research Overview: Where

Cook (2009a) and Sharples (2009, 2010) characterize the development of mobile learning research according to three general phases:

1. A focus upon devices (For example: Handheld Computers in Schools (Perry, 2003))
2. A focus on learning outside the classroom (For example: MOBILearn (O'Malley, et al., 2005))
3. A focus on the mobility of the learner (For example: MyArtSpace (Sharples, Lonsdale, Meek, Rudman, & Vavoula, 2007), CONTSENS (Cook, 2010a))

Approaches to mlearning vary from a focus upon content delivery (McKinney, Dyck, & Luber, 2009), SMS (Mellow, 2005), polling (Dyson, Litchfield, Lawrence, Raban, & Leijdekkers, 2009), and location awareness (Educause Learning Initiative, 2009a; Pachler, et al., 2010), to facilitating student generated content sharing (Sharples, et al., 2007), and augmented reality (Priestnall, Brown, Sharples, & Polmear, 2009; Sharples, 2009). In their review of one hundred and two innovative mobile learning projects published between 2002 and 2007, Frohberg et al. (2009) found that only five percent of these projects focused upon social learning, less than four percent required higher level thinking, with eighty nine percentage targeting novice learners, and ten percent facilitated user-generated content. Many mlearning studies focus upon content delivery for small screen devices (Stead & Colley, 2008) and the personal digital assistant capabilities of mobile devices (Corlett, Sharples, Bull, & Chan, 2005) rather than leveraging the potential of mobile devices for collaborative learning as recommended by Hoppe, Joiner, Milrad and Sharples (2003):

> Content delivery to mobile devices may well have a useful place in m-learning, however, there is an imperative to move from a view of e- and m-learning as solely delivery mechanisms for content… Handheld devices are emerging as one of the most promising technologies for supporting learning and particularly collaborative learning scenarios. (Hoppe, et al., 2003, p. 1)

The researcher has managed and implemented almost thirty mlearning projects between 2006 and 2011 using a participatory action research methodology (Swantz, 2008; Wadsworth, 1998) with each successive mlearning project forming a research cycle within a longitudinal research project. The focus of these mlearning projects has been on exploring the potential of mlearning as a catalyst for transforming pedagogy from instructivist lecturer-directed pedagogy to social constructivist pedagogy enabling student-generated content and student-generated contexts (heutagogy). The mlearning projects encompassed nine different tertiary courses, effectively forming nine case studies involving several research cycles spanning from one to four years of implementation and refinement, utilizing a range of wireless mobile devices (WMDs), and involved a total of 690 participants. The learning contexts included:

- Bachelor of Product Design (2006 using Palm Lifedrive, 2008 using Nokia N80, N95, and Apple iPhone 3G, 2009 using Nokia XM5800, N95, N97, 2010 using student-owned laptops and cameraphones, and Nokia N97)
- Diploma of Landscape Design (2006 Using Palm TX, 2007 using Nokia N80, 2008 using Sonyericsson P1i, 2009 using Dell mini9 netbook, 2010 using Nokia XM5800)
- Diploma of Contemporary Music (2008, 2009 using iPod Touch, iPhone 3G, 2010 using Apple iPad)
- Bachelor of Architecture (2009, using Nokia XM5800 and Dell Mini9 netbook, 2010 using Android HTC Desire smartphones and Apple iPads)
- Bachelor of Performing and Screen Arts (2009 using Dell Mini9 netbook and Nokia XM5800, 2010 using Dell Mini9 netbook, Nokia XM5800, and Nokia N97)
- Bachelor of Business (2010 using Apple iPad)
- Bachelor of Computing (2010 using Apple iPhone)
- Bachelor of Graphic Design (2010 using Nokia XM5800 smartphone)
- Bachelor of Civil Engineering (2010 using Apple iPad)

Figure 3 provides an outline of the growth and scope of the researcher’s mlearning projects 2006 to 2011. The generic term Wireless Mobile Devices (WMDs) is used to cover the variety of smartphones, netbooks, and touch-screen devices used throughout these projects.

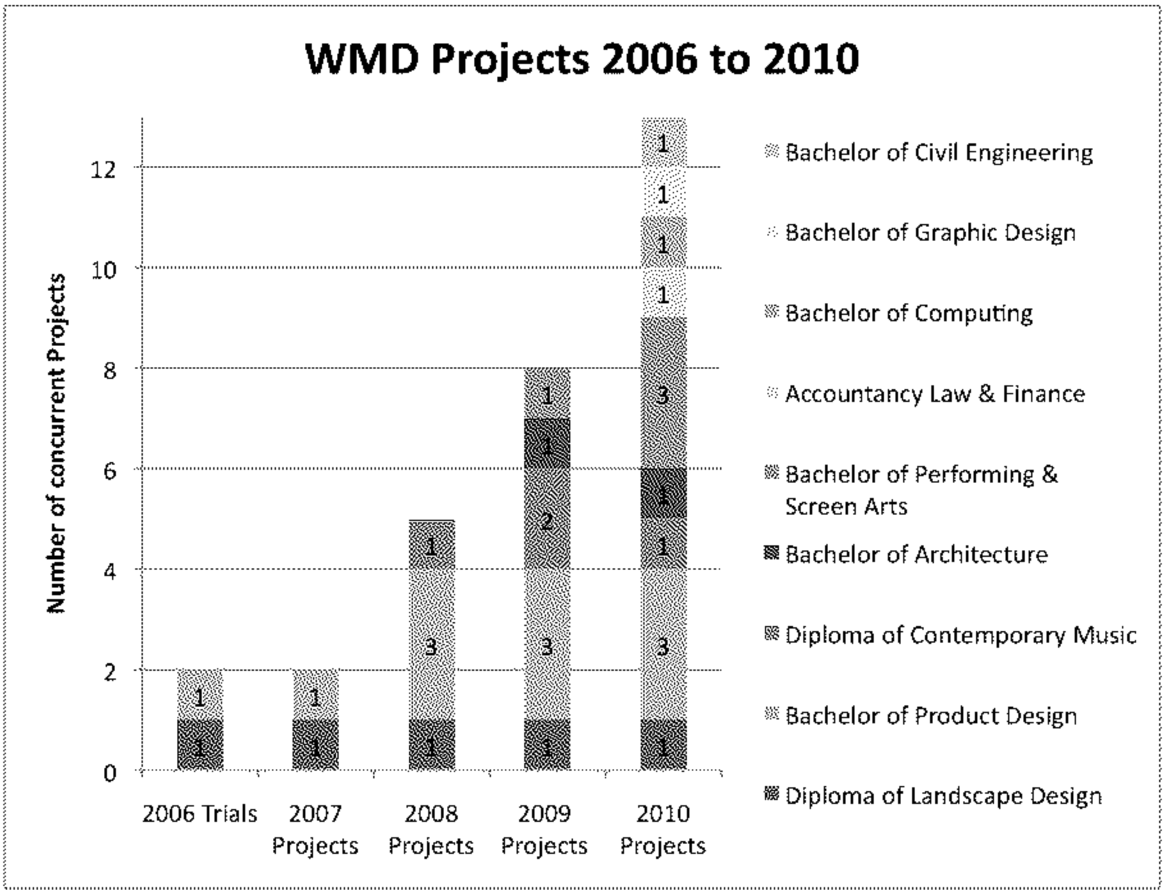

Figure 3: Number of mlearning projects 2006 to 2010.

Discussion: How

A significant body of peer-reviewed collaborative research between the researcher and a variety of lecturers from different course contexts has evidenced the impact upon lecturers' pedagogy and the depth of practice-based reflection that these projects have generated. For example: (Cochrane & Bateman, 2010; Cochrane, Bateman, Cliffin, et al., 2009; Cochrane, Bateman, & Flitta, 2009; Cochrane & Flitta, 2011; Cochrane, Narayan, & Oldfield, 2011; Cochrane & Rhodes, 2011; Flitta, Cochrane, & Bateman, 2009). This section discusses five examples of mLearning in different learning contexts, selected from the researcher's 2009 to 2011 mlearning action research cycles. The five examples illustrate the potential of the unique affordances of mlearning to enable pedagogical transformation that focuses upon student-generated content and student-generated contexts. Pre-project surveys of participating students have indicated that the majority of students were consumers of web 2.0 content rather than producers. In particular, the pre-project surveys revealed that prior to their involvement in the mlearning projects, the uptake of mobile tools such as Twitter was relatively low among these students.

We have found that for the majority of our students the engagement with these mobile web 2.0 tools for student-generated content and student-generated contexts is a new experience and requires significant scaffolding. This scaffolding was provided by embedding each mlearning project within a community of practice including the students, their lecturer, and the researcher as the "technology steward" (Wenger, White, & Smith, 2009) guiding the integration of these tools within each unique learning context.

QR Codes

Mobile codes are two-dimension codes similar to bar codes found on product information labels. There are a variety of mobile code formats, with the most popular being QR Codes (Quick Response Codes). A QR Code is decoded by an application on a cameraphone that uses the phones built-in camera to scan the code. QR Code decoding applications are available for a wide range of cameraphones, with most being free to download and install. QR Codes can represent a variety of information, including: URL's, a paragraph of text, an SMS message, a business card, or a geolocation (longitude and latitude information for an object). QR Codes can be simply generated using a variety of freely accessible web forms, such as: http://mobilecodes.nokia.com, http://www.splashurl.net, http://zxing.appspot.com/generator/. These codes can then be uploaded to websites, printed, or projected for decoding in a variety of contexts. The potential for the educational use of QR Codes resides in their ability to augment traditional information sources.

> QR codes link the physical world with the virtual by providing on-the-spot access to descriptive language and online resources for objects and locations. In this way, the codes support experiential learning, bringing scholarship out of the classroom and into physical experience. (Educause Learning Initiative, 2009c, p. 2)

During 2009, third year Product Design students featured the QR Code capabilities of their smartphones as a theme in their final graduation show. Students used QR Codes to annotate their presentations, and created individual business cards augmented with QR Codes that could be scanned creating an automatic address book contact on visitors' cameraphones. Each student created a QR Code that linked their final design project presentation to a Wordpress blog site providing visitors with more information on the students and their projects. The students demonstrated how to use the QR Codes on their smartphones to the Grad show visitors, decoding the QRCode URLs and showing the mobile version of their showcase blogs. Figure 4 illustrates the use of QR Codes within the third year Grad Show advertising flyer. The QR Code is the URL of the students' combined Wordpress blog with a summary of all of their projects. QR Codes were also used to theme the grad show booklet that was printed and made available to the show visitors.

Figure 4: 2009 Third year Product Design student Grad Show invitation flyer.

Augmented Reality

Augmented reality applications utilize a smartphone's camera to view the real world with overlaid augmenting digital information. This represents a significant unique affordance of smartphones, as described by Cook

(2010b). “The nature of learning is being augmented and accelerated by new digital tools and media, particularly by mobile devices and the networks and structures to which they connect people” (Cook, 2010b, p. 1). “An important affordance of mobile technology is that of digital augmentation, whereby contextual data is added to objects to enable a deeper understanding of them and richer meaning making” (Cook, 2010b, p. 2). However rather than being used as an enhancement for student-generated projects, the majority of smartphone based augmented reality applications have focused upon an enhanced teacher-directed content delivery paradigm. For example, Cook’s (2010a) mlearning research projects focused upon augmenting the learners experience in the field, and in reflection he asks “How do we get beyond good and useful exemplars?” (Cook, 2009b, p. 35). He proposed that to get wide scale practitioner and institutional up-take requires an institutional cultural change. Several criticisms can be leveled at Cook’s ‘exemplars’: the projects do not demonstrate a focus upon student-generated content or contexts as they are pre-defined, there is no long-term change in student learning paradigms as these are short day-long projects with no longitudinal scaffolding for students to personally appropriate the use of the mobile tools beyond the project, the students involved were self-motivated learners and involve small numbers minimizing transferability, and there is a high technical requirement for these projects involving the development of project-specific and intricate augmented reality multimedia.

To minimise the technical expertise required for mlearning implementation and maximise transferability, while explicitly using a social constructivist pedagogical foundation, the researcher decided to focus upon the potential of mobile web 2.0. Mobile web 2.0 enables learner-generated content and learner-generated contexts.

Using mobile web 2.0 developing Augmented Reality applications has become a relatively simple process that anyone with a compatible smartphone can now achieve (Butchart, 2011) by creating user-generated content for mobile web 2.0 augmented reality browsers such as Wikitude, Layar, and Junaio. These tools enable bridging learning contexts by supporting learner-generated contexts using the built-in camera, GPS and compass to overlay the physical environment with student created POIs (points of interest) and location-based data. However the uptake of these tools within educational settings is still in very early stages.

> Uptake of smartphone based AR in education has been very modest so far. We have not found any examples of channels being created in existing AR browsers such as Layar and Junaio that are specifically geared towards learning and teaching. Most likely, this is due to the immaturity of both the AR browsers and tools for publishing content rather than aversion to the idea of augmented reality itself. (Butchart, 2011, p. 38)

The educational use of student-generated augmented reality content is illustrated by the 2010 eCV elective project within the Bachelor of Architecture course at Unitec. The 2010 eCV10 Architecture mlearning project investigated bridging student generated ePortfolios and digital storytelling facilitated by the latest generation of mobile devices, allowing the capture and organization of this content to be contextual and based in authentic environments beyond the classroom. Lecturers and students were provided with an Android smartphone (HTC Desire) and an Apple iPad for the duration of the semester-long project. Students worked in four negotiated teams, initially proposing a group eportfolio project that utilized the unique affordances of the mobile tools. The Archifail team project captured images and mobile videos highlighting and critiquing poor Architectural design around Auckland City. The team created a Wordpress portfolio (http://archifail.wordpress.com/), and also created a layer for the Wikitude augmented reality mobile browser (http://prezi.com/byy1rnidvw-i/archifail/). This Wikitude layer included geographically tagged locations of failed Architectural design, supplemented with images and a short critique by the students of the design failures. Anyone with a compatible smartphone could then download the Archifail layer to Wikitude and use the smartphone’s built-in camera coupled with its GPS and compass to locate these points of interest overlaid as digital information on the real-world viewed through the smartphone’s camera. The students then created a tutorial explaining the steps involved in creating a Wikitude AR layer for the other eCV student teams (http://dave16288.blogspot.com/2010/11/wikitude-tutorial.html).

Twitter

Twitter has grown into one of the most popular microblogging platforms, with a user-base growing 1382 percent in 2008 (McGiboney, 2009) and over 1500 percent during 2009. Twitter can be used either asynchronously or synchronously to enhance communication and collaboration. As a primarily text-based tool Twitter is capable of working from any cellphone using SMS, but can be enhanced using smartphones with GPS, photo and video integration within a variety of Twitter applications, for example: the official Twitter mobile app, Twitterriffic, Tweetdeck, and the imminent 'deep integration' of Twitter into iOS5 for the iPod Touch, iPhone, and iPad (http://www.apple.com/ios/ios5/features.html#twitter). Twitter is a useful tool for enabling communication and collaboration (Educause Learning Initiative, 2009b), developing and maintaining geographically disperse communities of practice, and has become deeply integrated into many of the most popular web 2.0 blog hosts and media sharing sites (for example: Wordpress, Typepad, YouTube, Qik, Flickr, Ning). This integration with a wide variety of web 2.0 tools allows Twitter to become the social network linking users' eportfolios built from a collation of web 2.0 tools, allowing a flexible personal learning environment to be customized by the end-user. Thus in our mlearning projects that focus upon collaboration and student-generated eportfolios Twitter has become the primary communication and collaboration hub.

Buchem and Hamelmann (2010) discuss the potential for using Twitter for creating communities for professional development. Buchem (2011) also emphasizes the serendipitous nature of the use of Twitter in creating opportunities for unplanned collaboration and discovery. Our experience supports Buchem's propositions, as several of our mlearning projects that have utilized the affordances of Twitter have led to serendipitous (unplanned but fortuitous) outcomes (Cochrane, 2010). Twitter has been used in a variety of contexts within our mlearning projects, including: enhancing face-to-face discussions and brainstorms with live Twitter searches projected for the participants to view, beyond class discussions, and as a core asynchronous communication tool between geographically disperse student teams across international time-zones.

Mobile Movie Making and Video Streaming

Almost any cameraphone can record short video clips that can then be uploaded to web-based video hosts for sharing and distribution such as YouTube and Vimeo. Smartphones feature basic video editing tools directly on the smartphone, enabling titling, editing of multiple video clips and clip transitions – thus allowing a fully mobile video to be shot, edited, and shared from a mobile device. There are also several mobile live video-streaming applications and services for smartphones, including: Qik, Ustream, and Bambuser. The size, portability, ubiquitous connectivity, and long battery-life of cameraphones enable capturing of ideas and sharing of experiences in virtually any context, enabling student-generated content within student-generated contexts.

Mobile Film festivals have become popular in Europe (BBC, 2009; Mobigardens, 2010; Mobilizedtv, 2011) and Australia (Ratnanesan, 2010). This provided an opportunity to leverage some of the international expertise in this emerging field, and was particularly relevant for several mlearning projects within Film and Television elective courses between 2009-2011. The 2011 Film and television course elective "entertainment lab for the very small screen" (ELVSS11) explored team-based student-generated mobisodes (short mobile video episodes) using iPhones to capture video in unique ways, and iPad1's to edit and upload the mobisodes to YouTube. The five team mobisodes and student reflections on the project are available on the YouTube channel: http://www.youtube.com/user/ELVSS11#g/u. Using the iPhones students explored and made examples of filming techniques and positions that were unachievable via traditional film making using standard production-level digital cameras and crews. They also critiqued the advantages and limitations of the small screen format. This project not only explored an innovative use of mobile technology, but also enabled the course lecturer to reinvent the course's underlying pedagogy. The course was redesigned from a set of content-delivery lectures, to developing student-negotiated and student-generated team projects that were supported by the input of a range of mobile learning experts, both locally and internationally. Each face-to-face class session involved an overview of an aspect of mobile video production, and was followed by student-led discussions (enhanced with a live Twitter feed) around the development of their mobisode projects. Class notes and outcomes were negotiated with the students and made available on Google Docs. Remote guest lecturers from Wellington (NZ) and the UK (Salford University) were brought into the class via live Skype feeds, with interaction and questions enabled via both the live and asynchronous use of Twitter.

Situated Learning

The mobility and ubiquitous connectivity of smartphones allows them to be used within a wide variety of contexts – enabling student-generated learning contexts beyond the classroom, and enables lecturers to design learning experiences that bridge multiple contexts. Laurillard argues that "M-learning, being the digital support of adaptive, investigative, communicative, collaborative, and productive learning activities in remote locations, proposes a wide variety of environments in which the teacher can operate" (Laurillard, 2007, p. 172). Similarly, Herrington et al. (2009) argue that mlearning enables the use of new pedagogies that support authentic contexts in learning. This is illustrated by the development of the integration of mlearning linking theory and practice on site within the building technology course at Unitec.

During 2010 a building technology lecturer participated in the inaugural 2010 class of the Social Learning Technologies course developed and facilitated by the author (Cochrane & Narayan, 2011). The course was modeled on an intentional community of practice (Langelier, 2005), with the participants investigating the potential impact of the integration of mobile web 2.0 tools in education, based upon social learning theories. The participants were required to apply what they learnt and experienced to their own teaching practice. As a result one lecturer conceptualized and designed (using Google Sketchup) a portable 'eShed' or 'smartshed' that could be transported to the building sites where his students engaged in practical work experience, creating a direct link between theory and practice without the separation of theory lessons taking place in the context of a classroom off the building site. The eShed became a reification of the lecturer's reconceptualisation of teaching and learning based upon social constructivism and Laurillard's (2001, 2007) conversational framework. The concept was enhanced by leveraging the affordances of student-owned smartphones via the utilization of QR Codes for annotating building site components with rich media including YouTube video construction examples and Google sketchup building plan detail, and also the embedding of student blogs as live journals of their learning experiences on and off the building site including student captured photos and videos via their smartphones. Live streaming of mobile video via services such as Qik were also designed to allow participation by remote students, or live demonstrations across the building site streamed directly to the eShed smartboard, creating a virtual community of practice that links the physical community of practice. The eShed was given faculty approval in 2011 and constructed mid 2011. The final version of the eShed includes: an interactive smartboard, a video projector, internet connected PC, a wifi access point providing internet access across the entire building site, and storage of class sets of mobile devices such as iPod Touchs. The eShed will also allow students to view, interact and modify building plans on site via Google Sketchup, and present and discuss their course eportfolios to their lecturers and fellow students on site. Thus the eShed will become a focus for linking theory and practice, and enabling on site discussion, reflection, action, and 're-action'. An online presentation of the eShed development and sample video footage is available at http://prezi.com/ymotphudnegm/real-world-learning/.

Conclusion

The paper makes a case for the impact of mlearning to enable student-generated content and student-generated contexts in tertiary education. Five practical examples of the application of mlearning are drawn from the researcher's experience of implementing and evaluating over twenty-five mlearning projects between 2006 and 2011. Thus the paper illustrates what can be achieved by the creative and innovative planned pedagogical appropriation of the devices that our students are most likely to own – a cameraphone or similar mobile device.

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Nicola Building Virtual Tour; Considering simulation in the equity of experience concept

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Examining equity of learner experiences across delivery modes is a contemporary issue, particularly in comparing onshore and offshore or local and distance experiences. This paper begins the journey of reviewing equivalence of learning experience for local and distance students in a vocational course in a Property Services learning program, just as this case joins a larger multiple-case study examining equivalence. It focuses on the potential of a simulation in providing equivalent ‘practical’ experience of conducting a building inspection. A simulation designed to help achieve this, the Nicola Building Virtual Tour, was trialed in a small cohort in the Property Services program, and a survey harnessing learner opinion of this tool received largely positive feedback, but also provide some guidance in how to proceed.

Keywords: Simulation; virtual tour; equivalence; property services; vocational tertiary sector.

Introduction

Equity of learner experience in onshore and offshore delivery modes is an issue of focus in several universities in Australia, particularly since the 2007 approval by the Ministerial Council on Education, Employment, Training and Youth Affairs for a national protocol directly related to this (MCEETYA, Oct 2007: protocol 14, p.2, in Palaskas et al 2010). At RMIT University, Melbourne, there has been intensive work on an evolving project focusing on equivalence between on and offshore student experiences (i.e.: local students compared to students studying from outside Australia) in like learning courses (subjects). This work has resulted in ‘a model for achieving equivalence and comparability in higher education courses offered ‘transnationally’ in the College of Business at RMIT (Gopal et al., 2010). The project has since extended in two project directions; the first into a university-wide implementation planning phase, and the second, a focus on how educational technologies can help achieve equivalence and comparability in learning experiences. The latter, in draft as ‘Harmonisation of onshore and offshore teaching supported by enterprise educational technology’ (Botterill, 2011), is under review by learning and teaching staff against the contexts of sample courses in both higher education and vocational (TAFE/college) tertiary sectors, using multiple-case study methodology. This concise paper highlights the commencement of reviewing one such targeted vocational case for review of equity of experience with supporting educational technology, in the Property Services learning program. In particular, it focuses on the use of a virtual tour designed to better support off-campus or distance learning by providing ‘access’ to a facility to enable virtual building inspection practice.

The Nicola Building Virtual Tour was integrated into the Property Services program in 2010 and evaluated by way of surveying students post integration. Focusing on this tool was in recognition that while content-rich learning might readily transfer via enterprise educational technology options (e.g., lectures or tutorials via Lectopia or Elluminate; see Botterill, 2011), practical and applied learning experiences require additional consideration. Online interactive activities are well established for learners to apply concepts and skills; helping to engage, motivate and enable practice to reinforce learning (e.g., JISC, 2004). However, it remains important to evaluate the quality of learning offered in growing online and global education markets as "High performance standards, commitments to practice, and ethical conduct legitimize virtual curricula and the environments in which learning takes place" (Carrier, 2010:28). The survey data comprised largely positive responses to the virtual tour as an activity and an alternative to physical building inspection. The minority negative responses were generally further illustrated by free form, qualitative survey responses, which were useful for tool improvement and for consideration of implementation issues across differing delivery modes.

The 'Property Services' case context

The Certificate IV in Property Services is delivered in several program offerings in the vocational sector of RMIT, to cater for a range of specific learner cohorts locally and interstate and is currently under analysis for offshore/international delivery. Each Property Services offering presents in a different blended learning mode to suit the learner cohort, including blends of in-class, workplace and online/distance learning, where in-class can be on-campus locally scheduled classes or interstate 'fly-in expert' intensive workshops. The broad program structure is made up of a mix of core plus cohort appropriate Units of Competency (training curricula/modules), which are 'chunked' together into several learning 'themes' for meaningful delivery. Several of these units require access to physical properties such as residential, commercial or public facilities. For example, the unit 'Plan and coordinate property and facility inspection' falls under the learning theme of 'Maintenance and Service in the Property Industry'. This theme is currently undergoing learning re-design and development, while the 'inspection' unit has been selected for review against principles of equivalence or 'harmonisation' across the various delivery cohorts.

The 'Harmonisation' or equivalence project

The 'harmonisation' project (Botteril, 2011) acknowledges that educational technologies are not used to the same advantage in offshore RMIT teaching courses compared to onshore. It recommends an increase in technology use in the support of elements of equivalence and comparability (Palaskas and Gopal, 2011, in Botterill, 2011). The project promotes the institute's current range of educational technologies but also includes the open-ended technology of 'eSimulations', or "virtual simulations … [that] allow students to demonstrate theory in practice in non-threatening or risk-free situations while ensuring active learning experiences" (Botterill, 2011:22), highlighting usefulness in situations of limited access to resources.

Nicola Building Virtual Tour / simulation

Traditionally, building inspections are conducted during scheduled on-campus (local) Property Services classes utilising an ageing building, under the supervision of teaching staff with follow-up debrief activities. For the Nicola Building tool, a similarly aged building was specially photographed for 'stitching' together into a virtual tour for online learning access. Additionally, the images were graphically altered to provide more interest areas for inspection (predominantly faults) under the guidance of a subject matter expert. Support resources such as an inspection report template and a how-to guide were designed and developed. Learner access to the tool and resources were then enabled via the institute's learning management system (Blackboard™).

Figure 1: Screen capture of Nicola Building Virtual Tour

The Nicola Building simulation is a web-based Virtual tour not unlike what property services personnel employed within the real estate industry are familiar with, with exceptions mainly related to purpose. An example of divergence is that most property tours aim to highlight advantages while a building inspection for learner critique needs a more realistic view; they need access to both faults and advantages to enable a realistic facility report to be produced. The Nicola Building comprises two floors, and allows the learner to navigate their own way through the building moving from area to area as they choose. Depending on the intended learning outcomes for each relevant course activity, the teacher sets instructions utilising the tour, predominantly for what type of inspection report is required but also for other learning purposes such as safety and risk analysis. The learning goal in the trial was to produce an inspection report detailing the current condition of a facility, emulating the standard required in the industry.

The Nicola Building Virtual Tour was trialed by the traineeship cohort of Property Services (Operations) students. The traineeship students attended weekly classes on-campus and benefitted from concurrent training in their various property services work environments. The students were mature-aged and had a range of workplace roles and industry experiences. Fifteen students out of a class of 24 completed a paper-based survey after using the virtual tour in their classroom activities. The survey comprised both quantitative and qualitative questions, including 11 five-point Likert scale questions seeking responses of ‘Strongly agree’ through to ‘Strongly disagree’, followed by six open-ended questions. The first open question asked for detail related to the responses given to the previous quantitative responses, and others sought to draw out both negative and positive aspects of learning with the simulation.

Findings

Generally, the students in the trial positively received the Nicola Building Virtual Tour, as reflected in Figure 2. An additional question posed in the negative: ‘I was very unsatisfied using Virtual Tour’, received only two responses out of 15 that indicated they were unsatisfied with the tool. Another question set, asking for opinions of the tool as a regular part of the course for future students, received predominantly positive responses.

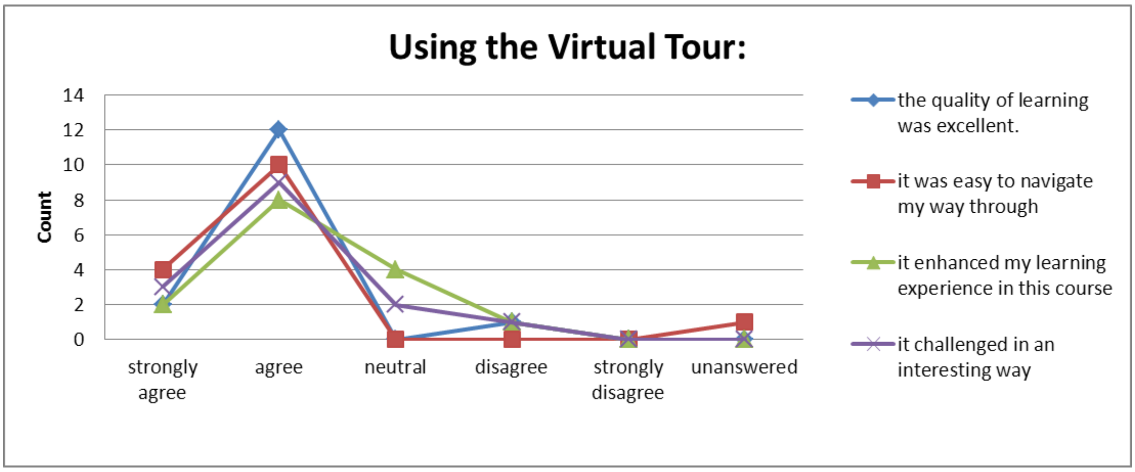

Figure 2: Learner perceptions of general learning value of the Virtual tour

However, the results were more mixed in key questions seeking to determine if the tour was a good replacement for a physical/actual building tour. Responses (see Figure 3) raised the question of why were up to 2 in 5 students either neutral or negative in that the tool was excellent for inspecting a facility? Some explanation of this was found in the qualitative responses discussed below.

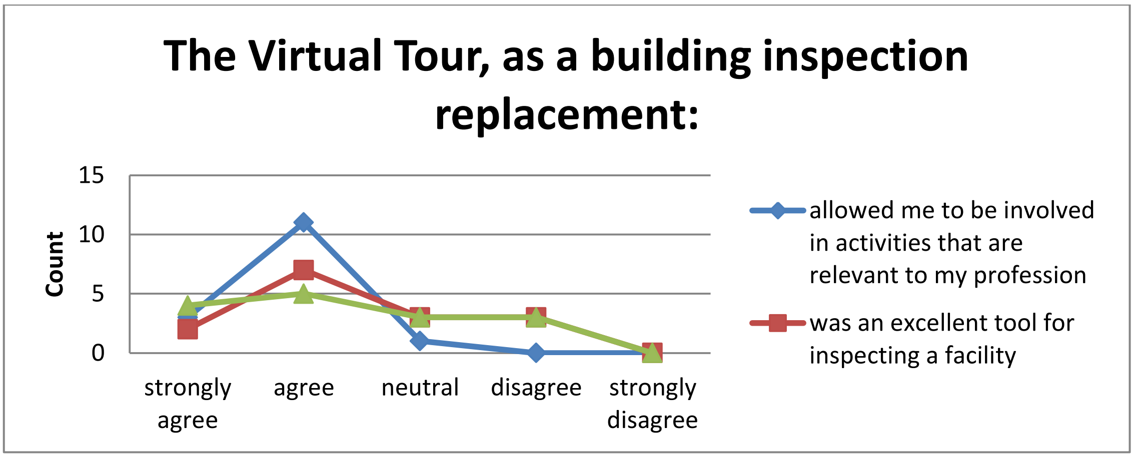

Figure 3: Learner perceptions of the Virtual tour for building inspection

The qualitative open-ended responses were themed into five main issues: technical problems, learning and teaching, and instructions/support materials, with all remaining in either positive or negative issues (not already coded into other themes). A number of issues raised were simply dealt with by tool and/or accompanying resource improvement, while others were illustrative for the focus of this paper.

Positive overall views were the most common feedback items, and included responses such as: "I thought it was excellent. A great learning tool & experience"; "Easy to use"; "Easy and quick access to facility inspection"; "Flexible & Freedom – not restricted to access"; "Alternate method for a building inspection remotely"; "Ease and the fact that it was quicker to have a look and take notes as opposed to the normal running around"; "Refer back to it if something is missed"; "The visual aide instead of referring to powerpoints or documents only".

The negative issues related primarily (and importantly to this paper) to a virtual tour not being as effective as a real tour, for example, "Not able to look in every nook & crannie [sic.] (detail)"; "I think you pick up more in the actual tour"; "Easier to detect faults when looking in real life". This seems to indicate that while the virtual inspection is useful in learning, it is likely to continue to be appropriate in combination with real-life/physical building inspections, regardless of the delivery cohort (on/offshore, etc.). That is, at an appropriate point in the course, a real inspection could be available via teacher-industry cooperation to allow the full benefit of the simulation to be realised. The tour could therefore provide preparation and/or repeated practice.

General learning and teaching issues were highlighted. Three students noted the need for some content direction before the tour, particularly if they hadn't been exposed to inspection tours before and needed orientation. For example, "for people who have not completed inspections before it is difficult to know what to comment on"; "I think there would be greater value in talking about different types of inspections. Eg. OHS. Property condition – life cycles & maintenance"; "Enable feedback on area's to inspect if not use[d] to this in role".

Discussion

Issues of equivalence and comparability of simulated practical learning versus alternate methods of learning are offered in the literature. For example, in a study involving learning electrical wiring by computer simulation (Liu and Su, 2011), it was found that students who used the simulations performed better than those accessing only lectures and demonstrations, and, compared to laboratories, simulations allow more time on task compared to set-up for actual experiments. The study also provided warnings, including that simulations may not provide the same level of irregularities as found in real-life scenarios, and that hints and supports should be available virtually instead of waiting for teacher feedback. This would apply to the Nicola Building Virtual Tour, in that the students who were perturbed by not having access to the same level of detail as an actual tour could be better supported by management of expectations of what can be achieved and offered feedback by direct teacher responses and/or access to a worked example to compare with own work (e.g., sample inspection report).

The learning and teaching issue of prior knowledge raised in the findings remains an important one for future issues of on and offshore or local and distance equivalence. Simply assuming adequate prior knowledge for such simulations is no substitute for basic learner needs analyses. In noting problems in learning from early computer-based simulations, Stead (1990) cited work by cognitive psychologist Ausubel (1978) to acknowledge simulations were of no value "to those with no prior knowledge of the topic … [as they] would be unable to interpret information from the simulation [as] meaningful" (p.107). Findings from the Nicola Building trial would indicate this is still the case. Other caution is found in Stead's work in relation to equivalence in learning experience, highlighting the need to embed the simulation in a complete learning activity, including the need for "time … to permit reflection and discussion" (p.116). Thus providing a reminder that simulations shouldn't be simply given to offshore/distance cohorts without adequate learning and teaching support structures in place.

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Evaluation of alternative feedback mechanisms on student engagement with assessment feedback

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This study examined students' perceptions of the usefulness of assessment feedback provided by ReMarksPDF and provides a summary of positive and negative aspects of different types of feedback annotations. Students randomly received one of 7 different combinations of feedback. 74.9% of students found ReMarksPDF feedback better than that they have received in the past and 73.2% of students agreed or strongly agreed that other units should adopt the ReMarksPDF system. Students found the mark tally table, assessment rubric, spider chart, spider chart (with average), colour coding and smileys to be significantly valuable feedback in that order of preference. Females gave higher ratings than males on all feedback types, except spider charts, which were equally highly rated by males. Respondents indicated that ReMarksPDF feedback was easy to read and understand and that it was beneficial to have comments appear in a side column note.

Keywords: Assessment feedback, Electronic marking, ReMarksPDF, Electronic Assessment.

Introduction

Assessment drives student learning and effort (Kendle & Northcote, 2000) and in turn influences the direction and quality of student learning (Maclellan, 2004). Numerous literature reviews indicate that feedback is critical to improving the standard of student work and learning (Black & William1998a; Hattie 1999; Heinrich 2006, Huber & Mowbray 2011) and that both formative and summative assessment directly affect student engagement. The structure of assessment designs often includes formative feedback. Feedback, at its best is individual in focus, outlining strengths and weaknesses and avenues for self-improvement (Linn & Miller, 2005; Heinrich 2006). Electronic feedback management systems such as ReMarksPDF offer opportunities for improvement in assessment practice and outcomes for students, including:

4. E-submission, allocation, marking, moderation and assessment return via a learning management system
5. Extensive annotation and commentary features, including rubrics, stamps, electronic dashboards and charts
6. Links to electronic portfolios classified by learning outcomes or graduate attributes
7. Quality management including consistency, reporting, and self-reflection

The purpose of this research was to determine students' perceptions of the usefulness of alternative forms of feedback provided using ReMarksPDF, an advanced PDF annotator for Windows, Mac and Linux, developed with the assistance of the ALTC – see www.remarkspdf.com. ReMarksPDF is an enterprise system (Blackboard 9.1 and Moodle 2.1) enabling e-submission, allocation to markers, marking (text, audio and video comments, colour coding, smart charts, stamps etc), extensive moderation, and return of assessment to students and marks to gradebook.

Figure 1 depicts the three main types of feedback examined in this study - Spider Chart, Spider Chart (with average) and Smiley (Highly negative, Negative, Neutral, Positive, Highly positive). Refer Figure 1.

Figure 1: Spider chart, Spider chart (with average), Smiley scale

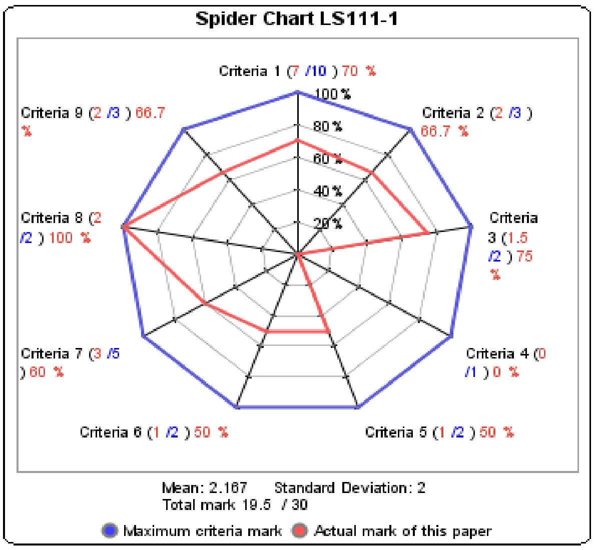
Method

A total of 154 (61 male, 93 female) Law students out of a single cohort of 210 students enrolled in LS111 Civil Procedure during Semester 2, 2010 at UNE voluntarily completed a survey on feedback received in relation to a draft Statement of Claim submitted in satisfaction of 30% of their grade. Each of three markers was randomly assigned 7 groups of 10 students who had randomly received one of seven distinct types of assessment feedback. Each group had a maximum of 30 participants. Refer Table 1. All assessment and requests for participation in the survey were returned at the same time.

Table 1: Groups, Feedback type and Response rate

Groups	Feedback type	Male	Female	n	Response rate
Group 1	Spider chart	9	16	25	83.3%
Group 2	Spider chart (with average)	11	8	19	63.3%
Group 3	Smiley	9	12	21	70.0%
Group 4	Spider chart + Spider chart (with average)	8	13	21	70.0%
Group 5	Spider chart + Smiley	12	12	24	80.0%
Group 6	Spider chart (with average) + Smiley	6	13	19	63.3%
Group 7	Spider chart + Spider chart (with average) + Smiley	6	19	25	83.3%

All students were provided with additional feedback consisting of an assessment rubric, colour coding according to a colour key, a marking tally, and pre-prepared comments based on a marking guide. Marking was done electronically using ReMarksPDF <www.remarkspdf.com>. Figure 2 shows the ReMarksPDF interface in Mac OS X Lion together with the Moderation panel showing



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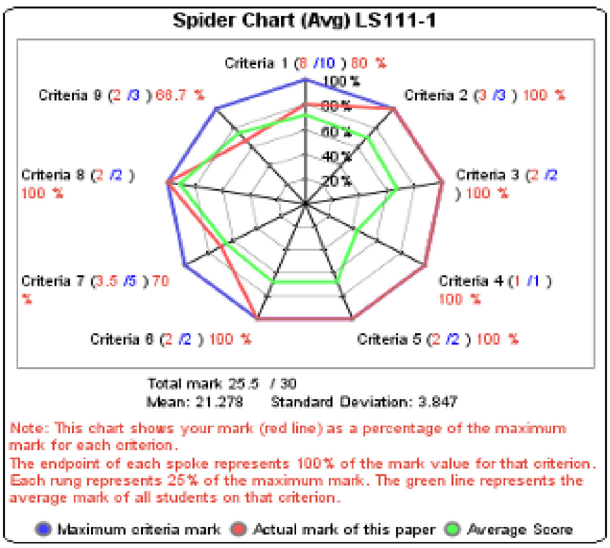

the distribution of grades. An actual student paper is open, on the right, showing their Smiley rating, Average Spider Chart indicating achievement on each criterion, Mark Tally Table, Colour coding and Auto Text comments. A survey instrument, ethics approval HE10/165 was prepared and administered on-line using Qualtrics <www.qualitics.com> - see http://remarkspdf.com/research. The survey instrument was designed to elicit student responses to different types and combinations of annotations.

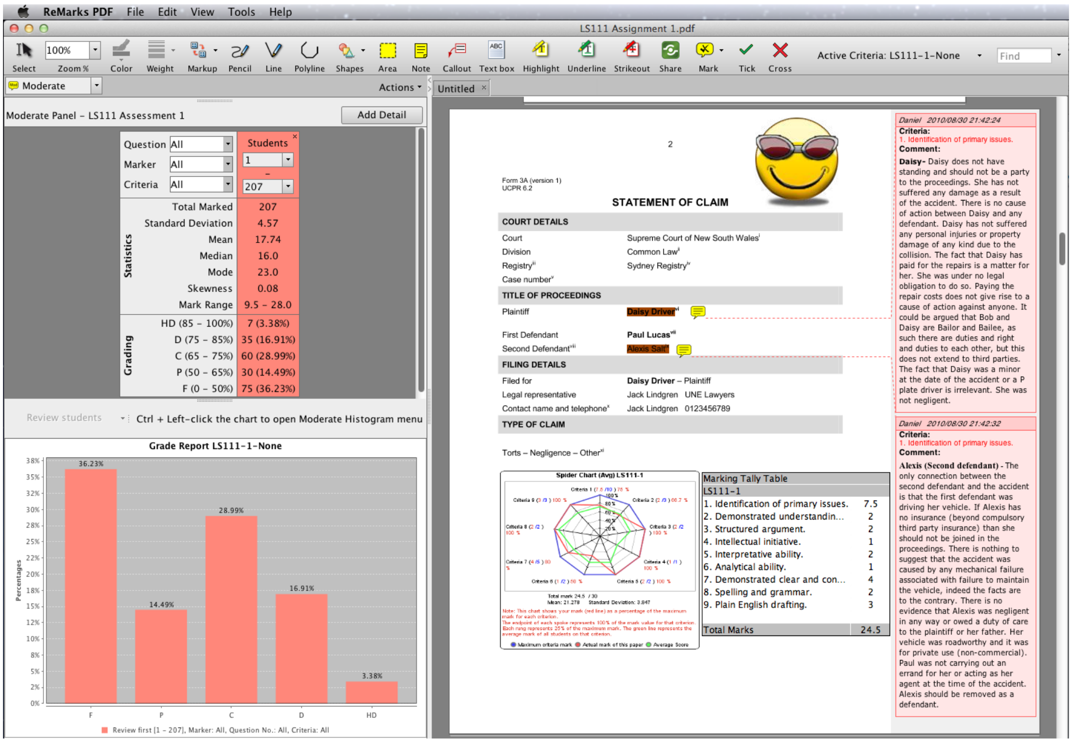

Figure 2: ReMarksPDF interface

Results

Students were asked to rate the overall value to them of the types of feedback annotations received. The results appear in Figure 3 and were significant at the 5% level (p = 0.000). A one-way ANOVA and post-hoc multiple comparisons did not reveal any association with equivalent full-time year, age or group.

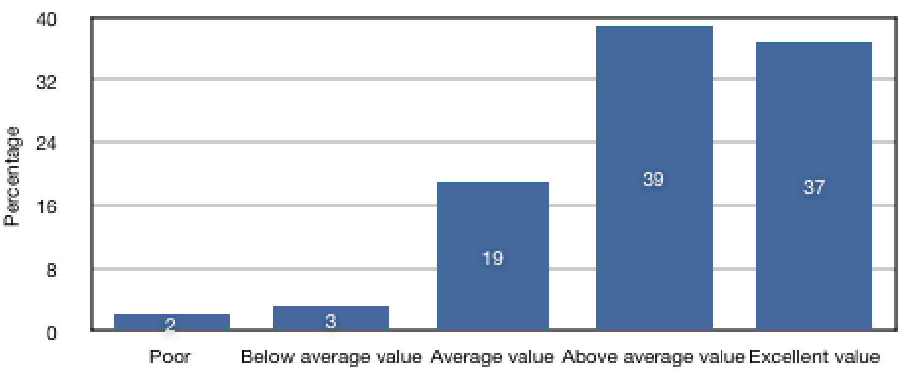

Figure 3: Overall value of Feedback

A t-test indicated females rated overall value more highly than males (p = 0.044). Neither mode nor attendance had any significant effect on the results.

Students were asked to rate the different types of annotations they received on a 5-point LIKERT scale from 1 Useless, 3 Neutral, through 5 Very Useful. The mean ratings in order of usefulness appear in Table 2.

Table 2: Annotation data

Annotation	n	1	2	3	4	5	Mean	*t*	*p**
Mark Tally Table	140	2 (1.4%)	6 (4.3%)	14 (10%)	52 (37.1%)	66 (47.1%)	4.24	16.257	0.000
Assessment rubric	141	5 (3.5%)	4 (2.8%)	20 (14.2%)	67 (47.5%)	43 (30.5%)	3.94	11.458	0.000
Spider Chart	82	3 (3.6%)	7 (8.5%)	12 (14.6%)	32 (39%)	28 (34.1%)	3.91	-3.97	0.000
Spider Chart with average	78	5 (6.4%)	8 (10.3%)	9 (11.5%)	26 (33.3%)	30 (38.5%)	3.87	-5.77	0.000
Colour coding	139	3 (2.2%)	15 (10.8%)	27 (19.4%)	53 (38.1%)	41 (29.5%)	3.82	8.611	0.000
Smiley	82	11 (13.4%)	14 (17.1%)	16 (19.5%)	26 (31.7%)	15 (18.3%)	3.24	-8.07	0.000

6. Sig. (2 tailed) One-Sample *t* test based on a neutral response of 3. **n** indicates the responses from students in all groups who received that type of annotation.

An independent samples *t*-test confirmed females rated annotations more useful than males at the 5% level for all variables except for spider charts. There was no association between age and responses. Part-time students rated the assessment rubric as more useful than full-time students at the 5% level ($p = 0.035$). There were no significant differences for on-campus or off-campus students. A one-way ANOVA and post-hoc multiple comparisons did not reveal any association with equivalent full-time year or age.

Students were also asked a series of questions on what they thought of ReMarksPDF based on a 5-point LIKERT scale from 1=Strongly disagree, 3=Neutral, through 5=Strongly agree. The results are shown in Table 3.

Table 3: Question data

Question	n	1	2	3	4	5	Mean	*t*	*p**
The ReMarks system provides better feedback than I have experienced in the past.	139	6 (4.3%)	7 (5%)	22 (15.8%)	49 (35.3%)	55 (39.6%)	4.01	11.06	0.000
Other units should adopt the ReMarks feedback system.	138	10 (7.3%)	7 (5.1%)	20 (14.5%)	42 (30.4%)	59 (42.8%)	3.96	8.88	0.000
ReMarks feedback is easy to read.	137	10 (7.3%)	7 (5.1%)	20 (14.6%)	42 (30.7%)	58 (42.3%)	3.96	8.77	0.000
It is beneficial to be able to view side column comments.	137	4 (2.9%)	4 (2.9%)	14 (10.2%)	43 (31.4%)	72 (52.6%)	4.28	14.20	0.000
ReMarks feedback is easy to understand.	138	9 (6.5%)	5 (3.6%)	21 (15.2%)	51 (37%)	52 (37.7%)	3.96	9.97	0.000

⅄ Sig. (2 tailed) One-Sample *t* test based on a neutral response of 3.

An independent samples *t* test did not reveal any gender differences at the 5% level, except for question 1, where females more strongly agreed than males. Part-time students rated 'ReMarksPDF feedback is easy to understand' higher than full-time students at the 5% level ($p = 0.028$). Off-campus students significantly rated 'ReMarksPDF feedback is easy to read' and 'ReMarks feedback is easy to understand' higher than on-campus students at the 5% level ($p = 0.019$, $p = 0.016$). A one-way ANOVA and post-hoc multiple comparisons did not reveal any association with equivalent full-time year or age.

Open-ended questions sought to elicit positive and negative aspects of ReMarksPDF and the types of feedback annotations. Selected results appear in Table 4.

Table 4: Annotation positive and negative aspects

Positive	Negative
ReMarksPDF	
• Avoid unnecessary delay of results and it is legible. • Clear and able to read the comments. • Being online saves paper. • Combination of graphs and annotation makes it easy to understand the feedback. • Brilliant! I have never received more cohesive and detailed results in any other subject. • Legible feedback. It shows that a lot of thought was put into the correction. Like the breakdown of the marks to the different areas so we I can see where to improve for next time. Its shows that the assignment was marked objectively rather than subjectively.	• Was a bit overwhelmed at first. Being a new system, I wasn't expecting it. Once I took a deep breath and started reading, was not so overpowering. • I do not have any negatives about any of the marking system. • Sometimes difficult to match the comments to the relevant area of the paper. • Marker's comment windows sometimes difficult to get open so that comments can be read. • When you print the document the comments are not completely visible. • None that I can think of. • Use of colour scheme a bit over the top.
Spider Chart	
5. You can visibly see where each mark is sitting against the maximum so you can work on weaknesses and see the strengths. 6. It provides a snapshot of my strengths and weaknesses. 7. Easy to understand, easily read.	• Nil. excellent way of seeing how marks were awarded. • Confusing to interpret and understand. • I am old and staid. I just do not like being confronted with new things...like learning to work a computer before I could consider enrolling at unit.
Spider Chart (with Average)	
• Found this very useful and would like to see other subjects adopt the same approach. • Excellent system. • It provides a clear illustration of the students strengths and weaknesses. • It was quick and easy to understand. • Good to compare against the average. • Excellent idea, highly useful, makes it easy to understand my position in relation to my class.	• Can be complicated to read, but I do not think there is a negative aspect. • The overall average is shown, but the average for each criteria spoke is not shown. This would be helpful. • Need a second degree to understand it. Don’t get carried away with academics, this is the real world out here.
Smiley	
• Its a visual cue as to how your assignment went e.g. happy sad in the middle. • Something different. • I smiled then went on to read the comments regarding my paper.	• If you get a frown it could be discouraging. • A sad face lowers a student's self esteem. • Don't really think it is needed. • Too open to interpretation. • Perhaps a scale of what level of smileyness.

Comment

While there were both positive and negative aspects to ReMarksPDF and the three types of annotations discussed, ReMarksPDF was nevertheless a valuable new tool for assessment feedback. 74.9% of students found ReMarksPDF provided better feedback than they had received in the past. 73.2% encouraged wider adoption of the tool. Students found the mark tally table, assessment rubric, spider chart, spider chart (with average), colour coding and smileys to be significantly valuable feedback in that order of preference. It would appear that quantitative annotation and classification schemes were perceived by students as more useful than more subjective schemes involving colours and depictions of emotions.

Females gave higher ratings than males on all feedback types, except spider charts, which were equally highly rated by males. Software such as ReMarksPDF offers the opportunity to use types of feedback, which would be otherwise impractical to manually implement - such as dashboard charts and auto comments. It is anticipated that e-marking software will have a positive affect on student engagement and learning outcomes by enabling markers to efficiently provide detailed individual feedback, outlining strengths and weaknesses of the student assessment submission and avenues for self-improvement.

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http://www.ascilite.org.au/conference/hobart11/procs/Colbran-concise.pdf

ReMarksPDF – Advanced Electronic Assessment Feedback

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ReMarksPDF is an ALTC project designed to significantly improve electronic assessment workflows in the tertiary sector and enhance student engagement. The project is concerned with summarizing the literature on e-assessment workflows, the policy implications for universities, relevance to TEQSA data collection, moderation and monitoring learning standards, new mechanisms for moderation within marking teams, and integration with Learning Management Systems. ReMarksPDF provides tools for timely feedback, embedding feedback throughout student assessment submissions, criterion-referenced assessment, and advanced moderation and quality assurance tools. The poster summarises the current state of development of the project and the free availability of this advanced cross-platform marking software for Australian academics. Case studies of ReMarksPDF Blackboard integration at Griffith University and ReMarksPDF Moodle 2.0 integration will be displayed. Technologically based methods of providing quality student feedback is an essential paradigm shift towards faster, simpler and more efficient assessment workflows for the benefit of both academics and students.

Keywords: Electronic Feedback, Electronic marking, ReMarksPDF, Electronic assessment

Introduction

Assessment drives student learning and effort (Kendle & Northcote, 2000) and in turn influences the direction and quality of student learning (Maclellan, 2004). Numerous literature reviews have revealed that feedback is critical to improving the standard of student work and learning (Black & William1998a; Hattie 1999; Heinrich 2006, Huber & Mowbray 2011) and that both formative and summative assessment directly affect student engagement. Assessment designs often include formative feedback aimed at enriching student engagement and understanding of the subject matter. Effective feedback should focus on the individual, outlining strengths and weaknesses and avenues for self-improvement (Linn & Miller, 2005; Heinrich 2006).

Timely feedback is essential for students to use feedback to improve later assessment submissions and focus on learning not marks (Fish & Lumadue 2011; Holmes & Papageorgiou, 2009; Ramsden, 2003). Students prefer feedback embedded throughout the body of their assessment submission (Wolsey, 2004) and the use of criterion-referenced assessment (O'Donovan, Price, & Rust, 2004).

Electronic feedback management systems, such as ReMarksPDF offer opportunities for improvement in assessment practice and outcomes for students and academics, including:

8. E-submission, allocation, marking, moderation and assessment return via a learning management system
9. Efficient electronic assessment workflows built on enterprise level system deployment
10. Extensive annotation and commentary features, including rubrics, audio, video, stamps, electronic dashboards and charts
11. Links to electronic portfolios classified by learning outcomes or graduate attributes
12. Quality management including consistency, reporting, and self-reflection

The ReMarksPDF Project

ReMarksPDF is a feedback management system, available free to Australian academics, designed to operate standalone or as part of an enterprise learning management system. The aim of the project is to significantly improve the quality, quantity and timeliness of assessment feedback whilst decreasing the workload and time commitment of academics associated with the marking of student assessment. ReMarksPDF provides rich media features such as auto text, sound and video comments, colour coding with assigned meanings, self-populating drag and drop graphs and charts, extensive moderation facilities (based on questions, marks, criterion, markers or combinations of these elements), style libraries, advanced rubrics and cover pages. The software is available in English, French, Modern Chinese and Arabic.

The intention is to improve student engagement with their studies through timely detailed feedback embedded throughout their assessment submissions, linked to criterion-referenced requirements.

Trials of the software are currently being undertaken at Griffith University, the University of Western Sydney and by numerous academics nationally and internationally.

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Going live: Building academic capacity in blended learning using web-conferencing technologies

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This paper reports on a current initiative at Queensland University of Technology to provide timely, flexible and sustainable training and support to academic staff in blended learning and associated techno-pedagogies via a web-conferencing classroom and collaboration tool, Elluminate *Live!*. This technology was first introduced to QUT in 2008 as part of the university's ongoing commitment to meeting the learning needs of diverse student cohorts. The centralised Learning Design team, in collaboration with the university's department of eLearning Services, was given the task of providing training and support to academic staff in the effective use of the technology for teaching and learning, as part of the team's ongoing brief to support and enhance the provision of blended learning throughout the university. The resulting program, "Learning Design Live" (LDL) is informed by Rogers' theory of innovation and diffusion (2003) and structured according to Wilson's framework for faculty development (2007). This paper discusses the program's design and structure, considers the program's impact on academic capacity in blended learning within the institution, and reflects on future directions for the program and emerging insights into blended learning and participant engagement for both staff and students.

Keywords: blended learning, web-conferencing, academic capacity building, learning design

Program Overview

The QUT "Learning Design Live" (LDL) program aims to facilitate the strategic institutional goal of improving student learning outcomes by building academic capacity in teaching and learning. QUT's strategic plan explicitly recognises the diverse learning needs of its students, many of whom do not attend - or are not able to attend - formal classes, and states that the university "will seek to provide welcoming, challenging and collaborative environments and experiences in the classroom and beyond" (Queensland University of Technology 2011, p. 4). Moreover, part of QUT's "vision for the future" is specifically "to provide outstanding learning environments and programs that lead to excellent outcomes for graduates, enabling them to work in and guide a diverse and complex world characterised by increasing change" (p. 10).

One of the ways QUT seeks to meet these strategic goals is by employing and fostering blended learning in a range of forms, which are informed by the institution's blended learning policy and associated policies on approaches to learning and teaching and high quality teaching (*QUT Manual of Policies and Procedures* [*MOPP*], 2010). Blended learning may be understood as the combination of face-to-face teaching and learning with online teaching and learning "whereby both face-to-face and online learning are made better by the presence of each other" (Garrison & Vaughan, 2008, p.52). Sharpe (2006) argues that institutions implementing blended learning require "highly contextualised and specific rationales for their adoption of technology" for the implementation to be successful (p. 3). QUT defines blended learning in its own institutional context as "the designed integration of face to face, distance, and electronic approaches to enhance student learning" (*QUT MOPP* 2010, s6.3), which, when taken together with its definition of student learning needs, corresponds to the rationales of "flexibility of provision, supporting diversity, enhancing the campus experience [and] operating in a global environment" as outlined by Sharpe (2006, p. 2).

Building Academic Capacity

The implementation of blended learning and the associated use of educational technologies have the potential to increase access to education and flexibility of teaching, to enhance communication and collaboration, and to create rich learning environments (Miller, Martineau & Clark 2000; Birch & Sankey 2008; Lonn & Teasley 2009). However, building institutional academic capacity in these techno-pedagogies is an essential part of the implementation process, and a range of factors have the potential to influence the success of such capacity-building activities. Many of these factors relate to Rogers' (2003) perceived attributes of innovations: relative advantage, compatibility, complexity, trialability and observability. The research suggests that effective diffusion of innovation in the field of e-learning requires a synchronised fostering of innovation from a top-down policy and leadership perspective together with bottom-up innovation and change (Wilson 2007; Davis & Eales 2007; Cook, Holley & Andrew 2007; Stein, Shephard & Harris 2009). Researchers concur that good communication strategies for awareness-raising and dissemination are vital to the diffusion process (Rogers 2003; Davis & Eales 2007, Zellweger Moser 2007). Arguably, however, this communication should be discursive in form, rather than didactic, and should encourage input by stakeholders at every level and in every part of the process (Davis & Eales 2007; Stein et al. 2009).

One critical requirement for building academic capacity in blended learning is the provision of adequate support for staff, both technical and pedagogical (DeLone & McLean 2003; Zellweger Moser 2007). Ellis and Goodyear argue that "It is rare for an individual academic to have all the knowledge and experience needed to make the best choices among learning tasks, technologies and ways of organising students, and to make sure that these choices are aligned to the best effect" and advocate team collaborations of academics together with educational development and technology specialists to "embrace more complex approaches to educational design, and make use of appropriate design tools and methods" (2010, p. 118), and these are potential benefits which may accrue as a result of the program.

Web-conferencing is a key emerging blended learning tool with its own set of techno-pedagogies, as facilitated through a range of technologies such as Skype, Cisco WebEx, Adobe Connect, and Blackboard Collaborate (Elluminate *Live!* plus Wimba). QUT supports the Elluminate *Live!* tool for use in teaching and learning, which facilitates a range of learning activities with differing levels of synchronicity and interactivity according to Bower, Hedberg & Kuswara's framework of online pedagogies (2010, p. 182). These activities include synchronous and asynchronous lectures, interactive tutorials, face-to-face lectures streamed to external students and containing interactivities such as polling and back-channel chat, remote and interactive guest lectures, document collaboration, virtual meetings and audio-visual assessment feedback. Bower (2011) argues that while the use of web-conferencing systems in teaching and learning may potentially enhance active learning especially in distance learning contexts, the implementation of these tools is a complex process requiring technical mastery and the ability to solve problems in real time, consideration of the pedagogical affordances of the tools separately and in combination, and the careful design of the learning experience to use the most appropriate tools and modes to achieve the desired outcomes (pp. 63-4).

Program Design

The research on innovation, capacity-building and blended learning strategies have closely informed the design of QUT's Learning Design Live program, which is designed to build academic capacity across the university in the techno-pedagogical competencies associated with teaching and learning in technology-enhanced learning environments. In terms of Graham's four levels of blended learning and teaching granularity (2006), the program is informed (and has the potential to inform reflexively) the institutional-level of blended learning, but focuses mainly on building academic capacity in activity-level and subject-level blended learning, while also explicitly considering the implications and possibilities of implementing course-level blending.

The LDL program aims to achieve the following objectives:

1. Raising awareness of the Elluminate *Live!* tool and its pedagogical affordances for blended learning within the university, especially among academic staff.
2. Providing an ongoing program of professional development activities related to blended learning using the Elluminate *Live!* technology which are timely, reusable and targeted, and which staff can access synchronously and asynchronously.
3. Modelling good practice pedagogical exemplars of Elluminate *Live!* usage.
4. Communicating information about associated university support structures, such as resource banks, learning design assistance, Elluminate *Live!* training, IT Help Desk support and audio-visual support.
5. Using the Elluminate *Live!* platform to showcase academic experts, faculty projects and university initiatives related to blended learning.

The program was developed according to Rogers' theory of innovation (2003) and specifically in terms of Wilson's framework for faculty development (2007). The first dimension of this framework is communicating the relative advantage of the innovation specifically for teaching and learning, with Wilson suggesting showcasing and information sessions as possible strategies. This approach is fundamental to LDL as stated in the program's objectives, and is further enhanced by cross-promotion of the program at other university communities of practice, showcasing and information events.

The second dimension outlined by Wilson is demonstrating the compatibility of the innovation with current learning and teaching practices and faculty values. Wilson suggests that "It is useful to start with individual faculty's current perceptions about teaching and learning in relation to their current practice, before examining how use of the new technologies can alter these practices and their role as a teacher" (p. 125). LDL achieves this by identifying current and popular learning and teaching practices and introducing blended learning strategies which complement, extend, enhance or transform these practices in ways which encourage dialogic engagement and reflection by session participants. Similarly, the program responds to the institutional value placed on blended learning for student outcomes, particularly in terms of the diverse learning needs of students, as discussed above. LDL sessions regularly discuss issues of student engagement and strategies to meet students' learning needs through the use of educational technologies and blended learning. However, faculty values are often complex and moreover in a state of constant change, as the cultural and generational contexts of university teaching compete with institutional targets and pressures, strategic initiatives and workload pressures. This has the potential to impact on staff receptivity to innovation, especially in the case of blended learning strategies, and is an ongoing challenge with which the program grapples.

The third of Wilson's dimensions requires addressing the complexity of the learning innovation and workload issues involved in its adoption. For the main part, LDL is not a dedicated training program; however the program aims to address this dimension by introducing the key functionalities of the technologies discussed in each session, including but not limited to Elluminate *Live!*, modelling pedagogical strategies and cross-promoting learning design support and training events. Finally, by its interactive nature, LDL fulfils the "trialability" and "observability" dimensions of Wilson's framework, and indeed, these are perhaps the strongest attributes of the program. As Wilson notes, "Offering faculty development online engages faculty as learners in the online environment, experiencing first-hand the use of the innovation" and this encompasses "encouraging participation in activities where they are using the new technologies themselves" (p. 126). Moreover, using modelling and active engagement strategies in Elluminate *Live!* assists academic staff to develop the required technical mastery, problem-solving skills and pedagogies which Bower (2011) identifies as essential to the successful implementation of web-conferencing technologies.

The program began in February 2010 and runs as a weekly half-hour session during each academic semester. The program targets academic staff as well as professional staff supporting academics in learning and teaching.Wide dissemination of upcoming sessions and previous recordings is achieved in coordination with Assistant Deans of Teaching and Learning in each faculty through regular email communications and in-faculty promotion. The calendar of events and session resources are also communicated via a QUT Blackboard community site housing resources relating to aspects of learning design, emerging technologies and blended learning pedagogies; this site has 304 active members (206 academic staff and 134 professional staff). The sessions comprise a mix of learning designer-led sessions and academic-led showcases of projects, innovations and reflections on practice. Each session models good pedagogical practice and contains technical support information as well as links to further support for the Elluminate *Live!* tool and for pedagogical assistance.

Research Methodology

Data relating to the LDL program was collected in three ways:

1. All participants attending the live sessions were invited to complete a Blackboard survey after the completion of each session (see survey questions below).
2. Those who viewed session recordings had the opportunity to provide unstructured feedback via a Blackboard blog or email. Some email feedback was received and this was incorporated into the survey data.
3. The number of downloads of each session recording was obtained at the end of each semester from Elluminate's Session Administration System.

Survey Questions for Participants in Live Sessions

Participants were asked to identify their role and faculty affiliation and to indicate their overall level of satisfaction with the LDL session they attended by providing feedback on the following specific areas:

1. What were the best aspects of this session?
2. What aspects of this session would you change or add to?
3. Please provide any additional comments about the session.

The collated data was analysed using thematic coding in order to ascertain the effectiveness of the program (to build academic capacity in blended learning tools and techno-pedagogies), to inform further development of the program, and to shed light on the ways that QUT academics are engaging with the challenges, opportunities and issues raised by blended learning, particularly in reference to web-conferencing technologies.

Findings

Statistics of live session participants and recording downloads for sessions is shown in Table 1. All sessions were presented by one or more learning designers (from a team of 9 people including the manager) and sometimes co-presented with a variety of academic and professional staff.

The data reveals two important trends: significantly greater numbers of staff access the recordings than attend the live sessions; attendance levels in the live sessions have declined since Semester 1, 2010; and the number of recording downloads is greater for the earlier sessions, although this possibly reflects the cumulative effect of ongoing downloads over time.

Table 1. Summary of Learning Design Live Statistics (to 21/10/11)

Semester	Sessions	Co-presenters	Range of number of participants in a session	Total participants in all sessions	Total no. of recording downloads
1, 2010	14	2	4-37	165	500
2, 2010	12	12	3-13	109	347
1, 2011	12	6	1-9	50	266

All of the LDL topics presented are listed in Table 2, which shows that some topics have been repeated with a slightly different emphasis (e.g. topics about Elluminate *Live!*, Blackboard Tweaks and community sites).

The most popular sessions (for live and recorded sessions) were those related to the use of Elluminate *Live!*, specific Blackboard issues (e.g. site design, incorporating tweaks into a site and community sites) and particular educational technologies (e.g. PowerPoint, vodcasting and QUT's Open Web Lecture system). The least popular were those repeating past topics (e.g. "Active community sites: development and management") and some generalised topics (e.g. "Learning Design Q&A"). However, it is currently difficult to ascertain the trends in downloads for Semester 1, 2011 as download figures tend to increase over time. A final point to make is that the use of multiple presenters or co-presenters did not seem to influence the overall popularity of a session with respect to attendance or download numbers.

Table 2. Learning Design Live topics and statistics (to 07/07/11)

Session title	Presenters	Co-presenters	Live participants	Downloads	Surveys complet
SEM 1, 2010					
1. Introduction to Elluminate *Live!*	1	0	37	137	17

2. Spring clean your Blackboard site	1	0	11	41	2
3. Site Design: Taking curriculum design online	1	0	13	52	0
4. Moderating Online Interactions	1	0	11	29	2
5. Vodcasting 101	1	0	13	39	2
6. Using PowerPoint effectively in your teaching	1	0	16	47	3
7. Creating Communities of Practice	1	0	6	39	0
8. Teaching with Elluminate *Live!*	1	0	13	27	1
9. QUT Lecture Recording System	2	1	13	12	1
10. Engaging Learners Online	1	0	4	10	0
11. Online Assessment and Blackboard Grade Centre Tips	1	1	6	17	0
12. Creating narrated presentations with authorPOINT Lite	1	0	7	25	0
13. Learning Design Q & A	1	0	6	6	0
14. Preparing Blackboard sites for Semester 2	1	0	9	19	2
TOTALS		2	165	500	30
SEM 2, 2010					
1. Top tips for Blackboard	1	0	9	31	1
2. What's new in Elluminate version 10	1	0	5	25	1
3. Supporting International Students	1	1	11	12	0
4. Blackboard Community Sites	1	2	8	11	0
5. Tweet if you're learning (Creative Industries)	1	2	13	17	1
6. Enhancing teaching and learning (and things mathematical!) with digital ink and screencasting (Science and Technology)	1	1	12	9	3
7. Flexible Learning Initiatives Project (Law)	1	0	7	9	0
8. Getting wiki with it (Teaching and assessing with Blackboard wikis) (Business)	1	2	13	9	3

9. Flexible Approaches to Podcasting (Built Environment & Engineering)	1	1	7	10	0
10. Using Xerte and multimedia for active learning (Law)	1	1	9	30	2
11. Toys and Tools - enhancing learning for diverse students (Education)	1	1	12	16	2
12. Using Communication Tools: It's not that hard! (Health)	1	1	3	8	0
TOTALS		12	109	187	13
SEM 1, 2011					
1. Effective Tweaks	2	1	4	34	0
2. Engaging conversations for learning through asynchronous discussions	1	0	2	(not recorded)	0
3. Special focus: OWL (Open Web Lecture)	2	1	7	22	0
4. Forum: Approaches to learning and teaching with Elluminate *Live!*	1	1	8	15	0
5. Authentic Learning and Assessment	1	0	1	5	1
6. Integrating Library Resources	1	2	5	18	0
7. Active community sites: development and management	1	1	1	4	0
8. A conference catchup	4	0	1	5	1
9. Getting the message across in 5 mins: Using free online tools to record screencasts	2	0	2	4	2
10. iPad uses in T&L	1	0	6	21	3
11. Blackboard 9.1 Upgrade - Part I	2	0	4	12	2
12. Blackboard 9.1 Upgrade - Part II	2	0	9	25	4
TOTALS		6	50	165	11

The numbers of Blackboard surveys completed after each session has decreased each semester from 30 to 13 to 11 for successive semesters. However, useful feedback has been obtained as summarised below.

LDL has received general positive feedback for both the live sessions and recordings:

- *It is great to hear of people using these tools in class and also how students interact with such classroom environments. This was a well paced, informative session with good opportunities to share knowledge and experiences.*
- *I like the choice of joining the session live, especially if I know I might have questions along the way, or viewing the recording at a time that I am available to.*
- *I'm hoping to keep engaging with these sessions (live or recorded!) as I am finding them very useful in terms of introducing new modalities for learning and ways to organise blackboard in more effective ways!*

Participants prefer sessions that are practical, informative, concise and relevant:

13. *I liked the actual practicality of it all.*
14. *This was good: I could follow step by step.*
15. *It was great and really helpful. Lots of useful and practical tips for making my Blackboard site schmicker. Thanks!*
7. *Good overview of the current projects. Links to the material available. Interactive nature, allowing feedback and info to be posted from all participants.*
8. *Very useful mechanism for keeping up with T&L developments.*

Sessions that provide insights into using Elluminate *Live!* received positive feedback:

- *Excellent! Can't wait to use this - it is going to be so helpful working with external students :)*
- *There is always something in Elluminate Live that I find useful and applicable to our teaching and learning contexts. Keep up the good work!*
- *Using Elluminate Live! for the first time and seeing how good it is. And the info was interesting despite the fact that I don't really need to use a lot of it. some more examples of new applications. Very good outline in limited time.*
- *I appreciate the opportunity to participate in the session- I learned a lot! This has really encouraged me to look into ways to use Elluminate in my teaching so thank you. It was also fun!*

Sessions that experienced technical difficulties or were seen to be too difficult, basic or inaccurate were unpopular:

4. *I have noted that a number of LATTE session recordings would be substantially improved by post-production editing, particularly where presenter(s) materials do not work, and/or there are delays or other glitches while the recording process continues.*
5. *It went too fast for me. Should address different skill levels. May be I need a one-to one training with this.*
6. *Too much on basics and not enough on advanced functions. I do not feel it met the objectives of the session.*
7. *I feel I knew more than the presenter covered.*

Conclusions

The most significant benefits of LDL for different stakeholders are listed here:

5. Participants: It has been worthwhile for staff to experience Elluminate *Live!* and other blended learning strategies from a student's perspective before implementing in their own teaching and to engage in cross-faculty discussions and teaching approaches. In particular, academic-led or co-presented sessions promote a diverse range of ideas and teaching approaches both about using Elluminate *Live!* and employing other educational technologies.

6. Learning Design Team: LDL has provided capacity building opportunities for team members since it draws on the strengths and interests of the team, fosters collaboration and has developed the team's skills and understanding of using Elluminate *Live!* for a variety of purposes. It has also helped the team to identify short and long term goals (that align with eLearning Services strategic goals) and helped to build an identity for the team at QUT.
7. Institution: findings from the LDL program have informed policy and guidelines related to blended learning and teaching and assisted in promoting learning and teaching approaches used by academics within and across faculties.

The LDL program is continuing to evolve but has not been without its challenges:

8. Scheduling sessions at appropriate times to maximise synchronous attendance has been only partially successful, given the competing commitments many academic and professional staff must manage.
9. The choice of topics requires constant dialogue with stakeholders but fostering such dialogue is challenging and does not necessarily result in a popular session.
10. We have needed to rethink what to present in the live sessions in view of the fact that most sessions will be viewed as recordings.
11. Technical problems within the session impact negatively on participant experience and potentially impact on staff willingness to adopt the demonstrated tools or strategies; prior testing is therefore of paramount importance.
12. It has been challenging to maintain a community of practice around LDL. Staff have not been as engaged in offering feedback or ideas for future sessions as expected and ways of encouraging this need to be further explored, including greater feedback to participants on survey results.

Reflections

The program has offered insights on the issue of engagement with blended learning. Most notably, it would appear that staff, especially academic staff, share many of the diverse learning needs and interests as their students: for example, they have a range of motivations and expectations of their professional development, they often have competing commitments which impact on their availability for synchronous learning, and they bring a wide variety of technical and pedagogic competencies to the learning activities. Participant feedback and attendance/download statistics indicate that the blended learning strategies employed in LDL have had success in supporting these diverse needs and interests, especially in terms of the different kinds of blended learning strategies covered, the variety of learning activities afforded, and the ability to create both synchronous and asynchronous experiences. However, while the program aims to foster a community of practice around blended learning, the participants themselves often want "just in time" resources rather than investing in ongoing dialogic interactions with colleagues, which is a challenge the program continues to grapple with from a professional development perspective, and also in terms of the implications for student engagement in blended learning.

The dominant trend of much higher rates of session downloads than live attendees brings into focus a key design challenge of web-conferencing and other forms of blended learning where both synchronous and asynchronous participation is possible: that is, to create learning experiences which include interactivities for live participation, yet also foster active learning for participants viewing the sessions asynchronously. As this is also a problem frequently raised by academic staff teaching via web-conferencing at QUT, future iterations of the program will aim to support and develop these important design skills and engage with the more fundamental question of whether the perceived primacy of synchronous learning is necessarily justified. This process will require further evaluation of the impact of LDL, especially in terms of student learning outcomes.

There remains the ongoing challenge of maintaining staff engagement in the program in the long term, which requires new strategies in terms of objectives, design and communication. Some planned future activities in this area of the program will include more face-to-face development and networking opportunities for participants, changing delivery modes to capitalise on physical spaces as an essential part of the blended learning experience, and a re-evaluation of the location and type of support resources provided to staff.

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Exploring Medical Students' Use of Technology

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The use of Information and Communication Technologies (ICTs) are increasingly important in the delivery of medical education. Whilst the primary motivation for technology integration is to increase learning and teaching effectiveness, such decisions are sometimes based on assumptions of a high level of technological literacy of students entering higher education. Recent literature has challenged these assumptions instead presenting a more diverse picture of students' experience and skill with technology (Kennedy et. al., 2007, Oliver & Goerke, 2007; Margaryan, Littlejohn & Vojt, 2011). This paper presents the results of surveys conducted with new graduate medical students designed to measure access to and confidence with technology. This data has been used by the medical school to monitor the technological profile of each cohort of students in order to implement suitable support activities and to provide an empirical foundation to inform decisions around the implementation of new educational technologies in the curriculum.

Keywords: Medical education, Technology, Digital Natives, Net Generation

Introduction

As medical curricular become more innovative, incorporating a diverse array of learning and teaching activities delivered across campus, clinical and community environments, information and communication technologies are increasingly being used to support delivery. As integration of technology has increased it has become clear that more understanding of students' technology access and use is required to make sure technology is utilised effectively. By providing empirical evidence of students' experience, confidence and access to technology, reliance on the use of generalisations based on the supposed technological attributes of members of this generation of students can be reduced. Such generalisations have been used by some to call for radical change to education to incorporate higher levels of technology (Oblinger & Oblinger, 2005), however others caution that more evidence is needed before change should be considered (Helsper & Eynon, 2007, Bennett, Maton & Kervin, 2008). The discussion around the so-called "digital natives" (Prensky, 2001) or the "Net Generation" (Tapscott, 1998) claim that today's students have grown up surrounded by technology, and therefore would be comfortable with an increase in the use of technology to deliver education.

Studies that have emerged over the past few years have begun to challenge these assumptions and have demonstrated that a significant level of diversity exists in the technological aptitude of the current generation of students (Kennedy et. al., 2007, Oliver & Goerke, 2007; Margaryan, Littlejohn & Vojt, 2011). In terms of medical students, Dorup (2004) found that whilst access and use of technology was increasing over time, not all students wanted an increase use of technology in their studies. Dorup also stressed the importance of building in suitable technology support activities to address the varying levels of ICT literacy. McNulty et. al. (2002) found that medical students' personality has an impact on their use of technology accounting for some of the variation in adoption of technologies.

This paper explores the technology access, use and confidence of medical students entering a new graduate medical programme. Five years of data are presented which show that not all students demonstrate a high level of technology engagement and there is a significant variance in some technology-based activities. This data has been used by the medical school to inform the development of technology support activities and the implementation of new technology in the curriculum. The data provides valuable justification for choices around educational technology and is useful when exploring technological solutions to pedagogic problems.

Background to the medical school

Established in 2006, the Graduate School of Medicine (GSM) at the University of Wollongong offers a four-year graduate medical programme. A strong emphasis of the programme is the development of medical practitioners for regional, rural and remote Australia to help address the shortage of doctors in these areas. The curriculum is integrated and spiral in nature designed around 93 clinical presentations and four themes of learning outcomes: Medical Sciences, Clinical Competencies, Personal and Professional Development, and Research and Critical Analysis. Rather than discrete subjects on each medical discipline (ie. Paediatrics, pathology, etc.), the curriculum develops scientific and clinical knowledge through problem-based learning, body system blocks of teaching, and clinical experience. Students begin their first clinical placements at the end of the first six weeks of the programme and continue clinical placements throughout each of the four phases of the course. The first 18 months (Phase 1) of the course is primarily campus-based, but in each of the other phases the time on campus is minimal with most of the students' time being on clinical placement. In Phase 2 students undertake clinical specialty rotations in the five areas of Medicine, Surgery, Paediatrics, Maternal and Women's Health, and Mental Health. Phase 3 consists of a12 month longitudinal placement in a regional or rural area where students divide their time between general practice, hospital and community clinics. The fourth Phase involves a six week pre-Internship term (usually taken in NSW), a six-week selective term (usually taken somewhere in Australia), and a six-week elective term (can be taken anywhere in the world).

Due to the diverse nature of the curriculum and dispersed locations of the students for the majority of the programme, technology has been used extensively to deliver various elements of the programme. Course content is tagged and stored in a learning content management system (Equella) and delivered to student via a learning management system (Blackboard Vista). The structure of these two systems allows students to access and search all learning outlines and resources delivered to their cohort to date. Each learning activity has an associated outline stored in Equella which sets out the elements of the learning activity including learning outcomes, pre-readings, and associated resources (lecture notes, lecture audio, etc.). The learning activity outlines are also tagged with the associated clinical presentation (from the list of 93), body system, clinical competence, medical science, etc. The GSM also delivers material in the form of Guided Online Assessable Learning (GOALS) objects which are interactive activities that support other elements of the course.

Several tools in the learning management system are also utilized extensively throughout the programme including the quiz tool, assignment submission tool, discussion forums and calendar. The school also makes use of technologies in the classroom including audience response systems (clickers) and video conferencing. The medical degree is taught across two campuses in Phase 1, 6 locations in Phase 2, and across 10 locations in Phase 3, which means that a majority of learning sessions are video conferenced. Another piece of technology integral to the curriculum is the Clinical Log. The Clinical log is a web-based tool designed to allow students to record and reflect on their experiences with patients. The Clinical Log allows students to map their experiences back to the curriculum and looks for any gaps which may need addressing.

In order for students to engage with all of these technologies it is necessary for them to have a reasonable level of technology literacy. As the use of technology in the curriculum increases awareness of the support students may need to gain the necessary literacy has become an important consideration. Surveys such as the one carried out in this study hope to provide timely and relevant data to assist with planning support activities and implementing new technologies.

Methodology

A technology survey has been administered at the start of the year for each new cohort of students since 2007. The purpose of the survey is to profile students' access to and confidence with technology. This data is then used to determine technology support and training requirements for students and to inform new technological innovations in teaching and learning.

The survey has developed over the past five years. Consistent to each year are the demographic questions of age and gender, type of Internet connection, learning management system the students have used in their previous studies and their confidence levels (on a scale of 1 to 7) in relation to using the Internet, email, word processing software, presentation software and audiovisual equipment. In 2009 the survey was expanded to include additional demographics, access/ownership levels of communication devices, frequency of technology-based activities (i.e. online banking, gaming, etc.) and social networking engagement. The categories of technology use for which students were asked to indicate their confidence were also expanded to include more university-related activities such as accessing library resources online, participating in online discussion forums and using statistical software for research. Furthermore, in 2010 questions were added to ask students the operating systems they use on their personal computer. In 2011 questions were added to assist with the planned introduction of podcasting (i.e. identification of students' preferred podcasting software).

Results

The results of the technology surveys over the past five years have shown a steady increase in access to and confidence with technology; however at the same time demonstrate that there remains a variance in individual student's technology access and use. Figure 1 demonstrates that access or ownership of computers has seen an upward trend in students adopting the portable laptop option.

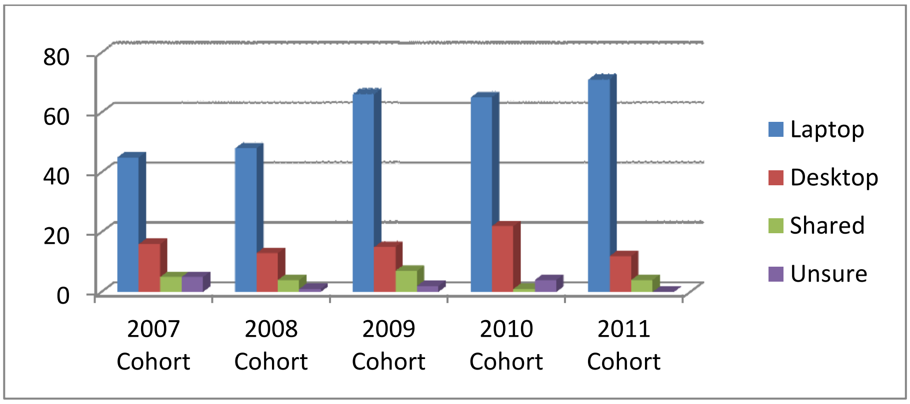

Figure 1: Computer Ownership (2007 – 2011)

Another area that impacts the delivery of the curriculum is the speed at which students can access learning materials. As online learning resources become more interactive and incorporate more audio and visual elements access to Broadband becomes critical. Figure 2 shows that Broadband Internet adoption has increased over the five years with virtually no students left on slower dialup connections.

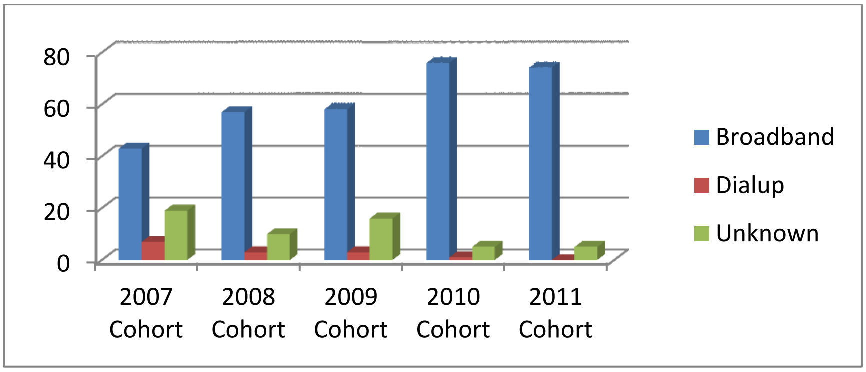

Figure 2: Internet Connection (2007 – 2011)

The rates of confidence with technology showed very little difference from year to year. The figure below shows the results for use of Internet, word processing software, spreadsheet software, presentation software and audio visual equipment as well as an overall rating for confidence with computer skills. Only results from years 2009 to 2011 are presented on this chart as the results for 2007 and 2008 were on a 10-point scale instead of 7. The low levels of confidence with audio-visual technologies are an example of an area that needs to be addressed with further support activities. As so much of the curriculum is delivered via this method, it is important that students are comfortable with its use and able to operate the equipment if required. As a result, video conferencing training sessions are now being run by the faculty's Educational Technology Officer.

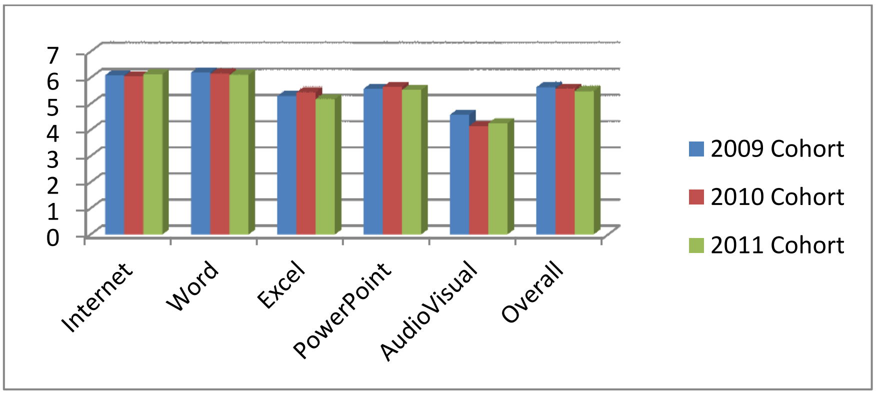

Figure 3: Confidence with technology (2009 – 2011)

Social networking is an area which has shown variance in student engagement. The surveys have shown that social networking has not been unanimously adopted by medical students with 10% of the 2009 cohort, 16% of the 2010 cohort and 11% of 2011 cohort students not accessing social networking at all. In the most recent cohort (2011), 67% of those students that use social networking sites access them daily, 23% weekly and 10% occasionally. These findings are consistent with recent studies which observed many differences in the way students use social software (Valtonen, Dillon, Kacklin & Vaisanen, 2011).

In relation to mobile devices, there have been a number of suggestions made by staff and students for the creation of an iPhone application for systems such as the Clinical Log. However, the mobile phone ownership statistics show that although all students had access to a mobile, only 25% of students owned an iPhone in 2010. Whilst this number grew to 38% in 2011 this still represents less than half of the students in the cohort.

Knowledge of these trends has prompted the Educational Technology team to explore other options for mobile application development including platform-independent options such as HTML5.

Conclusion

The wide variety of technologies incorporated into the medical curriculum creates many opportunities for the delivery of quality education. The use of regular surveying of students to gauge levels technology access and use has proven very useful to the GSM in determining how to maximise and support technology use in the delivery of the curriculum. Orientation to the educational technology elements of the courses is adapted each year based on the results of these surveys and specific student training has been introduced at certain points within the course (i.e. video conferencing training, orientation to the use of the Clinical Log, etc.). Whilst the levels of technology engagement are fairly high across the cohorts, variance still exists in relation to some technological activities (i.e. social networking) and confidence in relation to core delivery technologies (i.e. audio visual technologies). These factors need to be considered when new technologies are introduced and sufficient support resources need to be made available to those students who may need them. Surveying each new cohort will continue in the future with the surveys being adapted to include investigation of new trends and technologies (ie. tablets). In the future it is hoped that the surveys can be run more regularly (i.e. yearly) with each cohort to track and adapt to changes in technology adoption over the four years of the MBBS programme.

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Scholarship, leadership and technology: a case study of embedding evidence-based practice

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This case study describes how one university is addressing the challenge of embedding evidence–based practice in learning, teaching and technology by building on the concept of distributive leadership. Following its launch in 2008, the Caledonian Scholars and Associates initiative has firmly established itself as a key aspect of continuing professional development for learning and teaching within the institution, with technology playing a central role. The paper outlines how the initiative has benefitted from the experiences and findings of national and international developments and adapted them to the local context by supporting, encouraging and acknowledging evidence-based practice across the curriculum. It provides an overview of evaluation findings and concludes by outlining future plans to ensure sustainability.

Keywords: evidence-based practice; distributive leadership; embedding learning technology

Introduction

Raising the profile and status of innovative pedagogic practice in higher education can be problematic, due in no small part to the continuing pressure on academics to focus on career enhancement through disciplinary research. Whilst lip service may be paid to the central role of learning and teaching, the culture within institutions often systemically embeds the imbalance, as research, rather than excellent pedagogic practice, continues to attract higher status and remains a central tenet of academic promotion (Vardi & Quin, 2011) Against this background, an emphasis on scholarly approaches to learning and teaching, firmly grounded in evidence, is essential to enhance the standing of pedagogic practice and to increase opportunities for career progression through the learning and teaching route.

For those who pursue innovation through the application of technology, the task of gathering evidence to support career progression can be particularly daunting. Technology enhanced learning frequently stands accused of technological determinism with insufficient evidence or theoretical underpinning presented to support its claims of effectiveness in a learning and teaching context (Oliver, 2011; Creanor & Walker, 2010).

Hence the strategic implementation of evidence-based, technology enhanced practice linked to career progression within the disciplines is perceived as a challenging goal which requires explicit encouragement and support through institutional recognition and influential leadership.

Evidence-based practice can be interpreted in many ways and from a range of perspectives. Originating in the field of medicine, the concept has been widely adopted in education to ensure that pedagogic practice is effectively informed by the findings of high quality educational research (Biesta, 2007). It has often been linked to scholarship in learning and teaching (Boyer, 1990) which Prosser describes as '*evidence based critical reflection on practice to improve practice*' (2008:2). Whereas educational research can be highly theoretical, innovative scholarly activity, underpinned by action research, is firmly rooted in day to day learning and teaching activities (Mills, 2000; Reason & Bradbury, 2001).

The value of evidence-based approaches to the learner experience is undisputed (Jenkins, 2009), however institutional culture, disciplinary context, lack of acknowledgement and recognition can have a significant impact on staff engagement in continuing professional development (CPD) relating to scholarly activity, including technology enhanced learning. Innovative pedagogic practice is often equated with technology enhancement, even though it is recognised that technology can be employed equally to reinforce a traditional, transmission-mode pedagogy as to encourage forward-looking, student-centred approaches (Conole et al, 2004; Beetham & Sharpe, 2007). Tensions continue to exist between pedagogical and technological drivers, resulting in an ongoing struggle to maintain a scholarly focus against a backdrop of constant change and relentless technological advances (Watson, 2001). It is crucial therefore that innovation in learning and teaching is informed by scholarship and a sound evidence base, and promoted by persuasive opinion leaders, if it is to play a truly effective role in the education of 21st century learners.

The aim of this paper is to highlight some of the challenges faced in combining evidence-based approaches with learning technology, influential leadership and career progression by focusing on the experiences of one UK university over a three year period. Firstly, it will outline the background and rationale for a strategic CPD initiative designed to address these issues, informed by relevant national and international developments. It will go on to describe the implementation, outcomes and findings to date, before reflecting on the impact of such an approach and making recommendations for future development to ensure sustainability.

Influencing models and frameworks

Innovation as a concept is problematic within higher education with varied foci encompassing local, often individualised, developments in learning and teaching alongside more managerial and business-oriented institutional and political strategies (Hockings, 2005; Findlow, 2008; Smith, 2011). The relatively short history of learning technology in this context mirrors the variation in conceptual understanding and implementation, with strategies and policies veering between top down and bottom up developments with a similarly diverse range of outcomes.

Large-scale initiatives

In recent times for example, considerable amounts of UK government funding were disbursed by the Higher Education Funding Council for England (HEFCE) to establish 74 Centres of Excellence in Learning and Teaching (CETLs) from 2005-2010, each with a particular pedagogic focus. These centres, many of which incorporated technology enhanced approaches, were locally hosted by the successful bidders but had a sector-wide remit. The dual aims for this initiative were, *'…to reward excellent teaching practice and to further invest* *in that practice so that CETLs funding delivered substantial benefits to students, teachers and institutions'*[4].

In a parallel development in Scotland, the Scottish Funding Council (SFC) invested £6 million in a series of 6 transformational e-learning projects involving both higher and further education partnerships which addressed topics such as assessment and feedback, blended learning and pedagogically-driven approaches to embedding technology in the curriculum[5]. The aim was to effect transformational change in the culture and attitudes of institutions to the integration of e-learning within mainstream learning and teaching.

Whilst success in embedding innovation and evidence based-practice is clearly evidenced by sections of these strategic initiatives (Anderson et al, 2008; VLL Final Report, 2010), an interim evaluation of the impact of the CETLs noted that,

> The tradition of deliberate strategies to change and enhance learning and teaching in higher education in the UK has a relatively short history. Traditionally, its legitimacy among numbers of academics has been uncertain. Central or cross-disciplinary standards, approaches, suggestions and development have run up against the canon of concerns traditionally held by academics. So, academics do not appreciate a heavy central steer on practices that have been very much the local preserve. (Saunders et al, 2008:9)

These findings suggest that despite top-level encouragement and substantial resource, local ownership, empowerment and individual agency remain key influencers of engagement and impact in encouraging creative, evidence-based learning and teaching practice. Without a real sense of long-term commitment to the projects, continuation and embedding beyond the initial funding period is difficult to achieve. (Gunn, 2010a; Bates & Sangra, 2003).

The individual perspective

In contrast to these large scale initiatives, empowering and developing the potential of individual academics is the focus of the Professional Standards Framework for Teaching and Supporting Learning in Higher Education in the UK (UKPSF). Developed by the Higher Education Academy (HEA) in collaboration with the sector, the framework identifies a series of levels and criteria against which an academic's professional development in the scholarship and leadership of learning and teaching can be gauged (HEA, 2006). The framework can be contextualised at a local level, indeed institutions are actively encouraged to do so, and it links to accreditation as an Associate, Fellow or Senior Fellow of the HEA. Although not, as yet, a universally compulsory requirement, an increasing number of UK institutions require new academic staff to attain fellowship of the HEA at an early stage, either by undertaking an accredited programme of study or through a direct application based on experience. The framework is used by institutions to inform their postgraduate certificate programmes in learning and teaching and to shape CPD activities. The UKPSF is currently under review following a sector-wide consultation and while 'the use of appropriate learning technologies' is currently a stated requirement of core knowledge, there is a call for this to be strengthened in the revised version given the increasingly central role of technology enhanced learning in HE[6].

Internationally, the Australian Faculty Scholars Network has also attracted significant interest. Supported by the Australian Learning and Teaching Council (ALTC), it has extended its impact from the initial pilot institutions to a wider group of participating universities. The original aim of the project was to assess the validity of a leadership development capacity framework for teaching and learning (Parrish & Lefoe, 2008). This approach also focuses on individuals and is underpinned by the concept of distributive leadership (Bennett et al, 2003; Knight & Trowler, 2001) which is described by Lefoe et al (2007) as,

[4] http://www.hefce.ac.uk/learning/tinits/cetl/
[5] http://www.sfc.ac.uk/effective_institutions/eLearning/elearning_transformational_change.aspx
[6] http://www.heacademy.ac.uk/ukpsf

> ... a distribution of power within the sociocultural context of universities, and a sharing of knowledge, of practice and reflection through collegiality. (2007:5)

Originally conceived as a way of preparing future leaders in learning and teaching for a rapidly evolving higher education system, this model promotes the development of leadership skills amongst staff who do not necessarily have a formally recognised leadership role in a hierarchical sense. The model has been used successfully to take forward key technology enhanced learning priorities including e-assessment, feedback and online distance learning (Lefoe, 2010; Keppell et al, 2010), with participating staff rewarded with small amounts of funding, partial relief from teaching duties and support through the network of faculty scholars. One outcome of this initiative has been a distributive leadership development framework which, like the UKPSF, can be adapted for a local context. In addition, it was found that participants gained confidence in their own ability to act as leaders and to influence colleagues and senior managers in taking forward key learning and teaching innovations.

> With distributive leadership, those people who may not sit in hierarchical positions of leadership have an opportunity to lead both upwards and sideways among their colleagues and through this mechanism have a real opportunity to influence others and more importantly influence those with power that comes with hierarchical positions of leadership. (Parrish & Lefoe, 2008: 2)

Influenced by, and building on, these examples, the following case study outlines how such models and frameworks have influenced the approach of one UK institution which sought to attain a similar strategic impact through the empowerment of individuals, the embedding of technology enhanced learning and the encouragement of evidence-based practice across all disciplinary areas.

Case study: Caledonian Scholars and Associates

Glasgow Caledonian University (GCU) is a modern, campus-based Scottish institution with almost 17,000 students studying in its three academic schools in the areas of business and society, health and life sciences, and engineering and the built environment. With a significant widening participation agenda, it places a strong emphasis on learning, teaching and the student experience. Nevertheless, promoting recognition for excellence in learning and teaching and encouraging engagement in continuing professional development (CPD) in a meaningful way have been challenging goals, particularly in the fast-moving field of learning technology. Whilst undertaking the University's postgraduate certificate in learning and teaching for higher education (PgC LTHE) programme is expected of all new staff, participation in ongoing CPD for learning and teaching beyond this stage is generally optional and unrewarded. As a result, the University sought to address these inter-linked challenges in an informed way, building on experiences in the sector both nationally and internationally.

Inspired by the successful Faculty Scholars Network in Australia and informed by the HEA UK Professional Standards Framework, the Caledonian Scholars and Associates initiative was launched in summer 2008. It is underpinned by the distributive leadership model outlined above which recognises and encourages localised ownership of innovation and change. The initiative aims to support the implementation of GCU's CPD framework for learning and teaching, which reflects the key priorities of the University's Learning, Teaching and Assessment Strategy and is itself closely mapped to the HEA Professional Standards Framework.

The aims of the Caledonian Scholars and Associates initiative are to,

- provide opportunities for new and experienced staff to maintain continuing engagement with scholarly approaches to learning and teaching throughout their careers.
- enhance learning and teaching practice and the quality of the student experience
- recognise individual endeavour and address a number of promotion criteria through the learning and teaching route
- actively promote innovation in learning and teaching to benefit students, departments and academic Schools

- enable lecturers and staff who support student learning to gain University recognition for commitment to, and investment in, scholarship in learning and teaching.

Technology enhanced learning is integral to GCU's Learning, Teaching and Assessment Strategy (LTAS), the CPD framework and the Caledonian Scholars and Associates initiative. A blended approach has been adopted in which the best of traditional classroom-based teaching is enhanced and enriched, rather than replaced, by the most appropriate use of technology (Bonk et al, 2006). The aspiration is to,

> ...provide a high quality, inclusive and flexible learning and teaching environment which makes the best use of technology enhanced learning, creating a bold, innovative and distinctive approach. (GCU LTAS, 2008)

The Caledonian Scholars and Associates initiative aims to address the twin priorities of enhancing scholarly activity in learning and teaching and developing a more consistent, evidence-based approach to technology enhanced learning.

Implementation

The initiative was launched and facilitated by the Caledonian Academy[7], a central department with responsibility for educational development, blended learning, scholarship and research. Initially two calls were issued each year for Scholar and Associate applications with 7 or 8 awarded successfully at each round, in order to ensure the establishment of a critical mass of activity across the University. This has now been achieved and the call for applications has been moved to an annual basis. All applications must be aligned with the University LTAS and School/Departmental priorities, approved by deans and relevant senior staff as appropriate, and local mentors identified. Applications are peer reviewed by international experts, with final decisions on acceptance made by the pro vice chancellor for learning and teaching based on their recommendations. The criteria for Caledonian Scholars and Associates are aligned with the evidence required for career progression through the learning and teaching route and are explicitly identified in promotion documentation.

A relatively small amount of University funding has been made available for Caledonian Scholars (£2k over two years) and as an additional incentive, workload remission of up to 5 hours per week can be negotiated with School senior management. The number of Scholars accepted at each call is normally limited to a maximum of 7 or 8 due to the level of funding and time resource available. Successful Scholars are expected to be experienced staff who can evidence the following attributes and experience:

- A proven ability to provide leadership and influence peers in the area of learning and teaching, and/or enhancing the student experience
- Be recognised as an opinion leader within their School/Central Department on issues related to learning and teaching
- A desire to engage with a distributive leadership model to contribute to the University's continuing professional development in learning and teaching
- An ability to interpret and identify areas for improving learning and teaching practice in line with the University and/or School/Central Department current LTAS priorities.
- An understanding of the pedagogy of adult learning, and knowledge of available and emerging teaching and learning methods and assessment practices
- A proven record of achievement in educational design, teaching, learning and assessment strategy development, educational technology and/or curriculum development.

Extending the original Australian Faculty Scholars model, a new role of Caledonian Associate was also created in order to encourage less experienced staff who had an interest in becoming more involved in scholarly activity

[7] Following an internal restructure, leadership of the initiative has shifted to the new Centre for Learning and Academic Development

but who perhaps lacked the confidence to undertake an in-depth, two year action research project. Caledonian Associates do not receive funding, but they are entitled to negotiate workload remission of up to 3 hours per week and access ongoing support from the Caledonian Academy team as well as the wider community of Scholars and Associates.

Initially, applications were invited from individuals with a teaching or student-engaged role. This has now evolved to include colleagues working together as joint Scholars or in small teams of Scholars and Associates. The projects undertaken normally use an action research methodology and are linked to the distributive leadership approach. To date there have been 38 projects involving 38 Scholars and 16 Associates spread across all discipline areas, focusing on topics such as assessment, employability, induction and internationalisation. Re-usable learning objects in health, online induction in biology, virtual worlds in cyberpsychology, blogs and wikis in media journalism and online communication in law are just a few examples of projects to date. Although not a requirement for application, technology enhanced learning is strongly encouraged and features in all but a handful of projects. Indeed it seems that by not insisting on a technology focus, the growth of interest in innovation through technology appears to have been nurtured, with several of the Scholars and Associates adapting their projects to include technology following encouragement from other Scholars, colleagues and their students.

In addition to monthly meetings, the growing network of Caledonian Scholars and Associates is supported by an online community where information and resources can be shared and regular blog updates posted. Information on relevant conferences, events and funding calls is made available, and participants are encouraged to bid for additional small grant funding to help ensure the sustainability of their projects. The emphasis has remained strongly on the principles of distributive leadership throughout, with Caledonian Scholars and Associates gradually gaining confidence in their roles as influential change agents and opinion leaders.

Evaluating the impact

Two reviews of the initiative have now taken place. The first was conducted in 2009 at the end of the first year of operation by an external, international reviewer in order to ensure a level of objectivity. Data were gathered from in-depth interviews with participants, with the analysis also drawing upon the reviewer's experience of evaluating the Australian Faculty Scholars network.

Feedback was highly positive, with obvious support for the opportunities presented by the initiative.

> [We have] a huge amount of praise for the project. We've really appreciated all the support…we've been encouraged to look for dissemination opportunities and to use the networks to build capacity.

The report concluded that,

> The Scholars and Associates Program has proved beneficial to participants in a variety of ways in the initial phase. The Scholars were keen to talk about and reflect on their experience, and many useful suggestions were offered for future Program activities. Further value could be realized by harnessing the creative ideas of those involved. Encouraging their leadership as co-creators of future iterations of the Program would be a true reflection of the distributive leadership concept in action. (Gunn, 2010b:7)

The second evaluation was conducted internally the following year, mainly through focus groups with participants and discussions with a range of stakeholders, including the external reviewers who continually provided valuable insights and suggestions to inform the initiative as it evolved. Again, feedback was positive, although a number of challenges were also acknowledged. The findings highlighted the following issues:

Benefits:

- The distributive leadership model which underpins the initiative was seen as relevant and valuable.
- The competitive application process and the involvement of external experts in the reviewing process was welcomed as it helped to confer credibility and status to the initiative
- The 'two tier' system of Scholars and Associates was considered useful as it gave less experienced staff the opportunity to engage with evidence-based practice and action research at an early stage in their careers

Challenges:

- Participation in the initiative can be influenced by the extent to which informal CPD is encouraged and supported in Schools and Departments.
- Variance in approach is evident in the way Schools and Departments address the recommendation for workload remission for Scholars and Associates.
- The role of the School/Departmental mentor is not always clear

A number of changes have already been made in response to these two evaluations including a move towards more strategically focused calls for applications, acceptance of team applications and encouragement for new Scholars and Associates to build on and extend the work of others. School level support issues are also in the process of being addressed as part of a university-wide restructuring exercise.

The initiative has succeeded in gaining participation from staff in all 6 Schools and Learner Support with a particularly high level of engagement from health and life sciences disciplines (figure 1). It was highlighted during a recent Quality Assurance Agency institutional review of the University as a valuable case study and an authentic example of the distributive leadership approach in action.

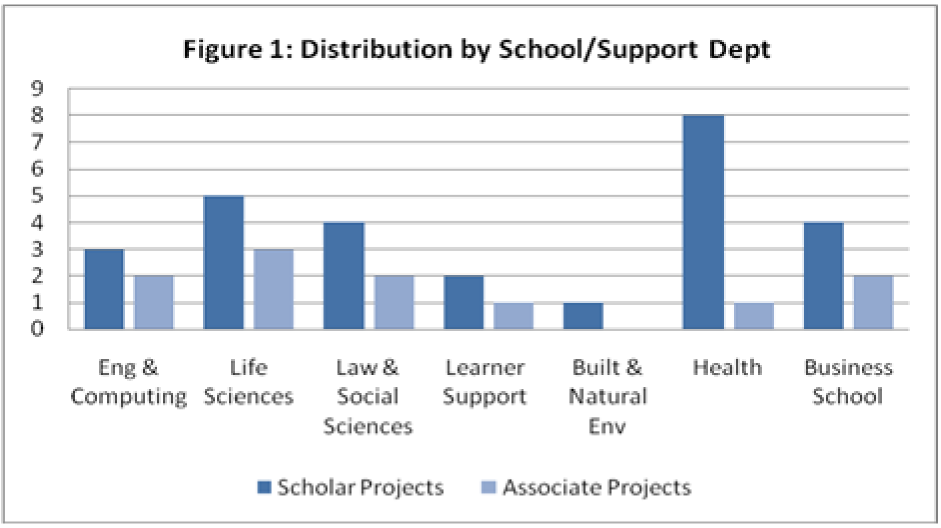

Figure 1: Distribution of projects by School/Support Department

Outcomes

Caledonian Scholars and Associates are required to submit interim and final reports incorporating literature reviews, methodology and outcomes. Findings to date indicate that projects have generally been effective in enhancing the student experience, and valuable recommendations to inform continuing research, scholarly activity and improved practice within modules and programmes have been proposed. In addition, a significant number of national and international conference presentations have been made and papers published in peer-reviewed journals, thus raising the scholarly profile of the individuals concerned and the reputation of learning and teaching at the University. Several Scholars and Associates have been successful in gaining additional small grant funding to extend their projects, both externally through the HEA subject centres and internally through the locally available funding streams.

A key aspect of the Caledonian Scholars and Associates initiative is its alignment with career progression for academics through the learning and teaching route. Several applications for promotion by Scholars and Associates have been successful in the last 2 years, including 3 to senior lecturer and 1 to professor in the most recent (2010/11) promotion round. In addition, a small proportion of Scholars are aligning their projects with doctoral studies. A significant number of Scholars and Associates are either previous graduates of the postgraduate certificate in learning and teaching or current students, demonstrating a clear alignment with progression through the CPD framework. A Caledonian Scholar was the winner of the recently launched (2011) Principal's Award for Teaching, and received particular commendation from the Principal for the creative use of a range of learning technologies. Overall, there is growing evidence of closer links between research, scholarship and academic practice, and a University-wide recognition of their value.

In addition, significant advances are being made in shifting the culture from a technically driven agenda to a more scholarly appraisal of the potential of technology enhanced learning. Literature reviews, action research and a greater awareness of latest thinking in the field are leading to thoughtful, evidence-based approaches which benefit students and teachers alike. Robust approaches to research methodology and data analysis ensure the development of informed and reflective pedagogical practice.

This is evidenced in a variety of ways. One project which focused on the creation of reusable learning objects (RLOs) in health went beyond the original aims by developing a collaborative model for the development of RLOs which can be adapted for use in different disciplinary contexts, and which is attracting interest at a national level through conference presentations. Similarly, a project which focused on induction in the biological and biomedical sciences has drawn on the literature and experiences elsewhere to develop a series of online resources and interactive communication tools for new students which will have an impact beyond the original discipline area. An unexpected by-product has been the involvement of students in developing a series of 'help' videos for the University's virtual learning environment which will be made available to all new students in the coming academic year. A number of the Scholars have also become members of the University's Blended Learning Implementation Group and are actively influencing the development of blended learning across the institution.

Future Development

As the Caledonian Scholar and Associate initiative approaches the end of its third year of operation, consideration is being given to its future evolution. Crucially, there is a need to create continuing opportunities for building capacity in scholarly activity and distributive leadership beyond the completion of Scholar and Associate projects to ensure sustainability (Gunn, 2010a). Whilst it is clear that the distributive leadership model is relevant and effective, it is also evident that given the limited time available for Scholars and Associates to implement their projects during the academic year, leadership activities often only become truly effective on completion of the action research projects. To encourage continuing engagement, a clear pathway for ongoing development is required which builds leadership capacity in learning and teaching while simultaneously strengthening links with personal career development through the learning and teaching route. This is also central to the more advanced stages of the HEA Professional Standards Framework.

The University is now developing a Senior Scholar role specifically aimed at those participants who have successfully completed their Scholar projects or who have demonstrated leadership in advanced learning and teaching activity through a range of other CPD activities. Details have yet to be finalised, but Senior Scholars will have an ongoing remit for embedding innovation in learning and teaching, to further enhance the culture of scholarship in learning and teaching across GCU in line with strategic objectives and continue to build strategic leadership capacity in learning and teaching through cascading their expertise to colleagues .

Conclusion

It is recognised that effecting transformational, cultural and attitudinal change takes time and sustained effort (Garrison, 2011). The university-wide impact of the Caledonian Scholars and Associates initiative is only now becoming increasingly visible following its launch three years ago. During that time, there has been a gradual shift from localised project outcomes to a wider understanding and acceptance of the potential of the distributive leadership model as a means of systematically embedding and rewarding evidence-based practice across the institution. Technology enhanced learning has undoubtedly gained ground as a mainstream learning and teaching activity, underpinned by a growing evidence base and promoted by committed opinion leaders and change agents. Whilst the initiative is facilitated centrally, ownership of projects remain with the participants, their departments and schools, bearing out findings from previous technology-focused transformational change projects that local 'buy-in' is an essential factor in ensuring longer term sustainability(Nicol, 2009; Mayes et al, 2009). The effort expended by Caledonian Scholars and Associates has been acknowledged by peers and by University management, and in several cases, rewarded through promotion, additional funding, student-led teaching awards and an enhanced external profile.

The initiative has not been without its challenges however, primarily with regard to time commitment and internal structural changes. Nevertheless, the ongoing commitment of senior management within the institution to support and expand the initiative is itself evidence of its success to date, as is the fact that this remains a competitive process, providing a valuable stepping stone in scholarly activity for less experienced staff and a means for experienced staff to raise their profile further and improve their prospects for career advancement.

University priorities will inform the future focus and development of the initiative, but the active involvement of staff at all levels within the institution as the living embodiment of distributive leadership principles should ensure an ongoing commitment to scholarly pedagogic practice, evidence-based technology enhanced learning and a high quality student experience.

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Bridging the gap – engaging distance education students in a virtual world

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Following a review of the provision of courses in the School of Information Studies (SIS) program at Charles Sturt University, academics in the school worked with learning and teaching services to design and implement a variety of teaching and learning activities in the online environment in order to address the challenges of distance education (DE). These challenges included high student attrition, lack of motivation, a sense of isolation and a need for greater and improved communication. A new model of teaching was developed with subject provision now fully online, utilising a range of social networking software, with the aim of creating a more engaging and sustaining learning environment to help overcome the isolation often noted by DE students. This paper outlines the outcome of the course review and reports in particular on one aspect, the development of the SIS Learning Centre in Second Life, where students and teachers meet to engage in new and innovative learning and assessment activities designed specifically to encourage greater communication and connectivity between DE students.

Keywords: LIS education, e-learning, distance education, Second Life

Background

The School of Information Studies (SIS) at Charles Sturt University is the largest provider of degree level education for the library profession in Australia, including teacher librarianship, and graduates around half of all the undergraduate and postgraduate Library and Information Science (LIS) students in Australia (Heazlewood, Pymm & Sanders 2006). The success of CSU's LIS programs has enabled the School of Information Studies to build a relatively large faculty, covering the full range of librarianship specialisations, offering nearly 100 subjects across both undergraduate and postgraduate programs. It was from this position of strength that the School approached a faculty restructure in 2008 that significantly altered its lines of reporting and accountability. This restructure provided the opportunity and incentive to review the existing curriculum of the School, with a view to expanding its offerings, improving the distance education (DE) student experience, reducing student attrition and further cementing its predominance in the Australian LIS education market place.

Distance education: facing the challenges

Since 1989, the School of Information Studies LIS programs have been offered in distance mode only. This suits the School's student profile of largely mature-age students, often with family and work commitments, and fits with the University's commitment to regional education. Distance education, of course, entails a number of challenges for lecturer and student. The challenges that need to be overcome include communication difficulties, lack of student motivation, high drop out from courses, provision of support at a distance and a sense of isolation or lack of student community. For instance, Moody (2004) notes that problems such as the mode of delivery, difficulties in establishing a learning community, and a loss of personal contact diminish the value of distance learning and contribute to high attrition rates. Student feedback over many years both within CSU and in the literature more generally (Yildiz & Chang, 2003; Zhao et al, 2005; Beldarrain, 2006; Keppell, Au & Chan, 2006; Garrison & Vaughan, 2008) suggest that building connections and engagement with lecturers and students are important factors in ensuring a positive student experience when studying off-campus.

The School has consistently sought to meet the challenges of distance education by adopting a range of approaches that will effectively engage the distance learner. That it has been successful at this is demonstrated through the success of the courses in a highly competitive field where over the last 30 years a significant number of LIS schools have closed worldwide(see for instance, Barron, 1991; Saracevic 1994; Willard & Wilson 2004; Ocholla & Bothma, 2007; Partridge, Yates, Hughes & Henninger 2010). It has managed this by responding quickly and effectively to the changing environment within which the library and information professions exist and by maintaining close links with the professions it serves. In order to maintain its leading position in what is a rapidly changing field, it has been essential to ensure course materials and teaching strategies have been regularly reviewed and evaluated. The latest course review in 2008 recommended that the courses and their subjects move to a fully online learning environment, in order to provide the platform for exploiting the affordances provided by increased use of educational technology.

This recommendation was adopted and, during the period 2009/2010, 28 new subjects were created and 25 subjects were reviewed, updated and enhanced to run fully in the online environment. To support this work, the school invested in the services of a full-time educational designer, who worked with the curriculum renewal team on course and resource design. The revised courses were launched at the end of 2009 and the results of their first year in operation are now being assessed. One highly positive result has been that for 2010 and 2011, enrolments at both undergraduate and postgraduate levels have risen considerably – for the first year of offering the revised programs, by 15 per cent at the undergraduate level and 36 per cent at postgraduate level.

Central to the new online model is a student-centred curriculum that enables active and collaborative learning. The subject materials consist of a set of learning modules for each subject, with integrated online activities and resources. The modules are accessed through the subject portal, CSU Interact (Sakai), thus ensuring a consistent and familiar online learning environment for students across subjects. The subject outline, interactive discussion forum and other tools for communication, assignment submission, evaluation and web content are accessed through the same portal.

One of the major reasons for adopting an online model was to address two of the key issues associated with distance education – the amount of reading required and the isolation and lack of a communal student experience. In this new learning approach, student development is fostered by providing an environment that exploits contemporary methods of communication, information seeking and knowledge building through the use of social networking technologies. The success of this approach has been confirmed through the positive student evaluations received for those subjects that most strongly engage with the new model, for example, those subjects exploring technology integration in organisations, social networking and digital preservation. As one student in the digital preservation subject noted,

> 'The *Second Life* component of the subject was highly beneficial, especially for the opportunity to interact with fellow students and academic staff beyond the forum and chat room.'

For some students the technology is challenging at first, particularly in those subjects integrating the use of synchronous learning environments such as *Second Life* (Hay & Pymm, 2011). However, the networks and support enabled by the technology provide an enriched learning environment where they share, build and create knowledge with other students as well as faculty. In effect the technology creates an environment where inquiry and learning can take place more effectively and with more enthusiasm than one in which students study in isolation from others. For many, of course, the a range of communication and collaborative technologies are already part of their everyday communication, social and work life and the online learning environment provided as part of their CSU studies becomes an extension of their experience.

Engaging students in learning

The move to online provision of its courses presented SIS with the opportunity to develop a range of coherent and imaginative resources, designed to engage students and foster deep learning. Embedded across all courses are activities designed to suit many learning styles including online readings, short lectures via podcast and video, screen capture demonstrations, online tutorials and activities from a range of sources, including state and national libraries and so on.

The dynamic online learning model adopted by SIS lends itself particularly well to contributions from guest lecturers – academics or professional experts. Inclusion of lectures and tutorials for instance can be spontaneous and opportunist, where previously they had to be planned well in advance and delivered to students with their mail package on video or CDROM. As in the 'real' world, lectures can be recorded in the virtual world and made readily available so that students with different study patterns, or from different time zones, can access them at times convenient to themselves. It also enables experts from around the world to provide high-level lectures, share their knowledge and experience and participate in discussions which would be impossible in any other way. Given the School's strong links with industry, this more ad-hoc approach allows ready participation from leaders in our field at times that suit them.

Thus the expansion of students' knowledge building is facilitated by the new model which affords far greater opportunities to provide up to date and targeted (just in time) resources. Lecturers and students identify and source new resources as they are required and can provide links, resource lists, sometimes in a wiki, or using a social bookmarking tool such as Delicious or Diigo. Lecturers also respond to students with feedback and examples, using audio, screen capture technology or voice-over slide presentations, and uploading them to the online learning environment. Positive student feedback for these revised subjects has been demonstrated by increased response rates to student evaluation surveys – for 2010 across all subjects these averaged over 40 per cent compared to around 33 per cent in 2008 – with large numbers of targeted free text comments commenting positively on this new approach.

> 'LOVED the variety of formats information was presented in. The mini lectures and weekly chat sessions were sooo helpful' (Student feedback).
>
> 'The inclusion of YouTube videos and weekly lecturer podcasts was wonderful' (Student feedback).

Early in 2009 a number of focus groups were undertaken, involving practitioners, employers, relevant professional organisations and other academics to assist in determining future directions for the course. Flowing from this was strong endorsement for the use of social networking platforms and other relevant Web 2.0 applications in order to try to personalise and improve the distance students' experience of online study, as previously cited in the 'Distance education: facing the challenges' section of this paper. .Thus funding was provided to enable all subjects to be redeveloped, with many of these redesigned to make the most of the opportunities offered by the online world and social networking technologies. Thus consideration was given to the use of blogs, wikis, Facebook, Linked In, Skype, Delicious, Twitter, Flickr, YouTube, Etherpad, SlideShare, TokBox, Amazon Cloud Computing and *Second Life* (Hider, Kennan, Hay et al, 2010).

Learning and teaching in *Second Life*

For this last application, *Second Life*, funding was also provided for the development of a CSU presence in this virtual world in order to exploit the potential for DE teaching offered by such an environment. It was anticipated that the *Second Life* CSU-SIS Learning Centre (as illustrated in Figure 1) built in the second half of 2009, would provide an immersive synchronous 3D learning environment offering the opportunity to further develop student interaction and provide space for new and innovative teaching and assessment activities (Hay & McGregor, 2010; Hay, McGregor & Wallis, 2009).

Figure 1: CSU-SIS Learning Centre (ground level) in Second Life

Second Life is a three dimensional virtual world created by Linden Labs in 2003 which can effectively mirror the 'real' world. Users can join this world by creating a virtual presence via an avatar, or by developing space in the form of an island, a building or even a classroom. Within the *Second Life* environment avatars can talk to each other using text chat and voice (VoIP), and interact with each other using movement, gestures and sound. This environment provides distance education students with an opportunity to meet and participate in discussions, debates and excursions, complete simulations and role-play activities, be involved in virtual tours and quests, and listen to real-time lectures and experience interactions with experts as virtual guest lecturers (Gregory, Willems, Wood, et al, 2011; Gregory, Lee, Ellis, et al, 2010).

Warburton (2009) identified a number of affordances that *Second Life* offers, two of which are of particular interest in the SIS project: extended or rich interactions, and community presence (p.421). A synchronous virtual learning space could help students overcome the isolation factor, develop collaborative skills, and experience creative opportunities, all of which are expected to promote greater engagement and learning.

In order to prepare students for the learning tasks and activities they will encounter in *Second Life*, lecturers provide training sessions in the CSU-SIS Learning Centre. A standard training kit has been developed as part of the Learning Centre design to ensure all lecturers and students are provided with the same training and guidance (no matter what the subject). This helps reduce the preparation for staff in providing training sessions, and allows individual students to revisit the instructional slides and learn how to customise their avatar at their leisure.

Undergraduate and postgraduate social networking subjects are offered across three teaching sessions per year. These subjects require students to complete a number of immersive learning activities as part of the curriculum, with some of these being offered in *Second Life*. Students are encouraged to attend online discussion sessions hosted by faculty and guest speakers; join a range of professional and educator groups; attend professional development activities; visit a range of libraries, university campuses, professional and education spaces; and meet with their faculty for individual consultation regarding project design/management and assessment task requirements. All students are required to maintain an online learning journal as part of the final assessment task to demonstrate evidence of their immersive learning experiences throughout the session.

In order to evaluate the success or otherwise of the student and staff experience in *Second Life*, after one year's experience in its use a formal investigation was undertaken. Three broad questions were determined:

- How did faculty feel about the *Second Life* experience?
- How did students feel about the *Second Life* experience?
- Based on student and academic feedback, what recommendations can be made to improve student and staff experiences, and learning outcomes in *Second Life*?

As a case study, the researchers set out to gather a range of quantitative and qualitative data via end-of-session subject surveys; dialogue captured on subject forums, and SL chat logs; and interviews with subject coordinators and other teaching staff. In total, around 70 students were involved via the surveys and the forum/chat sessions.

Feedback from some students who have not previously experienced a 3D virtual environment highlight the concern that it 'takes quite a lot of time' to become familiar with the *Second Life* client, and as a DE learner, if one cannot dedicate the time required to 'play around with it, then you really … use it on a fairly superficial level'. From a student experience perspective, this highlights the need for educators to ensure the use of a virtual world is carefully considered and integrated part of a subject, rather than merely using it as an 'add on'. Overall, students agreed that the benefits of being connected and 'sharing' the same 'space' are worth the effort within the social networking and preservation subjects at CSU.

Students often compare their *Second Life* experience with those on CSU web forums (which is the principle asynchronous tool used for discussion in most SIS subjects), with the latter paling in comparison, 'you really don't get that intimate sort of learning experience'. The desire to receive one-on-one guidance with faculty or in a small group is also powerful motivator for DE students to 'visit' a 3D virtual campus.

The research team concluded that as a result of their experiences in *Second Life*, they are convinced that it offers a powerful tool to improve the DE experience for all students. The technology is mature enough, most students in developed countries have access to sufficient bandwidth, and growing familiarity with Web 2.0 type tools means that, for many students, it is becoming less of an unfamiliar experience. For staff, there is a significant time commitment required to establish the initial activities but, with growing familiarity and use, this time commitment will fall and the benefits in the shape of improved pedagogies and learning outcomes seems to us clear. At the School of Information Studies, it is considered a commitment well worth making.

Conclusion

Issues relating to engagement with DE students and developing their concept of a learning community have been well documented. Today, the opportunities exist to design subjects and courses in such a way as they can make considerable inroads into alleviating these drawbacks. One such learning environment to assist in this is *Second Life* where the creation of a virtual classroom has proven to be highly successful in engaging students and improving their levels of interaction, and indeed their whole learning experience. Trialled across four subjects, its success has led to a wider take-up among staff and it will be interesting to follow through with further studies as students generally become more familiar with connecting in a 3D virtual world.

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Unresolved issues about 'authentic' online learning: Interpretations, assumptions and challenges

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Abstract and Symposium Plan

The focus of the symposium will be a critical exploration and examination of the notion of 'authentic' learning, leading to a discussion of implications and consequences for the design of online learning resources and environments. The symposium will begin with a 5-10 minute overview presented by Barney Dalgarno, in which he will outline a framework containing three specific interpretations of 'authentic' learning, as a precursor to a 5-10 minute presentation by each of the other panel members.

Gregor Kennedy will argue that the concept of authentic learning, although typically operationalised by presenting students with online approximations of 'real-world' tasks and activities designed to promote certain kinds of cognitive processing, reasoning and understanding, often involves the use of media-rich 'skins' as a prelude to the main educational task. Gregor will specifically critique the use of these media skins.

Helen Farley will discuss the potential of 3D virtual worlds as sites for authentic learning, arguing that despite the fanfare, significant shortcomings need to be addressed in order to reliably harness that potential. Helen will examine limitations of virtual worlds including their lack of haptic feedback, inappropriate sensory feedback, and difficulties associated with movement mediated through a keyboard and mouse.

Mark J.W. Lee will discuss authentic learning in open and distance education, arguing that many learners are situated in professional environments offering highly meaningful contexts for learning yet educators often favour fictional scenarios and artificial simulations. Mark will maintain that, in striving to promote learning that is meaningful and relevant to students in their professional lives, the notion of 'creating' an authentic

environment is something of a contradiction in terms.

Finally, **Barney Dalgarno** will draw together these ideas, relating them back to the framework introduced at the outset, before opening the symposium to the floor for 30 minutes of questions, comments and debate.

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Institutional support for and barriers to the use of 3D immersive virtual worlds in higher education

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Anecdotal evidence suggests that despite recognising the potential benefits of 3D immersive virtual worlds for learning and teaching, many academic staff have chosen not to adopt them, due in large part to the complex array of technical and policy hurdles that must be negotiated in order to make use of such resources within higher education institutions. This paper presents selected results from the questionnaire phase of an Australia and New Zealand-wide scoping study of the use of 3D immersive virtual worlds in higher education. The particular focus in the paper is on findings from the questionnaire about support provided within institutions, technical and other barriers encountered by those considering adoption, and whether and how these were overcome.

Keywords: 3D immersive virtual world, *Second Life*, institutional support, technical issues

Introduction

3D immersive virtual worlds such as *Second Life, Active Worlds* and *OpenSim* have garnered considerable attention and interest in recent years, with many higher educators seeing great potential for supporting and enhancing learning and teaching. In line with this growing attention and interest, studies of uptake and usage of these environments in higher education institutions have yielded evidence of steady growth (see, for example, Dalgarno, Lee, Carlson, Gregory & Tynan, 2010, 2011; Kirriemuir, 2007a, 2009c, 2010b). In spite of this, anecdotal evidence and evidence from the literature suggests academic staff who have used virtual worlds in their teaching have done so despite being met with numerous technical barriers and, in some cases, policy barriers within their institutions. It may therefore be reasonable to assume that there are many other staff who have intended or planned to use the technology in light of its potential learning benefits, but have not done so because of these barriers.

This paper reports on selected data collected from a sector-wide questionnaire administered as part of a scoping study on the use of virtual worlds in higher education in Australia and New Zealand, which is being undertaken by researchers at Charles Sturt University and the University of New England with support from the Distance Education Hub (DEHub at http://www.dehub.edu.au/) consortium. Earlier publications from this project (Dalgarno et al., 2010, 2011; Lee, Dalgarno, Gregory, Carlson & Tynan, 2011) have reported on the range of discipline areas in which respondents have used virtual worlds and the types of virtual world-based learning activities they have designed for their students to undertake. In the present paper, the particular emphasis is on the aspects of the questionnaire data relating to institutional support, barriers encountered and ways in which these have been mitigated or overcome. It is hoped that the findings and insights presented here will be of value to academic staff considering introducing such environments into their teaching by helping them become aware of some of the issues they may face at an early stage in their planning.

Background

The following definition of a '3D immersive virtual world' (hereafter referred to as a virtual world) has been adopted for the present study's purposes:

> a computer-based, simulated environment in which users are able to immerse themselves, and within which they are able to, through their avatars (computer-based representations of themselves or alternative selves), experience, manipulate, interact with and/or create virtual objects and places that are graphically depicted in three dimensions. The objects and places within a virtual world may be modelled according to those in the real world or may be fantasy based. Most current virtual world applications allow for multiple users and include facilities that enable users to communicate and interact with one another within the virtual environment. (Lee, 2010, p. 2)

In 2007, the New Media Consortium's *Horizon Report* (NMC and EDUCAUSE Learning Initiative, 2007) singled out virtual worlds as one of the emerging areas likely to impact higher education within a two to three-year timeframe. The inaugural edition of the Australia–New Zealand version of the *Horizon Report*, which was released in the following year (Johnson, Levine & Smith, 2008), named 'virtual worlds & other immersive digital environments' as technologies to watch with a time-to-adoption of one year or less. The number of virtual worlds in existence is ever on the rise, with numbers predicted by some to exceed 900 by the year 2013 (Mitham, 2008), but Linden Labs' *Second Life* is widely acknowledged as the most popular platform in higher education. Cummings (2010) estimates that approximately 750 institutions operate their own islands in *Second Life*, which does not take into account those that own smaller parcels of virtual land.

Recognising the clear increase in interest in and usage of virtual worlds in higher education and the specific prominence of *Second Life*, Warburton (2009) cautions that the pedagogical promise and value of this new technological environment must be appropriately weighed against the barriers to managing and using it for learning and teaching. He outlines eight broad issue areas that represent barriers relating to the use of *Second Life*, based on a survey of Internet newsgroups, blogs and extant literature:

15. *Technical issues*, including bandwidth, hardware, firewalls, downtime and lag as well as usage problems such as navigation, object creation and avatar manipulation.
16. *Identity issues* faced by users as they grapple with the fluidity and playfulness inherent in identity construction in the virtual world.
17. *Cultural issues* such as the difficulty of finding, developing a sense of belonging to and becoming an active participant of an in-world community, as well as the need to become comfortable and familiar with the codes, norms and etiquette rules of the virtual world.

18. *Collaboration issues* that have to do with the challenges in cooperation and co-construction within a virtual world, and the minimal social networking tools and functions available.
19. *Time issues* and the associated workload impositions on educators in not only mastering the technology but also designing and implementing learning activities and resources that make use of the technology in pedagogically sound ways.
20. *Economic issues*, including the cost of purchasing land, uploading images and textures, buying in-world objects/tools, and employing skilled people to perform building and scripting tasks.
21. *Standards issues*, specifically the lack of open standards and interoperability between virtual world platforms, which limits educators' and institutions' ability to transfer resources between platforms.
22. *Scaffolding persistence and social discovery issues*, the former of which arise from the fact that although the virtual world itself is persistent, persistence for avatars only exists when their users are online, and the latter of which are due to the limited functionality of the in-world profiles associated with each avatar as compared with egocentric social networking services on the Web such as *Facebook* and *LinkedIn*.

Building on the widespread interest and acknowledged potential of virtual worlds, a number of sector-wide and cross-sector reports on their use in education have been published in Europe and North America, but the DEHub virtual worlds scoping study is the first of its kind focusing on the Australasian region. The overseas reports are optimistic about the opportunities and potential offered by the technology, but also highlight a number of challenges and barriers that exist. For example, one of the earliest of these reported on the results of a May 2007 survey run by the NMC (2007) in the United States to collect information on the activities, attitudes and interests of educators in *Second Life*. Of the 209 respondents, 113 (54%) claimed they were involved in an education-related activity in *Second Life*. The respondents to the NMC survey were also asked to describe their most positive and negative experiences in *Second Life*. The positive experiences described related predominantly to the richness of in-world interactions and the opportunities for meeting new people and to expand social and professional networks, in addition to the generosity of the in-world community in offering assistance. Respondents most frequently cited issues of a technical nature, including the steep learning curve required to master the software, as being among the most negative aspects of their experiences.

In the same year the NMC survey was carried out, the US-based EDUCAUSE Center for Applied Research released a research bulletin on *Second Life* in education, drawing on extant literature as well as on interviews with various North American educators and innovators in the area (Kelton, 2007). The diverse examples of virtual world use in higher education showcased in the bulletin demonstrate some of the many applications that are possible. Nevertheless, the author warns that "[h]istory has proven that higher education incurs real risk when entering into a close alliance with a for-profit company when consistency for academic purposes is such an important issue" (Kelton, 2007, p. 9), and discusses a number of obstacles to broad-scale adoption of the technology. He echoes the NMC survey respondents' comments about technical problems and the complexity of using the *Second Life* software, and moreover observes that "[b]ecause those involved with Second Life appear to be having fun, some have come to question it as a serious teaching, learning, or research tool" (p. 8). In a later article Kelton (2008) expands on this discussion, classifying the challenges into four major categories:

- *Perceptual:* This includes challenges caused by the misconception that virtual worlds are all games, as well as other negative ideas about the use of virtual worlds in education that are perpetuated by the mass media.
- *Technical:* While technical issues relating to bandwidth, processing and memory will be overcome with time, two major technical hurdles needing to be addressed at this time, according to Kelton, are the lack of tools for facilitating truly collaborative interactions between users in real time and the lack of interoperability between the different virtual world platforms.
- *Operational:* The three main issues in this category are the need to learn how to use the tool, the occurrence of server downtime and the existence of legal age restrictions.
- *Pedagogical:* This category relates to the educational value and assessment of the technology as well as the intellectual property and ownership issues involved.

The UK Joint Information Systems Committee (JISC) scoping report on 'serious virtual worlds' (de Freitas, 2008) also identified a number of opportunities and challenges facing their use for educational purposes. It named creating more engaging, personalised and student-centred learning experiences, especially for hard-to-reach and unmotivated learner groups as well as those studying at a distance, as a particular area of opportunity, along with providing support for learners with disabilities or mobility issues to help reduce the need for them to travel. Other opportunities suggested by that report include empowering learners to construct their own spaces, content and activities, facilitating cross-disciplinary collaborative research and learning initiatives, as well as mixing or 'blending' virtual and real spaces and experiences. Some of the challenges identified by the JISC report include accessibility and the need for broadband connectivity, the development of open standards, and the provision of support for practitioners in the form of guidelines, case studies and implementation models.

Also in the UK, John Kirriemuir has conducted a number of 'snapshot' surveys sponsored by the Eduserv Foundation examining the uptake and use of virtual worlds in British universities and colleges, the findings of which are documented in a series of rolling reports. Eight reports in the series have been produced thus far (Kirriemuir, 2007a, 2007b, 2008a, 2008b, 2009a, 2009b, 2009c, 2010b) – the first four were funded by Eduserv as individual investigative projects, and the rest were published under the auspices of Virtual World Watch. The eight snapshot reports successively display an upward trend in the numbers of academics and universities that are using virtual worlds, so that by the time of writing the Winter 2009 report (Kirriemuir, 2009c), evidence had been found of the technology being used to some degree at all but one university in the country. The first few of the snapshots in the series pointed to problems in terms of the negative reactions staff using virtual worlds were receiving from their colleagues and peers, but the later snapshots indicated that the situation in this regard was slowly improving over time. Workload levels, funding, resources and support appear to be persistent complaints, as do technical issues, causing the need for staff to put in large amounts of their personal time in order to sustain their projects and efforts in this area. Kirriemuir (2010a) expounds on his findings in relation to technical support in an article published in a special issue of the journal *Educational Research*. Drawing on qualitative data gathered from the first six snapshot surveys, he lists four categories under which comments from respondents about technical issues fell: 'updating the Second Life viewer', 'technical capability' (i.e. hardware, software, network), 'port, firewall and proxy issues' and 'lack of knowledge of virtual world use in education' (on the part of IT support departments). Based on the survey data as well as informal correspondence from academics, he details a number of recommendations in the way of possible solutions to the technical obstructions and limitations, arranged under the headings of 'IT awareness of virtual worlds in teaching and learning', 'national minimum standards for IT innovation support', 'flexibility of high-end IT provision in universities' and 'greater production of support materials and software by Linden Labs'. According to Kirriemuir (2009c), where institutions have managed to overcome institutional technical barriers and support issues, substantive virtual world developments have taken place.

Evidently, despite the substantial interest in virtual worlds among academic staff and the growing body of examples and success stories of the use of such environments in higher education learning and teaching, the international studies reviewed above show that a number of important issues and challenges are frequently encountered. To some extent these issues are similar to those identified in studies of early adoption of other technologies for learning and teaching in higher education. For example, Samarawickrema and Stacey (2007), in a study of adoption of learning management systems (LMSs), found that academic time, technology problems and funding limitations all impacted upon successful adoption. Similarly, in a review of studies spaning five decades in the school education sector, Leggett and Persichitte (1998) pinpoint time, expertise, access, resources and support as key implementation obstacles.

The aim of this paper is to report specifically on the issues faced by academic staff in Australia and New Zealand when integrating virtual world technology into their teaching.

The study

In early 2010, supported by funding from DEHub, the authors began a comprehensive scoping study of the use of virtual worlds for higher education learning and teaching in Australia and New Zealand (see Dalgarno et al., 2010). This scoping study, which will conclude in 2011, involves a systematic review of current and planned applications at institutions across the two target countries, with the goal of capturing and understanding how virtual worlds are being used across universities and disciplines. The present paper reports on a portion of the data acquired from an online questionnaire completed by 117 Australian and New Zealand higher education staff in June-August 2010 as part of the scoping study.

The questionnaire was developed using an iterative process, including pilot testing by 10 respondents prior to the creation of the final version. *SurveyMonkey* (http://www.surveymonkey.com/) was used as a delivery platform for the questionnaire, and it included questions grouped into the following sections: demographic data; views and beliefs about the potential of virtual worlds for learning and teaching; summary information about subjects/units in which virtual worlds had been used; detailed information about a single subject/unit in which virtual worlds were used; and success factors and barriers to the use of virtual worlds in learning and teaching. The present paper draws on the questionnaire items concerning respondents' experiences as they pertain to institutional support and problems encountered, in addition to those soliciting respondents' advice and recommendations for the future. As well as approaching individuals directly via email to request their participation, the questionnaire was made available through various electronic mailing lists/listservs and web-based communities. As an incentive, those completing the questionnaire were able to opt to be placed in a draw for a chance to win their choice of either an 8GB iPod Touch or $250AUD paid as Linden Dollars (the currency used in *Second Life*).

Following on from the questionnaire phase of the scoping study, interviews are currently being conducted with up to 30 people from the questionnaire respondent list in order to allow more in-depth information and insights to be obtained. These interviews are semi-structured and approximately 60 minutes in duration. A cross section of participants from a range of institutions, including academics from various discipline groups, educational designers/developers and IT support staff, are being interviewed. The results from the interviews will be reported in future publications.

Findings

Respondents

The 117 respondents to the questionnaire included 59 males, 56 females and 2 who did not specify their gender. There were 9 respondents in the 26-35 years age range, 40 in the 36-45 years age range, 46 in the 46-55 years age range, 19 in the 56-65 years age range, and 1 in the over 65 years age range, with 2 who did not specify. Of the 117 respondents, 89 were academic/teaching staff, 9 were educational designers/developers, 6 were learning and teaching management staff, 7 were research students or other research staff, and 6 did not specify their job roles. The respondents included 82 from Australia and 35 from New Zealand. 62 of the respondents indicated they had actually used virtual worlds in their teaching, and this group identified 125 discrete subjects/units in which they had done so. These 62 respondents were asked to complete a section of the questionnaire in which they were invited to provide more detailed information about one particular implementation of virtual worlds in their teaching.

Summary of platforms used and support provided

As part of the more detailed information provided about a single implementation of virtual worlds, the majority of participants (49 or 79%) indicated that they had used *Second Life* as the platform, with *Active Worlds* (4 or 6.5%) being the next most commonly used platform, followed by *OpenSim* (2 or 3.2%) and *There.com* (1 or 1.6%). Respondents were also asked whether a virtual world, island or space was developed specifically for the purposes of the subject/unit, and if so, they were asked to provide details. 31 respondents indicated that they had developed a world or space specifically for the subject, while 25 indicated that they had not. An analysis of the additional details provided revealed that 13 of the respondents had purchased new land or space, 12 used an existing space with 7 of these indicating that they had developed new environmental features within it, and 3 rented or borrowed a space, with one of these indicating that they had developed new environmental features. Most of the Australian participants who used an existing island or space indicated that their institution owned it, while a number of New Zealand respondents indicated that they used land provided by the SLENZ group (see http://slenz.wordpress.com/).

Respondents were asked whether they had drawn on the support of other staff within their institution, and if so were asked to give details. 31 respondents specified that they had drawn on such support, while 25 specified that they had not. In providing details about who provided the support, 16 listed IT support staff, 9 listed educational designers, 6 listed academic colleagues, 3 listed casual staff or students, 2 listed project officers and 1 listed library staff. Respondents also listed 10 categories of support provided. Consistent with the fact that the most frequently cited support role was IT support, almost all of the categories of support related to IT aspects of the work rather than pedagogical aspects. Specifically, 9 mentioned the solving of connectivity or firewall issues, suggesting that many university networks do not readily allow the use of virtual worlds. Additionally, 8 mentioned that they had received support with the development of the environment, which perhaps illustrates that developing environmental features within a virtual world is still not something that most academics can be expected to do themselves. Other categories of IT-related support included support with installing and configuring software (5 responses) and the provision of ongoing technical support (4 responses). Non-IT categories of support that were identified included the running of workshops for staff or students (3 responses) and pedagogical support (1 response).

Respondents were asked whether they had obtained dedicated funding to support their implementation and/or use of virtual worlds in the subject/unit, and if so were asked to provide details. 30 respondents indicated that they had received funding, while 26 indicated that they had not. The funding sources described were categorised according to whether they were research (5 responses), learning and teaching (13) or not specified (7), and whether they were internal within the institution (11), external (3) or not specified (11). The most commonly described grant source was internal learning and teaching grant funding (8 responses). The fact that more than half of the respondents had relied on some sort of funding beyond the normal funding allocated for teaching implies that the use of virtual worlds is still at the early-adoption stage. If and when it becomes more mainstream and grows into a standard component of the university teacher's technology toolkit, it is conceivable that the need for separate, dedicated funding and support will fade.

Limitations identified and problems encountered

Respondents who described a particular implementation of virtual worlds were asked to describe the main problems and stumbling blocks that impeded their efforts. In addition to this, all participants were asked to list up to five general limitations/disadvantages of virtual worlds for university learning and teaching, the three most significant barriers and the three most critical success factors in the implementation and use of virtual worlds in university learning and teaching. There was considerable overlap in the answers to these four questions, so they were coded using a common set of categories. 26 categories were identified and these were then clustered into 7 higher-level categories: technology (see Table 1), support, funding and time (see Table 2), usability and familiarity (see Table 3), equity and ethical issues (see Table 4), inherent limitations of virtual worlds (see Table 5), acceptance of virtual worlds (see Table 6), and management and planning (see Table 7).

The most frequently mentioned problems were those under the broad category of technology. As shown in Table 1, the main technological problems identified were lack of sufficient bandwidth, firewall issues, hardware requirements and audio problems. In alluding to bandwidth as an issue, most did not specify whether the problems were at the student's or the institution's end, but it appears from the wording used (e.g. "broadband issues") that they meant home rather than university Internet bandwidth. A number talked about poor performance as an issue, which was in some instances put down to the bandwidth and in others to the computer hardware used on campus. An additional technological problem reported in several instances was difficulties in getting in-world audio communication to work. More general technological problems represented in the data included reliability of student Internet access and problems with students getting the virtual world software to work on their computers off campus.

Table 1: Technological problems, limitations and success factors

Category	Number of mentions as a limitation	Number of mentions as a barrier	Number of mentions as a success factor	Number of mentions in relation to a particular subject
Bandwidth	47	19	6	14
e.g. *"limited to people with broadband Internet"* *"connecting from home always presents the user with problems in our regional area"*				
Firewalls and other IT policy issues	34	31	18	10
e.g. *"campus IT infrastructure limitations (bandwidth, security firewalls, etc)"* *"firewalled at the University so all work by the respondent done at home after hours"*				
Hardware requirements	25	11	8	6

e.g. *"availability of computers with the necessary system requirements whether they be university or the students' own computers"* *"some students did not have the technology to enable them to enter Second Life which is why it could not be compulsory"*				
Audio problems	2	0	2	4
e.g. *"initial problems with voice for some students"* *"there were technical issues of trying to get students to talk (in real time) to each other (voice and text)"*				
General technology requirements or problems	32	18	10	9
e.g. *"some students weren't able to get their software to run on their computer"* *"challenges in configuration of applications on desktops"*				

Table 2 lists issues associated with lack of support, funding or time to devote to the activity. A distinct message here is that successful implementation of virtual worlds requires management and IT support together with additional funding, coupled with substantial time commitment from the lecturer. It is not clear from the responses the degree to which the availability of land through the SLENZ group was helpful to New Zealand participants in getting started with the use of virtual worlds in their teaching, but one might expect that it may have at least partially reduced the funding needed at the initial stages.

Table 2: Support, funding and time related problems, limitations and success factors

Category	Number of mentions as a limitation	Number of mentions as a barrier	Number of mentions as a success factor	Number of mentions in relation to a particular subject
Time commitment	25	23	17	5
e.g. *"commitment and enthusiasm of lecturer for that mode of pedagogy"* "[lack of] *time to devote to project"*				
Cost and funding	19	26	12	4
e.g. *"cost to students and institutions (Internet charges, land rentals, etc)"* *"lack of resources to keep application current and well supported in a teaching context"*				
Management support	5	7	11	0
e.g. *"support from intuitional management/ IT department on board – i.e. the infrastructure issues"*				
Resources – general	0	0	6	0
e.g. *"sufficient resources to build something worthwhile"*				
Support – general	16	16	32	4
e.g. *"support across the university from academic and general (IT support) staff"* *"lack of understanding/help from IT support"*				

Table 3 lists the problems identified that were linked to staff or student ability to use the relevant software. Some referred to students' IT skills as the major problem, while others cited their own learning curve or the lack of familiarity of their academic peers as an issue. Still others laid blame on the software's usability.

Table 3: Usability and familiarity problems, limitations and success factors

Category	Number of mentions as a limitation	Number of mentions as a barrier	Number of mentions as a success factor	Number of mentions in relation to a particular subject
Student user familiarity and learning curve	24	7	5	8
e.g. *"getting students au fait with the mechanics of the 3D world, how to move around ..."* *"students slow to acquire requisite control of the technology and interface"*				
Academic user familiarity and learning curve	12	13	8	3
e.g. *"many lecture*[r]*s are still new to us*[ing the] *3D environment"* *"colleagues are generally 'scared' of learning to use SL* [Second Life]*"*				
General user familiarity and usability of software	13	7	8	8
e.g. *"complex software that is difficult to learn"* *"challenges with setup and the proficiency learning curve / intuitiveness"*				

Table 4 summarises responses relating to ethical or equity issues. These included inappropriate behaviour by students and others in the virtual world, the problems of obtaining institutional clearance to use virtual worlds in teaching, and the difficulty of ensuring all students had access.

Table 4: Equity related and ethical problems, limitations and success factors

Category	Number of mentions as a limitation	Number of mentions as a barrier	Number of mentions as a success factor	Number of mentions in relation to a particular subject
Ethical issues	23	3	1	1
e.g. *"possible griefing by rogue users"* *"supporting unsocial character development"* *"getting ethical clearance to use a 'social networking' tool with students"*				
Equity issues	3	3	0	0
e.g. *"access and equity – financial and age restraints"*				

Table 5 summarises responses identifying inherent limitations of virtual worlds as tools for learning and teaching. Issues highlighted included problems with communicating through an anonymous avatar and limits in non-verbal communication in a virtual world, a lack of clarity about the actual learning benefits of virtual worlds, limits in the authenticity or fidelity of visual simulations in a virtual world, and the potential for students to be distracted by the game-like appearance of a virtual world or by irrelevant objects and avatars within the world.

Table 5: Inherent limitations of virtual worlds and associated problems, limitations and success factors

Category	Number of mentions as a limitation	Number of mentions as a barrier	Number of mentions as a success factor	Number of mentions in relation to a particular subject
Limitations of communication mode	18	1	1	0
e.g. *"not being able to identify people outside of the avatar appearance"* *"interaction is very much through an interface, face-to-face behaviour and practices could be lost"*				
Need for clarity of learning benefits	9	8	16	0
e.g. *"needs to provide opportunity not possible in other methods"*				
Limits in the authenticity of the representation	4	0	0	0
e.g. *"possible missing of steps in real world process unless the virtual experiment is set absolutely accurately"*				
Student distraction by virtual world or game like appearance	6	0	0	0
e.g. *"technology can distract from learning"*				

Table 6 lists problems associated with student or academic acceptance of the potential value of virtual worlds for learning and teaching. A recurring issue here seemed to be the fact that students and other staff often did not initially see in-world learning activities as something to be taken seriously.

Table 6: Acceptance of virtual worlds and associated problems, limitations and success factors

Category	Number of mentions as a limitation	Number of mentions as a barrier	Number of mentions as a success factor	Number of mentions in relation to a particular subject
Student acceptance	15	7	9	8
e.g. *"student reluctance to use the technology"* *"students were concerned about the validity – saw it more as fun than as a learning tool"* *"students thought it was weird and decided against it"*				
Academic staff acceptance	11	6	13	1
e.g. *"when it is not valued by current assessment, students and staff do not usually value it"* *"general scepticism of other faculty"*				
General acceptance	8	17	6	2
e.g. *"bad press of VWs – although dropping off",* *"resistance to a new paradigm concerning teaching and learning"*				

Table 7 summarises responses in which management and planning issues are highlighted. The need for careful and considered planning in terms of the design of both the environment and the learning activities was heavily represented in the questionnaire data. Difficulty in organising for students and staff to be able to synchronise given their diverse locations, time zones and commitments was another recurring problem identified. Many respondents stressed the importance of opportunities for professional development and for sharing and collaboration between teaching staff involved in the use of virtual worlds.

Table 7: Management and planning associated problems, limitations and success factors

Category	Number of mentions as a limitation	Number of mentions as a barrier	Number of mentions as a success factor	Number of mentions in relation to a particular subject
Planning for learning (content, outcomes, timelines)	12	1	32	0
e.g. "[need for] *clear purpose and goals in the implementation*"				
Design and development of the environment	10	0	7	0
e.g. *"creation of useful, repeatable simulations can be difficult"*				
People synchronisation issues	6	2	0	0
e.g. *"time zone differences can make synchronous participation challenging"*				
Continuity as subject is revised and/or teaching staff changed	0	3	0	0
e.g. *"the way courses are passed from lecturer to lecturer inhibits continuity"*				
Need for workshops, meetings, training	0	0	6	0
e.g. *"professional development of staff that includes pedagogical changes and task modification needed to maximise new learning opportunities in 3D"*				
Need to collaborate with others	0	0	5	0
e.g. *"good support from educational community and good contacts with relevant people"*				

Solutions offered

Respondents describing a particular implementation of virtual worlds in university teaching were asked what they had done or planned to do to overcome these problems. All respondents were also asked what additional advice and/or recommendations they had for other university colleagues contemplating the use of virtual worlds for learning and teaching. Responses to these two questions were coded using a common set of categories and the results are summarised in Table 8. Interestingly, although the vast majority of the problems identified (see tables above) were technology related, the most frequently mentioned recommendations had to do with professional development (primarily suggesting that the more professional development undertaken by the lecturer, the better), followed by recommendations related to learning design (a common theme here being that the use of virtual worlds requires a clear pedagogical purpose). There were, however, a number of recommendations related to the virtual world platform (often suggesting a move away from *Second Life* to other platforms), IT support (especially the need to obtain approval to bypass or 'punch through' the firewall) and computer laboratory infrastructure. The value of research, scholarship and networking were also underscored, along with the need for ongoing time commitment and for thorough planning.

Table 8: Recommendations and advice

Category of recommendation	Number of times mentioned in relation to overcoming problems in a particular subject	Number of times mentioned as additional advice or recommendation
Professional development	11	6
e.g. *"I will continue to learn as much as possible myself so as to enable me to reduce my reliance on technical assistance"* *"Attend classes, meetings, events and explore in the virtual world to learn from others and don't limit this to universities"*		
Learning design	6	8
e.g. *"Continue to develop lesson designs, tools, the environment and the bots to the point where they overcome the ... challenges and enable the learner experience of interacting with the environment"* *"Has to be a purpose for the learning other than simply being in SL* [Second Life]*"* *"We used machinimas to overcome the problems we encountered during the design stage"*		
Technology infrastructure	8	1
e.g. *"Put in a case for a new lab with equipment designed to facilitate SL* [Second Life] *teaching";* *"Provide open access to labs were students can practice and play in SL* [Second Life]*"*		
Virtual world platform	8	0
e.g. *"Moved to an open source platform (Project Wonderland) so we could work with Java and not pay a third party for ... land"* *"moved to OpenSim on a LAN to avoid dealing with Linden Labs"*		
IT support	5	3
e.g. *"Made submissions to ICT regarding access – firewalls are supposedly coming down* [next year]*"* *"collaborative approach to dealing with the politics of getting it through the damn firewall"*		
Research, scholarship and evaluation	5	3
e.g. *"More focused research to explore the factors effecting 'intuitiveness' as it pertains to Second Life and medical education"* *"One current 3D MUVE project has benefited from the experiences of the earlier encounters and this has resulted in design elements helping to facilitate student engagement"* *"Read what others have done in this field"*		
Networking	3	5
e.g. *"I networked with other people using Second Life in education, in particular the New Media Consortium"* *"network and connect with the 'experts' and mentors who are already using VWs in education"*		
Policy and support	2	6
e.g. *"Attempted to explain to the gatekeepers that if innovation is desired then gates must be opened and barriers removed"* *"Give yourself time and get support"*		
Time and commitment	2	5

e.g. *"It takes time to get on top of the virtual world and its capabilities but once you have reached a sufficient level of familiarity the potential for creating engaging and effective learning experiences is boundless"* *"Also be prepared to commit substantial time to the effort, but have fun in doing so"*		
Planning	0	3
e.g. *"Make sure that resource requirements (R&D, support, hardware, software) for a proposed system are detailed and costed in advance"* *"Plan everything. Have a Plan B, and a Plan C, and a Plan D"*		

Discussion and conclusion

This paper has provided a summary of the experiences and perspectives of 117 respondents to a questionnaire relating to the use of virtual worlds for higher education learning and teaching in Australia and New Zealand. In particular, the paper has summarised the platforms used, the problems and limitations encountered and the solutions to these problems offered by the respondents. Many of the problems and limitations identified by respondents – including 'time commitment' and 'support' – are reminiscent of those that have emerged from other university technology-adoption studies (e.g. Wilson et al., 2000; Kilmon & Fagan, 2007; Samarawickrema & Stacey, 2007), while others relate more specifically to the use of virtual worlds – for instance, 'limits in the authenticity of the representation' and 'student distraction by virtual world or game-like appearance'.

As with earlier studies and reports from other countries (see, for example, Warburton, 2009; Kelton, 2007, 2008), the most frequently reported problems in the present study were technological in nature, with bandwidth and firewall issues along with hardware requirements to use the client software being the most commonly raised. Another issue identified by many respondents related to the learning curve students and academic staff are confronted with as they attempt to become adept at using the software; this mirrors findings from the NMC (2007) survey. Evidence from other studies suggests that these technical and usability challenges will gradually be overcome, and research and development initiatives around the world are yielding useful, evidence-based resources such as practical guides and handbooks to assist academic staff in their use of virtual worlds in their teaching (see, for example, de Freitas & Rebolledo-Mendez 2008; Savin-Baden, 2010). Nevertheless, it is apparent that from a technical perspective, online learning and teaching cannot be undertaken as seamlessly in a virtual world as it can when using other more established technologies provided within institutional LMSs.

The theme of institutional support was also prominent in the questionnaire responses, including both the need for management support and provision of resources as well as the need for ongoing technological support. A related issue that emerged was the need for funding for virtual environment development and additional time allocation for teaching staff. These issues were also emphasised by Warburton (2009), as well as by Kirriemuir (2010a) in his article on UK university and college technical support for *Second Life* developers and users and in his various snapshot reports. It is important to additionally note that the questionnaire was administered during 2010, prior to the decision by Linden Labs to remove educational discounts on the purchase and rental of land in *Second Life* (Linden, 2010). Consequently, it is likely that cost issues are even more pronounced for higher educators now than they were at the time when the data were collected.

Similar to the findings of Kelton (2007, 2008), an additional problem commonly reported by the questionnaire respondents in the present study was a lack of acceptance by staff and students of virtual worlds as legitimate or 'serious' learning tools. This had implications for a number of respondents, as manifested in a lack of 'buy in' on the part of students and other academic staff. Like Warburton (2009), who described problems with students being unfamiliar with the behavioural norms of virtual worlds, a number of respondents identified anti-social in-world behaviour as a concern. These types of problems are likely to remain while the use of virtual worlds is an activity undertaken only by a small proportion of the population, but could be expected to diminish as usage becomes more mainstream. Bowers, Ragas and Neely (2009), in a study of post-secondary instructors' adoption of virtual worlds, found that 80% of respondents were in either the first ('innovators') or second ('early adopters') stage of Rogers' (2003) five stages of technology adoption. Findings from Kirriemuir's UK-based snapshot reports (see, for example, Kirriemuir, 2007b, 2010b) imply that there are specific issues faced by these early-stage adopters.

Solutions and recommendations for the future offered by respondents included the need for professional development, clear planning from both a technological and pedagogical perspective, and networking with other educators with experience in the use of the technology. It is prudent to note that despite the emphasis in this paper on the negative aspects of respondents' experiences, elsewhere in the questionnaire, they were asked about the degree to which a series of possible learning benefits actually occurred during the implementations of virtual worlds they described. Their responses to these questions were highly favourable – for example, 93% of respondents expressed agreement with the statement "the use of 3D immersive virtual worlds was motivating and engaging for students", 84% agreed with the statement "the use of 3D immersive virtual worlds led to more effective collaborative learning", and 87% agreed that "the use of 3D immersive virtual worlds allowed learners to learn through experiences in context". There is evidence to suggest that many of the problems and obstacles respondents faced were to a large extent surmounted, and from their perspective, valuable student learning can and in fact did occur.

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Leveraging technology for engaging learning design

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Web 2.0 tools alone do not teach or result in effective or meaningful learning. A review of literature on evolving learning designs based on the tenets of Pedagogy 2.0 (Lee & McLoughlin, 2010) highlights four contributing elements of design for socio-constructivist learning environments: authenticity, motivation, scaffolding and skills development. This paper details an innovative learning design for the integration of technology to provide flexible access and encourage engagement while facilitating the development of knowledge management skills in an undergraduate course. A combination of technologies and strategies were used to encourage students to sufficiently engage in the assessment tasks. These were: course website for information provision, WebQuest for scaffolded instructions, wiki for collaboration and social bookmarking for sharing and reviewing references. The evaluation of the learning design was generally positive with students reporting increased 'tech savvyness'. However, a significant challenge was facilitation of equitable and synergistic group work which is central to socio-constructivist learning designs. Future iterations of the design will focus on this aspect in addition to encouraging student engagement with the Web 2.0 tools that were underutilized this time.

Keywords: Web 2.0, Pedagogy 2.0, digital literacy, learning design, personal knowledge management, WebQuest

Introduction

Technology integrated teaching is always a challenge, even more so when teaching first year courses. Assumptions are made about the digital literacy and technical skills possessed by students. The notion of them being 'digital natives' (Prensky, 2001), or the 'net generation' (Oblinger & Oblinger, 2005; Tapscott, 1998) assumes that they are skilled at using and adapting technologies for educational use. However, educational researchers are increasingly discovering that these 'digital natives' or the 'net generation' possess technical skills to utilize technology for social interactions and networking but not for educational gain (Cigognini, Pettenati & Edirisingha, 2010; Kennedy et al., 2007; Narayan & Baglow, 2010).

The current and potential use of social software in tertiary education has been well documented (Bates, 2010; Bower, Hedberg & Kuswara, 2009; March, 2007; Lee & McLoughlin, 2010). The literature predominantly describes a socio-constructivist perspective that promotes greater learner control of the learning environment, making learning in the Web 2.0 world more social and collaborative. In the socio-constructivist pedagogy, actively engaged students learn by sharing information through participation in collaborative and cooperative activities (Sthapornnanon, Sakulbumrungsil, Theeraroungchaisri & Watcharadamrongkun, 2009). Group work is a major strategy used to facilitate such sharing of information. It also enables co-construction of knowledge and understanding that capitalizes on the peer-peer interactions and productive elements of the dialogic and constructionist pedagogies as well (see Figure 1).

Web 2.0 tools alone do not teach or result in effective or meaningful learning. "[T]here must be particular purpose or rationale for their use, and teacher support and guidance…are still…essential" (Bates, 2010, p29). Contemporary educationalists agree that technological development in parallel with evolving pedagogies optimize the opportunities afforded by Web 2.0 (Bower et al., 2009). The evolving pedagogy, framed as Pedagogy 2.0 (Lee & McLoughlin, 2010) shifts focus from knowledge acquisition to knowledge transformation (creation and building) in authentic, motivating and well scaffolded learning environments that still maintain strong connections to curricula.

Pedagogy 2.0, while enabling "new pathways to learning with peers" (McLoughlin & Lee, 2010, p59), gives prominence to the "cultivation of digital competencies in ways that allow learners to develop their critical thinking, knowledge building and creative skills" (p60). Consistent with this is the increased emphasis being placed on embedding academic literacies (including digital and information literacy) into the curriculum (Gunn, Herne & Sibthorpe, 2010) to enable learners to take full advantage of Web 2.0 technologies by developing their skills and abilities to search, retrieve, analyse, evaluate, organize, create and share information (Bates, 2010; Cigognini et al., 2010; McLoughlin & Lee, 2010).

According to Lee and McLoughlin (2010), teaching and learning with tools that are otherwise used in social contexts requires teachers to "demonstrate its relevance and to adopt innovative approaches that take advantage of the unique capabilities and affordances of these tools". Alam & McLoughlin (2010) go as far as saying that as educators it is our "moral and ethical obligation to … maintain a participatory and inclusive attitude in pedagogy and in learning environment design." This re-affirms our belief that the success of technology integrated teaching does not solely depend on the affordances of technology but more so, on the influences of the target audience's ability to access, review, use, and manage information. How do we make the best possible use of Web 2.0 technologies to meet our needs and student demands for technology integration while taking into consideration their varying levels of skills (Ryberg, Dirckinck-Holmfeld & Jones, 2010) and digital literacy?

Focus

Web based technologies such as podcasts, online lectures, online discussions, and more recently Web 2.0 applications are increasingly being used by schools of pharmacy to provide effective learning opportunities for pharmacy students (DiVall, 2008; Estus, 2010; Miller, 2009; Swu-Jane, 2007; Sthapornnanon et al., 2009).This paper details an innovative learning design for the integration of technology to provide flexible access and encourage engagement while facilitating the development of knowledge management skills in a group assignment of an introductory pharmacy course.

Definitions

For the purposes of this paper:

- Web 2.0 applications are social software that allow multiple users to collaborate via sophisticated, interactive interfaces to develop micro content that is usually openly available (Alexander, 2006 cited in Bower et. al, 2009).
- Pedagogy 2.0 is the "conceptualization of teaching that is focused on participation in communities and networks for learning, personalization of learning tasks and production of ideas and knowledge" (McLoughlin & Lee, 2010, p 68).
- Scaffolding is the conceptual framework for learning support that enables students to perform better than they would otherwise do in the absence of any type of support (Cho & Jonassen, 2002 cited in March, 2007; McLoughlin, 2002).

The context

The School of Pharmacy at The University of Auckland recruits students from throughout New Zealand. Many students leave Auckland during university breaks, whilst others have work or family commitments to contend with. This year, the 99 students enrolled in P101: Pharmacy Practice I had five weeks to complete the group assignment. Two of these weeks fell in the university break and two were where some students had a heavy academic workload. Therefore, the assignment was re-designed to incorporate an appropriate blend of technologies that allowed students to access and complete this assignment flexibly and removed the need for them to meet face to face with other group members or to visit the campus library in person to search for information. The components of the assignment and respective assessment details are presented and described in the Table 1.

Table 1: Components of P101 assignment

Component and format	Requirements	Assessment details
e-poster (developed using Microsoft PowerPoint template based on an exemplar provided).	Students were randomly assigned into groups and asked to collaboratively design an e-poster on a given topic. In this case, the topic was the social implications of a chronic disease.	Group mark. The assessment rubric covering content, references and overall design was available to every group member.
Oral presentation of the e-poster (free use of props and different presentation tools).	Students, in their respective groups, present their e-poster to the class.	Group mark. The focus of the assessment was on the depth and breadth of research reflected by the quality of the presentation and the group's ability to answer questions from the class.
One page written summary of work (print out).	A referenced summary of the e-poster, representing the group's findings is handed in at the oral presentation session.	Group mark. The focus was on properly crediting and referencing all the literature used in the e-poster.
Three web references with justification for their usefulness (shared electronically).	Individual students are required to share three web references that they found useful in retrieving information for the e-poster. They are encouraged not to duplicate website references already shared by their classmates.	Individual mark. Marks were allocated based on the quality (judged by the criteria discussed in the lecture) of the websites submitted.

Design of an integrated assignment

Learning design considerations

A review of literature on evolving learning designs based on the tenets of Pedagogy 2.0 (Lee & McLoughlin, 2010) highlights four contributing elements of design for socio-constructivist learning environments: authenticity (Alam & McLoughlin, 2010; Cigognini et al., 2010) , motivation (March, 2007), scaffolding (Bates, 2010; Brack & Van Damme, 2010; Collis, 1998; March, 2007; Ryberg et al., 2010; Sthapornnanon et al., 2009) and skills development (Alam & McLoughlin, 2010; Bower et al, 2009; Cigognini et al., 2010; Gunn et al., 2010). It is important to note that all these elements were identified and taken into consideration for our specific learning design as P101 is an introductory course where, for most students, this was the first time they had experienced the educational use of Web 2.0 in their degree programme. Hence, capitalizing on the evidence base, the use of Web 2.0 tools was authentic, purpose driven, well scaffolded and linked to assessment while attempting to develop students' digital literacy and knowledge management skills for life-long learning opportunities.

The aims of the learning design were:

23. To provide flexible access to resources and tools to enable students to complete individual and group components of the assignment off campus.
24. To enable the teacher to monitor student collaborations in group tasks and manage assessment better.
25. To enable students to develop personal knowledge management (PKM) skills in Web 2.0 that they can use in the Bachelor of Pharmacy programme and beyond.

Figure 1 visualizes the learning design concept, which was a combination of approaches suggested by Bower et al. (2009), Dave (2009), McLoughlin & Lee (2010), McLoughlin (2002) and represented in an adaptation of the PKM skills model (Cigognini et al., 2010). Core to our learning design was the idea that 'technology is a mediator of pedagogy and content' (Alexander, 2006 cited in Bower et al., 2009). The types of thinking and processes that students needed to engage in to complete their course requirements was paramount in identifying the appropriate blend of technologies. The position of technology in the periphery of the design is testament to the fact that technology does not drive learning but it does have affordances that can be built on to provide better learning experiences. In addition to this, technologies are rapidly changing hence the broken line. Knowledge and skills are at the core of the learning design. In this case, technology enabled us to provide flexible access to the course content ensuring equity in access and facilitated the development of digital literacy, group culture and PKM skills. The latter was possible through linkages to the course assessment that provided some degree of motivation for students to engage sufficiently.

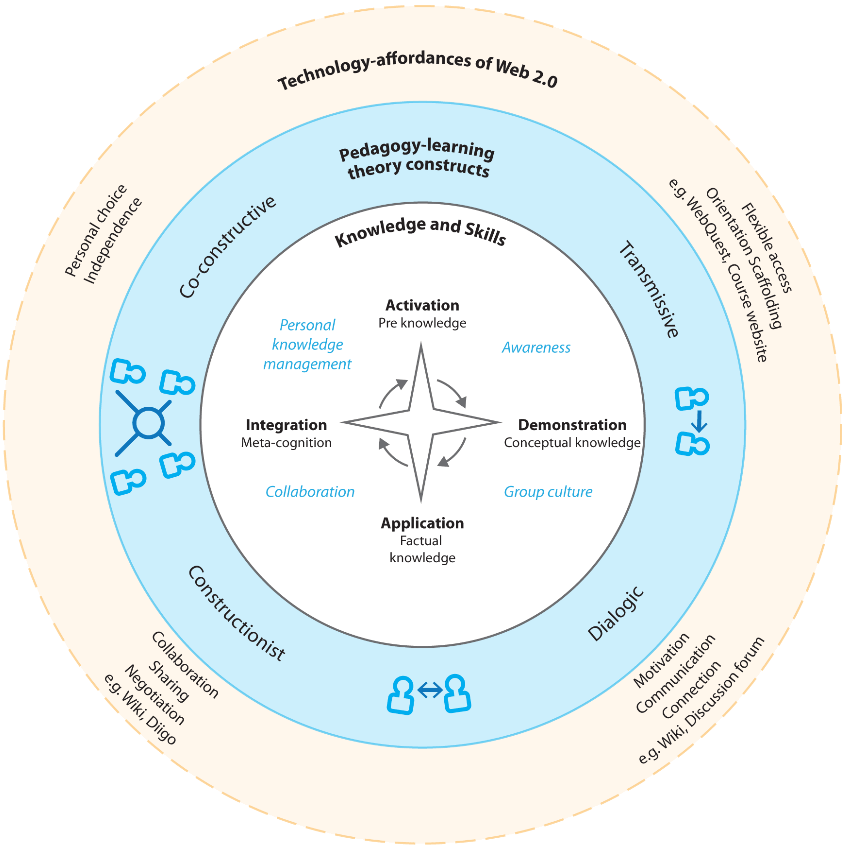

Figure 1: Learning design of P101 integrated assignment

Affordances of Web 2.0

As defined previously, Web 2.0 refers to social software. The myriad of Web 2.0 applications available (see http://www.go2web20.net/) add to the complexity of matching the affordances of each with its usefulness in education. Common applications that have been widely used in educational contexts are blogs, wikis, social bookmarking and social networking. Meaningful use of these tools can vary from mere provision of information (flexible access, orientation) and guiding learning processes (scaffolding) to encouraging motivation, enabling connections and PKM. The particular function is largely dependent on the context in which these tools are used. It is suggested that a 'suite of tools' is better than a particular technology in learning designs to ensure learners have a choice to "engage in meaningful tasks" (Alam & McLoughlin, 2010). The type of tasks and thinking processes students engage in are far more important than the type of technology (Alexander, 2006 cited in Bower et al., 2010). With due consideration to this, we used a number of tools in our learning design as described in Figure 1.

Pedagogy for Web 2.0 learning design

Ways of interacting to engage in knowledge building processes is an important element of online pedagogy (Bower et al., 2009). Web 2.0 learning designs are usually situated in the socio-constructivist approach. However, as educators document their Web 2.0 learning designs, it is becoming obvious that there still is a place for transmissive, dialogic and constructionist approaches. Many students need the 'structure and guidance' (Bates, 2010) that can be offered via the transmissive approach. A particular example from our learning design is the provision of information on the course website including detailed descriptions of each tool and 'how to' guides. Though transmission is considered a low order thinking process, it is still relevant in 'cognitive apprenticeship' (Collins, Brown & Holum, 1991, cited in Bower et al., 2009) where the expert imparts knowledge and models thought processes.

Dialogic and constructionist approaches are centered on discourse between peers in a learning environment that encourages and motivates students to engage in meaningful dialogue; a core requisite for collaborative learning. These can be built on to produce a co-constructive pedagogy where learners are expected to engage in higher order thinking processes and develop the ability to manage information and take control of their learning while sufficiently engaging in collaborative group work. Our learning design, as it was for beginner skills and content, did not aim to proceed to the highest level of PKM.

Knowledge and skills
As mentioned before, Web 2.0 learning designs have increased focus on developing skills such as knowledge management and information literacy to enable learners to take full advantage of these learning environments (Cigognini et al., 2010). According to Cigognini et al. (2010), PKM is a 'multifaceted set of abilities and processes' that an individual undertakes to gain and share knowledge. This hinges on 'digital competency' when the learning environment is Web 2.0 based. Since our design was for an introductory course, every attempt was made to facilitate the development of PKM skills. The development of such skills takes time, however, the process begins in a close structured environment such as that provided in the design of the P101 technology integrated assignment tasks.

Selection of technologies-finding an appropriate blend

Information and structure through the course website
The course website was designed and developed using an in house interactive web development tool called CourseBuilder (http://www.cad.auckland.ac.nz/index.php?p=coursebuilder). It complements the features and capabilities of the Learning Management System, therefore enabling us to make optimal use of both systems. The website provided all the information required to complete the assignment e.g. timetable, deadlines, group allocations and extensive stepwise instructions on how to use the e-tools provided.

Scaffolded inquiry through a WebQuest
The assignment itself was presented as a WebQuest (Dodge, 1997) which contained detailed information to allow successful completion of the assignment. The WebQuest strategy was proposed by Berni Dodge and Tom March in 1995 to develop engaging web-based tasks that elicit higher order thinking through guided inquiry (Starr, 2005). Rather than force-fit an earlier approach, we adapted the revised version of WebQuest that "highlights its benefit to both students and teachers as a framework for leveraging achievement and maximizing authentic learning" in a Web 2.0 world (March, 2007).

In order to create an authentic experience that was contextualized, students, in their randomly assigned groups, were allocated a chronic disease and asked to produce a promotional e-poster for a fictional charity trying to elicit donations from the public. All information presented had to be sourced from the internet and general criteria were set about the scope and format of the e-poster (see Table 1). E-posters were accompanied by an oral presentation to peers, and at the end of the assignment, students voted for the groups that they felt elicited in them a desire to make a monetary donation. Tasks included listening to a recorded lecture, accessing and extracting information from websites providing guidance on team work, and voluntary tasks and quizzes related to searching, retrieving, and appraising medical and health information sourced from the internet. Some educators perceive the inherent structure of the WebQuest to be limiting (Barbour, Rieber, Thomas & Rauscher, 2009) but as indicated by Bates (2010), we wanted to provide a structure and sufficient guidance to motivate students to engage in the learning process. 'Transformation scaffolds' form the core of every WebQuest and can encourage student motivation and facilitate advanced thinking with appropriate integration of enriched learning resources (March, 2007). According to March (2007), technology can provide its 'disintermediating effect' that can help learners prime their own intrinsic motivation.

Collaborative learning through a group wiki
A wiki (PbWiki) was provided for each of the groups, which consisted of four or five randomly allocated students. The use of wikis in socio-constructivist environments involving group work is well documented (Cain & Fox, 2009; Collis, 1998; Miller, Bookstaver & Norris, 2009; Collins, Huber & Groom, 2010; Brack & Van Damme, 2010; Bower et al., 2009) and according to Dabbagh & Reo (2010, p14) wikis "epitomize the social constructivist idea that knowledge derives from social interactions, since it is a social software tool that makes it easy for multiple users to create and edit web pages collaboratively."

The wiki enabled flexible access and multiple options for group collaboration. Though we set up wikis for every group and encouraged them to use this collaborative tool, the onus was on the groups to put this into effective practice as no marks were allocated for using the wiki. The usefulness of such a collaborative technology is dependent on many variables (see results and discussion).

Networking, knowledge construction and sharing through social bookmarking
A social bookmarking site (Diigo) was used for students to submit individual contributions to a shared bank of web resources. The networking nature of this tool enabled students to share their web references and provide feedback on other students' submissions. A requirement of this task was to avoid duplication of references already submitted by other students on the network. This added an element of competition, intended to motivate students to realize the full potential of social bookmarking which according to Bower et al. (2009), can range from the promotion of recall, identification and exchange of factual information to facilitating discourse.

Student perception of learning design for technology integration

All students in this cohort successfully completed the assignment. However, in order to evaluate the learning design for technology integration from the students' perspective, their opinions of the assignment were sought via an anonymous online survey and a focus group facilitated by the lead author. The online survey was adapted from the one published by Burchum et al. (2007). It consisted predominantly of questions presented in a 5 point Likert scale format but also included questions requiring ranking and free text responses. The focus group was intended to gather more considered and detailed opinions on the process of completing the assignment and the perceived usefulness of the technology integration into the assignment. Participation in both activities was voluntary and in order to facilitate the candid opinions of the participating students, the identities of those who participated in the focus group were kept confidential and not revealed to the School of Pharmacy staff member involved in this project.

Results and discussion

Online survey
Fifty four students out of 99 completed the survey; therefore, a response rate of 54.5% was achieved. An encouraging 67% of the responding students enjoyed the assignment. Table 2 provides a summary of the responses in relation to specific strategies and tools used.

Table 2: Summary of evaluation

Strategies and tools	**Students' perception**
Scaffolded inquiry into an authentic task - WebQuest	77.8% agreed that the WebQuest added value to the assignment. 87% thought the WebQuest tasks assisted them in learning to distinguish between reputable/authoritative websites from other less reliable ones. 51.9% agreed that the WebQuest contained enough information to complete the assignment without any further instructions from the teacher.
Collaborative learning - wiki (PbWiki)	Wiki was ranked the most useful and enjoyable and 68.5% would be confident to use them in future assignments. However, 44.4% of students were unsure if the wiki promoted effective student-student collaboration.
Networking, knowledge construction and sharing – social bookmarking (Diigo)	Diigo was voted the least enjoyable but the second most useful of the tools. 48.1% do not intend to keep using and adding to the social bookmarks created during the assignment while 42.6% were undecided.
Knowledge and skills development (digital literacy measured as 'tech savvyness', group work, knowledge management) – use of various etools in assessed tasks	51.9% agreed that the assignment tasks helped them develop transferable technical skills. Figure 2 illustrates the change in 'tech savvyness' before and after completion of the assignment. 75% of students thought that the assignment developed their ability to work effectively in a team and 63.5% thought that their team worked well together. However, free text reponses indicate that managing the group work was also a challenging aspect of the assignment for some students.

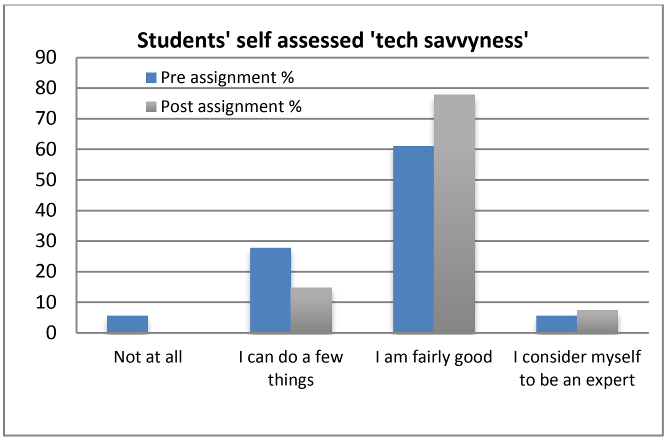

Figure 2: Self assessed student 'tech savvyness'

Focus groups and open ended responses

Focus group responses re-affirmed the findings of the online survey. The assignment as a whole was well received but some students expressed dissatisfaction with aspects of the group work involved. As many groups failed to negotiate roles and get the work done equitably some students thought that it was unfair to award marks predominantly based on group produced work. This is consistent with what Brack & Van Damme (2010) reported as group progression from collaborative to cooperative over the course of the group task.

Motivation was also another important factor with most students complaining about the lack of commitment shown by some group members. The idea of introducing a reward system for those taking the initiative was also suggested so individuals are held accountable for their part in the group task. Two student quotes given below illustrate contrasting views on group work.

> "group work sucks. I ended up doing heaps of ours while others did very little. It just doesn't seem fair. And i know that the idea is to work together, BUT if your members are not responding to email after email after email, then what else are you suppose to do? Fail or do it all. It puts studious students under too much stress and gives slackers a free ride." (P101 student)

> "…thank you for giving us the opportunity to know our team members better! I felt that this assignment was a great way to promote team-bonding!" (P101 student)

It was also clear from student comments in the evaluation that though majority of the assessment tasks required them to collaborate in groups, their individual experiences were quite varied. The perceived usefulness and the extent of use of the Web 2.0 tools were dependent to some degree on students' digital literacy and technical skills. Though attempts were made to facilitate the development of such skills to influence the extent of use, not all the tools were utilized to their maximum potential. The difference in 'tech savvyness' (see Figure 2) is evidenced in the following comments:

> "We only had to use basic programmes for this assignment so I did not really learn anything too extravagantly new." (P101 student)

> "I would definitely use Diigo now as a good bookmarking source rather than adding a whole bunch of websites to my Favourites tab on my browser…" (P101 student)

Contributing elements of design for socio-constructivist learning environments revisited

Authentic learning

The use of a WebQuest enabled students to engage in an authentic learning experience that Cigognini et al. (2010) advocate is the basis for developing digital literacy and knowledge management skills. The graduate profile for the Auckland School of Pharmacy includes the ability to be able to communicate effectively in writing and orally, apply critical thinking and structured problem solving techniques, and utilise technology effectively to acquire, organise and present health-related information. In addition BPharm graduates are expected to be able to work both independently and in teams, both as a leader and a member. Successful completion of the WebQuest to develop the e-poster provided the opportunity for students to develop, apply and demonstrate aspects of all these skills. Boud et al (1999) suggested that students articulating their emerging understanding of an area can deepen their own grasp of the subject. The oral presentations associated with this assignment involved peer teaching and were well received by students, indeed some students suggested making the oral presentations longer to enable them to fully articulate what they had learnt.

Motivation
Collis (1998), Alam & McLoughlin (2010) and Brack & Van Damme (2010) all mention aspects of motivation as influencing the success of group tasks using collaborative tools like wikis. In P101, wikis were provided as a tool to help students collaborate and complete their assignment flexibly but the use of the collaborative wiki was not compulsory. Student satisfaction with using this tool depended on their experience of group work. Frustration arose due to the asynchronous nature of the wiki because motivated team members found that it was difficult to communicate with and manage the contributions of less motivated group members. Though the task was designed to be 'motivating in itself' as Collis (1998) suggested, sufficient engagement from students depended on how their groups utilized the wiki as the onus was on them to be active in the inquiry process (Alam & McLoughlin, 2010).

Facebook groups were set up spontaneously by several student groups, and texting and e-mail was also used as an alternative to the wikis. Students found the use of these methods more effective than the wiki for communication, coordination and management of data collection and assimilation tasks required to create the e-poster. However these alternative methods of completing the assignment did not allow the teacher to monitor individual contributions and group progress in this instance.

Scaffolding
This concept is widely publicized in all aspects of Web 2.0 use in educational contexts as a result of researchers questioning the assumption that 'digital natives' possess sufficient digital skills to learn effectively in technology integrated environments. Sufficient scaffolding through strong links to curricula is suggested by Ryberg et al. (2010) for young people who might not come to university equipped with digital literacies.
As indicated in Table 2, the majority of students found the WebQuest activity to be valuable for their completion of the assignment. This aspect of the assignment was also the most structured with scaffolding being the very justification of its existence (March, 2007).

McLoughlin (2002) presents various categories of scaffolds, of which, orientation (communication of expectations), coaching (learner support via software help), task support, expert regulation (sharing exemplars), conceptual and procedural scaffolding were all implemented in various ways in this integrated assignment. However feedback from the student evaluation indicated that the assignment instructions concentrated predominantly on the e-tools and knowledge required to complete the assignment, which improved the equitable nature of the assignment but neglected to equally scaffold the team work aspects of the assignment. To improve this aspect of the assignment the next iteration of the learning design will incorporate the soft and hard scaffolds of face to face orientation and instructions for group work respectively (Brack & Van Damme, 2010). We intend to cover aspects of team work including roles, work allocation and communication strategies in a workshop and introduce a team building exercise at the start of the assignment. A requirement for group and individual progress reports will also promote accountability and encourage participation of all group members. This will also allow the teacher to monitor and manage any issues that occur and also allow individual student marks to accurately reflect their contribution to the assignment.

Skills development
Perhaps the best indication of students' developing knowledge management skills was the use of the social bookmarking tool (Diigo). The individual task involving Diigo, was worth a small percentage of the marks available for this assignment, and was completed by almost all of the class (98%). However evaluation of the assignment revealed that whilst some students used the class Diigo resource bank extensively to find material for their poster slides, some students did not realise the full potential of social bookmarking and used Diigo only to upload their websites to be eligible for their marks, without participating in and benefitting from the social aspect of this tool. In the next iteration of the assignment more time will be spent encouraging students to use this tool to its full potential by explaining the benefits of using this tool both for the assignment and throughout their degree programme and professional lives. Penalties for posting a web page already submitted will also be imposed. This will require a greater degree of engagement on the part of the student and may change their current perception that clearly indicates superficial level of engagement.

"Social bookmarking was done only because it was compulsory. It could have helped me if I was

> trying to collect as much information as possible but my aim was to complete the assignment, and therefore researched only information I needed…" (P101 student)

As mentioned before, PKM skills take time to develop and it may be that students need more exposure to the use of social bookmarking to fully appreciate its relevance and usefulness.

Design plans for future iteration

In addition to what has already been mentioned, the next iteration of the course will focus on facilitating effective group work and promoting student engagement with the aspects of Web 2.0 tools that were underutilized this time. Perhaps a social networking tool such as Facebook may be used for collaborative work based on its communication features. As reported by Dabbagh & Reo (2010), there are three levels of social software use: level 1 is personal information management, level 2 is basic interaction and sharing and level 3 is social networking. The use of wikis and social bookmarking by P101 students in this assignment did not progress to the highest level of networking, as envisaged in the learning design but this might improve with the use of an actual social-networking tool for the purpose of collaboration.

Estus (2010) demonstrated the positive impact of using Facebook in an academic context with American pharmacy students. Creating private Facebook groups which all groups are required to use would enable the group work aspect of this assignment to be monitored and is an avenue that we intend to explore in future. We believe that the minimal use of the tools may have been because of the students' lack of appreciation of the potential and possibilities around knowledge management enabled by these tools, in particular, collaborative learning.

Conclusion

This paper details an innovative learning design for the integration of technology to achieve flexibility in access and encourage engagement while facilitating the development of knowledge management skills in an introductory pharmacy course assignment. The results of the evaluation of the first iteration of the design are encouraging. All students successfully completed the assignment and some did develop skills as evidenced by the change in 'tech savvyness'. However, the intentions of the design did not fully eventuate in student actions for active development of PKM skills. The lessons learnt from the first iteration will be used to inform the learning design of future iterations.

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Database of Research on Distance Education

Lance Deveson
Library & Information Manager
Australian Council for Educational Research

The Distance Education Research Database is an invaluable resource for anyone with a stake in the distance and online education industry. It will keep you up to date with the latest thinking in distance and online education around the world, allow you to examine a treasure trove of research relevant to your professional development and provide a solid basis for your future studies. The Poster session will demonstrate the database , its features and practical uses.

Keywords: Higher Education, International Students, Transnational Education, Distance Education, Blended Learning, Online Education

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Embedding an ePortfolio system at a programmatic level

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This paper outlines the ePortfolio implementation process at the University of South Australia. The eP system, powered by the open-source ePortfolio Mahara, is one element of an integrated suite of technology enhanced tools for teaching and learning at the University and will be available to all students and staff from the second half of 2011. This ePortfolio system has been chosen because of its flexibility and its capacity to be the venue for many complex tasks.

We have sought to conduct the implementation of the eP, for teaching and learning purposes, at a programmatic level across the institution. We recognise that for a system like this to operate optimally it needs to be integrated within a program of study at every year level and that piecemeal approaches to using ePortfolios, while of some value, do not ultimately allow the full potential of portfolio learning styles to flourish. This paper reports on the work-in-progress of our ePortfolio implementation.

Keywords: ePortfolio, programmatic implementation, learnonline, Mahara, academic development.

learn**online**

After an extensive examination and feasibility process, featuring a great deal of commitment from and collaboration between, the various stakeholders within the institution, it was decided in 2010 that the University of South Australia would adopt Mahara, the open-source ePortfolio. This system is currently being rolled out institution-wide and will be available to all students and staff during the second half of 2011. The University's Learning and Teaching Unit is entrusted with the effective implementation of the software, for the use of academic staff, across the institution and this paper will outline some of the academic development processes for embedding the eP across the divisions of the University.

The University's, fully integrated, learn**online** system includes a Learning Management System, a virtual classroom, a lecture recording system and an ePortfolio. All of these elements are being introduced over a two year period. This paper will discuss one facet of the current implementation process and that is the embedding of the ePortfolio (eP) at a programmatic level. Thus this paper is a case study of the early planning and implementation process as we look to roll-out eP's across entire programs of study. We are a large university with four divisions and there is intense interest from among our staff for an eportfolio.

Before a discussion of the training and development profile we are adopting it's useful to outline the main ideas underpinning our approach to the design and implementation process. The key elements of which are:

1. A recognition, as noted in the supplementary report of the Australian ePortfolio Project (Hallam et al, 2010), that 'the extent of ePortfolio (eP) practice has moved away from their use mainly in single units of study towards more programmatic implementation in undergraduate student learning'. We recognise and strongly recommend that for an eP to be most effective, a whole-of-program approach is desirable.

2. That based on the conclusions of Clark and Neumann's (2009) study on ePortfolio implementation which stated that, 'use of these ePortfolio tools to support teaching, learning and professional development is complex and requires considered pedagogical planning and preparation if they are to be usefully appropriated' our approach is extremely thorough and preparation needs to be completed well prior to the commencement of the program.

3. That we strongly encourage the development of a consultative and collaborative environment to work in, the importance of which is highlighted by Gathercoal et al (2002) and Lambert and Corrin (2007), in their discussions of ePortfolio implementation.

4. That during the program mapping, development and design phases of the process, a strong rationale for the use of an eP is developed in accordance with the stated aims of the courses involved and the program within which they operate. As Stefani, Mason and Pegler (2007, p. 45) point out, 'the overarching issue is the pedagogical principles underpinning the rationale for implementing ePortfolios in to the curriculum'.

5. That, where possible, the implementation be part of a broader impetus around the integration or development of technology enhanced learning and that this aim is commensurate with financial support from the institution for the program who undertakes the implementation. This kind of support helps with the issue of academic staff buy-in and the workload pressure that development work like this can bring.

These five elements form the basis for our approach to the implementation process, a process which begins with academic staff involved completing six hours of basic technical training. This includes four hours of computer lab based instruction and two hours of self-study. At the completion of this all staff in a particular program will have a working ePortfolio of their own, including their individual profile, membership of various groups/networks related to their program and a working knowledge of how to create and disseminate various fully functioning views/pages. These artefacts can contain a wide range of multimedia (both embedded and externally sourced) and elements like blogs/journals, forums and the creation of forms for recording professional competencies. They will then move through a four month period of development working closely with academic developers to design, develop and implement materials to support their courses. These materials will become part of academics' individual ePortfolios but they are also able to use them as artefacts to scaffold future course development should they choose.

Before the mapping, design and construction phases of the implementation could commence, an ePortfolio implementation pack was created to be used throughout the entire implementation process. This toolkit enables academic developers to work with academic staff from any given program in a coherent way and ensures that there is some consistency around the development of rationales for eP usage. The tool kit contains a blank program template, which is essentially a spreadsheet in to which every course from a program can be added and its elements examined and compared. It also includes a pre-populated template, or matrix, by way of an exemplar. There is also a grid of eP pedagogies aligned with tasks and desired outcomes, a short paper outlining the basis of our approach and a list of criteria for both course and program level implementation. These tools are a key element in the development of a rationale for implementation and lead to a familiarisation and alignment with eP pedagogies for the academic staff involved from the outset.

The tool kit also contains a series of proforma exemplars outlining the various pedagogical possibilities with eP use to be used during the eportfolio design phase of the implementation. This involved the development of specific materials for the purpose of each broad assessment type. The artefacts created for this objective contain the following exemplars and are embedded as copyable views within our ePortfolio system – reflective practice – presentation of evidence – professional competencies – mobile content – using multimedia – self and peer review – group work/collaboration – eP's and WEB 2.0. This allows them to be easily accessed and disseminated among academic teaching staff and can help to provide guidance for teaching staff that choose to use the eportfolio system without undergoing training or a systematic ePortfolio implementation:

Table 1: Phases of the four month ePortfolio implementation process

1. Program Mapping	**2. Course and ePortfolio Design**	**3. PEER REVIEW OF COURSE DESIGNS**	**4. Resource and Content Construction**	**5. Implementation**	**6. EVALUATION**
Confirmation of course elements. *1. Course and staffing details* *2. Assessment details* *3. Professional Competencies* *4. Rationale for implementation*	Course structures (including assessment and course outcomes) will be designed to incorporate eP's and these designs will be aligned with factors established in the mapping phase.		Individual course groups will develop materials/resource/artefacts to be implemented in their courses in the following study period.	Materials and processes developed in the previous phases will be implemented into course and program structures in readiness for upcoming study periods.	
Familiarisation and alignment with eP pedagogical possibilities.	Begin development of ePortfolio communication strategy for students of particular program.		Begin to generate and validate the learning resources.	There will be a comprehensive peer and self-assessment period at the conclusion of this phase with the wider program team with analysis of both the process and the implementation itself.	
Using list of criteria, courses will be assessed for suitability for eP implementation.					

Program Mapping

Program mapping is the evaluation of the selected program to ascertain appropriate courses for an eP implementation. The goal of the process is to create a map/matrix of potential eP usage throughout a program. Before the process of program mapping can begin a sufficient level of consultation with key stakeholders (program directors, course co-ordinators and all program teaching staff) must occur. During this period it is essential to for academic staff to share documentation about the structure of their particular program, and plans for development or alteration in coming years. This should include information about assessment, course outcomes and graduate qualities. This allows for the program template to be partially populated prior to the start of the mapping sessions.

The time commitments for this phase of the process are (2-4 hours for the program team, including those who may not be involved in ongoing development) and 3 hours per person, plus academic developer and program director liaison. This process promotes a shared understanding and ownership of eP development and gives a holistic view of how an eP will be a fully integrated part of both a staff members and student's experience. This process is also an essential part of building the overall justification for a student to use an eP in the first place. Academic staff will need to communicate the potential benefits for students throughout the course of their program, whether they are used for assessed or non-assessed activities, for professional networking or interprofessional communication. Indeed, student awareness of career planning, which generally takes place outside the domain of the course structure but is an essential element of a student's overall experiences can be a crucial element in eP adoption. As McCowan, Harper and Hauville (2005) noted in their discussion of the eP implementation at QUT, 'when the career-related benefits were discussed and its role as an organising and selection preparation tool were understood, students adopted it wholeheartedly'.

In this mapping phase courses are added to the template by way of a grid that separates the study periods. To this are added the following aspects of each course:
• Course and staffing details
• Assessment details
• Professional competencies (if applicable)
• Rationale for implementation

Individual courses are then assessed by program academic staff and academic developers using the following criteria. The teams analyse whether in courses;
- students work with rich media
- there are professional competencies associated with credentialing
- students generate artefacts regularly
- reflective practice is a feature of student activity
- there are practical components to the program which can be supported with eP use
- the course has a career planning focus
- the course is part of a series that develops over the three or four year course of a program
- has group work
- requires students to organise activities autonomously
- there is already an eP element to other courses within any given study period

When all the above factors are taken in to consideration a rationale for implementation or not is developed and the template generates a complete list of courses that will use eP including their assessment profiles, desired course outcomes and the teaching staff involved. Results from the early stages of program mapping indicate that between 40-50% of courses actually decide to implement the eP.

Course and ePortfolio Design

The list of courses is then used to organise a training schedule for specific groups of staff and to eliminate others. The groups become course based and academic development begins with small groups of staff to begin the design phase of the process. The rationales developed for the implementation in the program mapping phase are now used to inform the initial design process. In conjunction with the ePortfolio exemplars mentioned above these rationales are used as a foundation to design course/ program specific resources. Thus it is essential that course structures be designed to incorporate eP's and that these designs be aligned with reasoning established in the program mapping phase.

The time commitment for academic developers and course teams to do design and development work requires 1 hour meetings held fortnightly and this means that staff would commit 8-10 hours per person. This involves a 50/50 split between consultation/discussion/planning with an academic developer which could be considered situated work to link program plans to individual course planning, staff development, materials design and development and private study. This time will be used for working our processes for use of ePs associated with particular learning activities and/or assessment pieces. The course designs are stored in the eP as work-in-progress artefacts, thus there will necessarily be some overlap with the following resource and content creation phase, where the artefacts become fully realised. When all the individual course teams have their designs for implementation completed, the final phase of this section of the process is a peer review session involving the entire program team, including program directors and all relevant teaching staff.

Resource and Content Construction

Based on the work done in the design phase and on the feedback received during the peer review phase the academic staff now begin the 'hands on' work of materials development: writing, creating eP artefacts and views. The goal of this phase will be to have completed the construction of their materials and support resources for the following study period.

This phase is will consist of individual/small group work on development estimated to take 10-25 hours of individual work, depending on how course teams divide the labour. It is estimated that roughly 20 hours individual work per person will be required. The figure will decrease for larger course teams who can divide the labour between them and individuals who are involved in development for multiple courses as they will learn from experience and work more quickly or staff who have experience with ePortfolios. It will increase for staff who teach individually (bearing the entire development load for a course), have specialised uses of the system in mind which require extra development time or need extra support. The time will vary according to the degree of integration (e.g. one or two tasks vs. several ePortfolio tasks) within a course and the extent to which staff are experienced with the technology.

Implementation

In the final phase, materials developed in the previous phases will be implemented in to course and program structures in readiness for upcoming study periods. A crucial element of this phase is the completion of a coordinated communication strategy across the program to ensure student awareness of the eP system and an integrated help resource on the University's website. Courses that have implemented the eP will continue this process at the commencement of the next period with the aims of the strategy being built in to course structures and course help resources. Once the materials and artefacts have been created and embedded in the eP system there will be an evaluation of both the process and the resources created by the process. At the end of every programmatic implementation there will be a coordinated period of self and peer assessment undertaken within the eP system itself and a focus group with academic staff. Staff will also provide feedback on the process and an evaluation of the design effectiveness using a customised survey instrument.

Conclusion

The ultimate goal of this process of staff development and programmatic implementation is that it becomes integrated with the academic development of all the other elements of the learn**online** project to achieve a focussed, cohesive whole. This approach will help leverage our integrated systems to promote deep learning and improvements in teaching and learning for all staff and students across our institution.

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Learning new technology tools in pre-service teacher education: A model for instructional approach

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The purpose of this qualitative study is to propose a model of instructional approach for pre-service teacher education in the area of learning a new technology tool. Through the instructional approach, it is hoped that pre-service teachers will become confident in integrating the technology tool which they have learnt, to enhance teaching and learning in the classroom. The study involved 30 Post-Graduate Diploma in Education (Physical Education) pre-service teachers and 59 Post-Graduate Diploma in Education (Secondary) pre-service teachers who were attending a core Information and Communication Technology (ICT) course in the year 2010. An instructional approach was designed for the implementation of video sports games for the 30 Physical Education (PE) pre-service teachers and for the implementation of Interactive White Board (IWB) for the 59 Post-Graduate Diploma in Education (Secondary) (PGDE Sec) pre-service teachers. During the course, the pre-service teachers were introduced to Video Sports Games and Interactive White Boards through an instructional approach that comprised of self-paced team exploration of the tools, peer sharing and critique, team exploration of various lesson plans culminating in lesson ideas/plans designed as a team. Based on data collected through observations, reflections and artifacts submitted by the teams, this study proposes a refined instructional approach to be adopted at the pre-service teacher education level for effective learning of the technology tool. The findings revealed that immersion time with the tool, team learning, peer sharing and critique were significant components which enhanced the pre-service teachers' learning experience. The study explores the significant role of the tutor and pre-service teachers and proposes an enhancement of the current instructional approach.

Keywords: Teacher Education, learning technology tool, instructional approach

Background

A number of studies have reported that the large amount of investment in technology integration in education did not reap the desired results. Concerns were raised that the potential for ICT to change how teachers teach and how students learn had not been fully realized (Bate, 2010; Meredyth, Russell, Blackwood, Thomas, & Wise, 1999). Other studies reported that although technology integration has taken place, teachers were not making effective use of ICT for teaching purposes (OECD, 2001; Venezky & Davis, 2002; Voogt, 2008; Wray, 2009; Zhao & Cziko, 2001,).

The intention of this qualitative study is to propose a model of instructional approach for pre-service teacher education in the area of learning a new technology tool. Through the instructional approach, it is hoped that pre-service teachers will become confident in integrating the technology tool which they have learnt, to enhance teaching and learning in the classroom.

Research on teacher learning of technology tools

One of the key factors that had a considerable influence on the teachers' decision to integrate technology was availability of time. Dias (1999) identified lack of time as a barrier to integration. Time in the study encompassed the opportunity to learn, to plan and to collaborate with other teachers. Lack of time was also cited by Wang and Chan (1995) who conducted a study among 130 Singapore secondary school teachers. The findings revealed that teachers' perception of lack of time hindered technology integration. Ertmer (1999) and Manternach-Wigans (1999) also claimed that teachers' perception of lack of time for them to learn and integrate technology into the classroom is a contributing factor that inhibited technology integration.

Dawson and Heinecke (2004) reiterated that teachers' lack of time to explore technology use and fragmented schedules in school contribute to technology being integrated as an add-on tool. The data collected for this study spanned over a seven month period with over eighty hours of classroom observations and interviews with key personnel and teachers in the school as well as document analysis. The explanation given by teachers in the study was that they did not have time to plan for effective technology-based lessons and that they needed time to fit technology in their lessons. In addition, the teachers felt that they did not have time to immerse in the use of the technology to enable them to have the knowledge and technology skills to plan.

Jaber and Moore (1999) and Martin (2000) indicated in their findings that teachers need to be given time to plan and to integrate technology into the curriculum in order to achieve substantial effective integration. Further, teachers should be given time to plan and implement within the school year and to share their successes and obstacles with their peers so as to learn from each other (Wetzel, 2001).

From the findings presented by the different studies, it can be inferred that the teachers wanted time to immerse themselves in technology use so that they would be competent and comfortable users of technology. In addition, teachers wanted time set aside for them to plan and reflect on technology integrated lessons. The teachers also wanted time set aside for sharing of technology resources and strategies. They wanted time to collaborate with each other and to attend relevant professional development that would provide them with knowledge of appropriate technology integration strategies.

Professional Development

Teachers were seen rooted in the traditional instructional form and hence they were not making the necessary effort to integrate technology to create innovative learning experiences for their students (Demetriadis et al., 2003). It is difficult to integrate technology into the traditional classroom practices and hence technology integration has been relatively ineffective (Jules Van Belle & Soetaert, 2001). Results of some studies showed that teachers were not making effective use of technology in their lessons (OECD, 2001; Pedretti, Mayer-Smith, & Woodrow, 1999; Zhao & Cziko, 2001). Some reasons for the dissatisfying results of technology integration could be attributed to teachers' attitude towards computer use (Demetriadis et al., 2003) as well as improper instructional reforms based on improper pedagogical beliefs (Selwyn, Dawes, & Mercer, 2001). Teachers needed knowledge of appropriate technology integration strategies and ICT skills to effectively integrate technology into their lessons to optimize the benefits for their students' learning (Pierson, 2001; Shuldman, 2004). Teachers' professional development needs to focus on both technology skills training as well as appropriate technology integration strategies in the curriculum. Braak (2001) suggested that to overcome the lack of translation of technology competency and comfort level into strategies for applying technology effectively, there was a need to expose teachers to good practices during in-service training. The focus of these training should be to get teachers familiarized with technology, on the use of technology as well as the value of technology as a pedagogical tool.

Some studies reported that effective use of computers is dependent on the teachers' technology skills as well as their intention of technology use (Albalat & Tarrago, 1995; Hodgson, 1995; Venezky, 2004). Relevant professional development can take the form of observing colleagues, learning from each other, observation of each others' technology integrated lessons, as well as to provide opportunities for teachers to share and collaborate with each other (Blase & Blase, 1999; Flanagan & Jacobsen, 2003; Jacobsen, 2001, 2002; Prain & Hand, 2003). Divaharan and Lim (2010) suggest that teachers' technology integration practices can be improved through exchanges among colleagues, attending conferences as well as observing each others classroom practices. Teachers need knowledge of appropriate technology integration strategies and technology skills to integrate technology in ways that optimize the benefits for their students' learning (Pierson, 2001; Shuldman, 2004; Divaharan & Lim, 2010). Teachers' professional development needs to focus on both technology skills training as well as appropriate technology integration strategies in the curriculum.

In précis, it can be deduced from the findings presented from the literature review that there are some key factors that influence teachers learning of a new technology tool and to translate that learning into planning for effective lessons. These factors identified are availability of time, access and relevant professional development.

Most of these studies have focused on the professional development of in-service teachers. There is a need to examine how pre-service teachers' learning should be designed so that they know how to effectively design technology integrated lessons for their students. Pre-service teachers are relatively unfamiliar with teaching practices. The methods for teaching them about pedagogical uses of the technology tools could differ from that for in-service teachers. There is substantial evidence that faculty modelling of technology use is a particularly successful strategy for pre-service teachers' technology integration training (Divaharan & Koh, 2010; Strudler & Wetzel, 1999; Beyerbach, Walsh & Vannatta, 2001; Pope, Hare and Howard, 2002; Brush, Glazewiski, Rutowiski, Berg, Stromfors, Stock and Stutton, 2003). Handler (1993) found that those who frequently saw computers being used in their pre-service methods course felt better-prepared to use the computer as an instructional tool. When tutor modelling is followed by opportunities for them to practice and apply technology tools in the design of lessons, it increased their self-reported confidence level for utilizing these technologies in the classroom (Pope et al., 2002).

A comparison of both in-service and pre-service professional development methods reveals that the technical skills need to be addressed. During in-service teacher professional development, exposing teachers to possible pedagogical approaches seems to enable them to plan and conduct effective technology integrated lessons. In pre-service training, however, there seems to be a need to adopt tutor modelling of the tool so as to allow for pre-service teachers to experience the tool before they are comfortable with designing technology integrated lessons.

The research questions that governed the study are:

1. What are the factors that facilitate pre-service teachers to learn a new technology tool?
2. How pre-service teachers learn a new technology tool introduced in the course?
3. What instructional approach should be adopted to facilitate the learning of a new technology tool for pre-service teachers?

Method

Course context

The study was conducted with 30 PGDE (PE) pre-service teachers and 59 PGDE (Sec) pre-service teachers who were attending a 12-week core ICT course. This ICT course is a core module that trains them in pedagogical skills associated with technology integration in their subject area. Pre-service teachers were taught the theories and principles of technology integration during the first four weeks. The next eight weeks were devoted to the learning of specific technology tools which focused on the pedagogical use of these tools. As tutorial groups were formed by subject specialization, tutors and pre-service teachers in each tutorial group jointly selected two to three specific technology tools that were pertinent to the group. Examples of specific technology tools available for selection were the Interactive White Board (IWB), concept mapping, video sports games, webquests, and Web 2.0 tools such as wikis and blogs. This study was conducted across a four week period where pre-service teachers were learning how to use Video Sports Games and IWB. The learning of each specific technology tool spanned across four two-hour lessons, once a week.

This study was conducted during the July 2010 semester where video sports games and IWB tools were formally introduced after they were piloted in the previous semester. Data was collected from three tutorial groups. One tutorial group consisted of pre-service teachers from PGDE (PE) who opted to learn how to integrate video sports games in their physical education lessons. The other two tutorial groups consisted of 59 PGDE (Sec) pre-service teachers who were from the Humanities and English Language programme. The pre-service teachers are all graduates in the age range of 21-25. They have at least a minimum of two months to a maximum of one year of school experience. This experience helps them to understand the demands of teaching in the classroom with an ICT tool.

The structure of learning specific technology tools

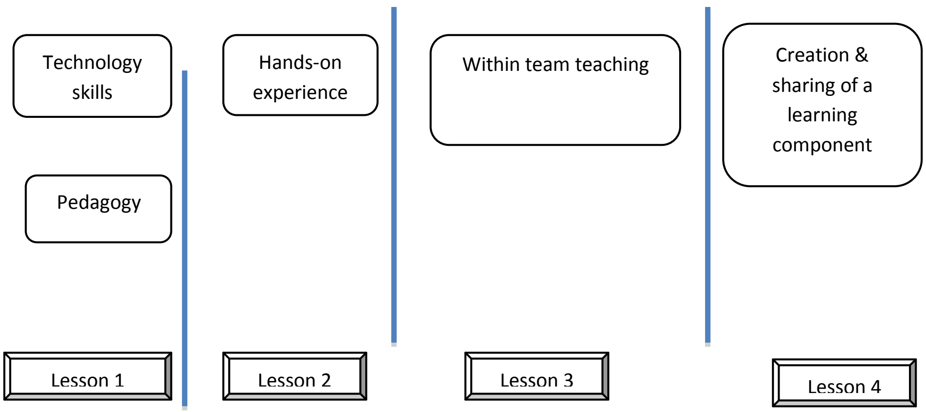

Figure 1: Instructional approach to the specific technology tool component

The approach to the learning of the specific technology tool component was designed based on review of literature (see Figure 1).

Lesson 1 – Self-paced learning from technological resources and pedagogical examples

During Lesson 1, the tutor introduced the various tools to the pre-service teachers. For IWB, the pre-service teachers accessed an on-line self-paced tutorial which helped them to understand how to operate the hardware as well as to learn the key features of the software that accompanied the board. For video sports games, the pre-service teachers explored the various game titles. To learn the technical skills, the pre-service teachers activated the help feature within the software and the game tutorials to assist them in the technical skills.

For pedagogical examples related to IWB, the pre-service teachers were asked to explore a database of lesson templates and materials prepared by teachers from Canada, United Kingdom and America, due to a lack of Singapore based resources. It was hoped that the exploration would create pedagogical awareness of the use of the tool. However, there was a lack of readily available pedagogical resources for Video Sports Games. The tutor created lesson ideas to ground the pre-service teachers' pedagogical awareness.

Lessons 2 & 3 – Hands-on exploration and peer sharing

The focus of lessons 2 and 3 were to provide pre-service teachers opportunities to learn the tool as a team. The pre-service teachers formed teams based on their subject areas. They explored the features of the tools, recalling the self-paced video tutorials as well as online resources. They learnt as a team and taught each other within their teams.

Lesson 4 – Integration of the technology tool in the subject area

After learning the technical skills and acquiring pedagogical awareness of how the tools can be used, pre-service teachers were required to integrate the technology tool in their subject specialization. Each team was required to select an area from their subject specialization and to integrate the technology tool which they have learnt. They were required to showcase how the tool can be used to enhance learning. The focus of this session was to provide opportunities for the pre-service teachers to apply their pedagogical knowledge and to design a lesson segment with the integration of the technology tool.

Data collection

The objective of this pre-service ICT course is to ensure that the pre-service teachers learn a technology tool and acquire pedagogical skills related to integrating the technology tool. Hence, the data collection focused on how the pre-service teachers perceived the learning opportunities provided for them and to refine the instructional approach based on their feedback. To comprehend the learning process, pre-service teachers were given 20 minutes at the end of each lesson to reflect as a team. The PGDE (PE) group had six teams consisting of five members in each team. The PGDE (Sec) group had a total of 12 teams from the two groups. Hence, data was collected from a total of 18 teams with a total of 89 pre-service teachers. Each team posted their reflections on their Wiki page that was set-up for them before the beginning of the module. A total of three cycles of reflection/feedback were collected from each team.

During the Cycle 1 reflection, the pre-service teachers were asked the following questions:

1. How did you and your team members learn the technology tool? Describe your individual experiences.
2. What difficulties did you face when learning the technology tool?
3. How did you overcome the difficulties?

During Cycle 2 reflection, the questions focused on the following areas:

1. What were the strengths and weaknesses of learning as a team?
2. Suggest ways in which the learning process could be improved.

During the Cycle 3, the questions sought to collect information about whether the pre-service teachers felt that they have had sufficient exposure to pedagogical approaches and were able to integrate the technology tool.

1. How did you explore the integration ideas prior to designing the integration of the technology tool?
2. Suggest ways in which improvements could be made in the area of pedagogical awareness.

In the duration of the three lessons for each technology tool, the author who was also the tutor took observation notes on how the groups interacted and their learning preferences. The observation notes and the pre-service teachers' reflections provided useful data as the reflections allowed the researchers to ascertain whether the current instructional approach adopted (as reflected in Figure 1) was effective.

Data analysis

The pre-service teachers' reflections were analysed through the use of content analysis. The reflections were coded in the following manner to answer the research questions of this study:

1. What are the factors that facilitated pre-service teachers learning a new technology tool?

   Responses coded were from Cycle 1 reflection questions 1, 2 & 3 and Cycle 2 Question 2 and Cycle 3 Question 2.

2. How pre-service teachers learn a new technology tool introduced in the course?

   Responses coded were from Cycle 2 & 3 reflection questions.

The pre-service teachers' responses were triangulated with the observation notes by the author.

Results and discussion

Through content analysis, the following factors were elicited from the pre-service teachers' reflections.

Research Question 1: What are the factors that facilitated pre-service teachers' learning of a new technology tool?

Description	No. of teams	% of teams
Time to explore	17	94%
Access to resources	16	88%
Team learning	18	100%
Online tutorials	8	44%
Individual exploration	5	27%
Hands-on exploration	18	100%

Table 1: Factors pre-service teachers felt assisted them in the learning of a new technology tool

Pre-service teachers' reflections showed that they preferred exploring in teams rather than as individuals. They appreciated the time given to them to explore the technology tools in teams. In their suggestions for improvements, they highlighted that they wanted to be comfortable with the technical skills, before they could comfortably explore the possible pedagogical approaches when planning for the integration of the technology tool. Besides, they wanted more time to discuss with their team members and even more time for hands-on exploration.

Research Question 2: How pre-service teachers learn a new technology tool introduced in the course?

83% of the teams (n=15) responded that they wanted to be comfortable with the technical skills first before they could begin exploring the pedagogical approaches to integrating the technology tool. All the teams (100%, n=18) also strongly felt that the culture of sharing among the team members contributed to their confidence in attempting to explore the tool. The fact that they had a common goal – that is to implement the technology tool in their subject area provided the impetus for the pre-service teachers to help each other to learn the tool and to discuss the possibilities for integration in their subject areas. In their comments for improvements, the some teams highlighted that the learning of the technical skills and exposure to pedagogical skills should be available to them at all times (as reference materials). This will allow them to refer back to the resources, should they have any difficulties. In addition, most of the teams (88%, n=16) also suggested that there should be sharing of technical skills, pedagogical skills and lesson integration ideas among the teams so as to enrich their learning from through the sharing by their peers.

Analysis of the tutor's observation notes concur with the pre-service teachers' suggestion. The teams did not attempt to stretch themselves beyond their group capacity. A possible reason could be that they are unaware that there is more potential to the technology tool than what has been explored by the team. One of the best possible ways to scale up their skill levels and knowledge levels may be to make provisions for sharing. This will enable them to be exposed to much more ideas than they have explored within their team. The tutor observation also revealed that there was less apprehension to learning the tool and the culture of sharing and team exploration seem to have provided the impetus to examine an entirely new technology tool which might not have been the situation should the pre-service teachers be required to explore individually. Only about 27% (n=5) of the teams indicated individual exploration as factor that contributed to the learning of a new technology tool.

Research Question 3: What instructional approach should be adopted to facilitate the learning of a new technology tool for pre-service teachers?

Based on the content analysis of the pre-service teachers' reflections and tutor observation notes, the author is proposing a new instructional approach.

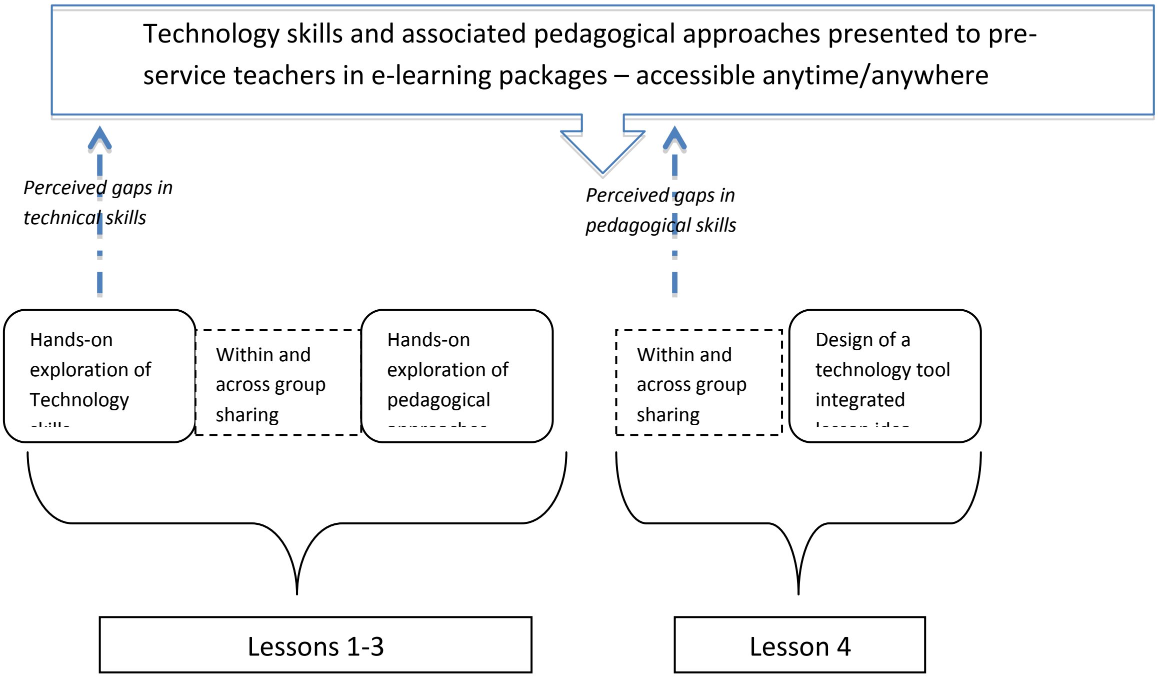

Figure 2: Proposed new instructional approach to the learning of a new technology tool

Proposed new instructional approach to learning a new technology tool

E-learning packages

The proposed design and creation of e-learning packages consisting of technology skills and pedagogical approaches is to provide opportunities for pre-service teachers to learn at their own pace. Based on the pre-service teachers' suggestions, these materials will be made available to them at the beginning of the technology tool learning sessions. The availability of the packages at the beginning of the module makes provision for the pre-service teachers to go through the packages as many times as they need to build up their technology and pedagogical skills. This creates time during face-to-face tutorial interaction. This allows them to make use of the time to discuss, share and learn from each other instead of using tutorial time to learn the technology and pedagogical skills. Hence, when pre-service teachers meet during lessons 1-3, they would have learnt the technology skills and pedagogical skills on their own time. They will come together as a team to share what they have learnt on their own. During the sharing, they can assist each other and to learn from each other. The availability of the reference materials at their disposal, allows for independent and self-directed learning. The anytime/anywhere accessibility to the e-learning packages again makes provision for the pre-service teachers to go back to segments of the package which they feel they need to in order to improve their technology as well as pedagogical skills.

During Lesson 4, the teams will share across, thus making provisions for across team sharing to optimise their learning capacity of the tool. Having learnt the various possibilities of the technology tool and various integration ideas, teams are now ready to design a lesson idea integrating the technology tool. The creation of the e-learning packages provides more hands-on team exploration time, team learning and across team sharing during face-to-face tutorial time.

Focus on learning of technology skills

Feedback from pre-service teachers reiterated the findings from literature that teachers need to be comfortable with the technology skills before they can consider designing and integrating the tool into a lesson. Hence, the technology learning component begins with provisions for mastering the technology skills first in Lesson 1. Time has been given for them to share with each other as well as to share across teams. Once they are comfortable with the technology skills, they proceed to the next stage of exploration, pedagogical approaches. Again, time has been given for pre-service teachers to share their pedagogical knowledge with each other as well as across teams before they are required to design a lesson segment integrating the technology tool that they had explored. By the design stage, this new approach would have given pre-service teachers ample opportunities to gain technology and pedagogical knowledge so that they can comfortably design a lesson segment. Since the pre-service teachers found sharing with peers and learning from other teams extremely useful, the researchers will create more opportunities for them to share, thereby creating a culture of sharing.

Conclusion

The focus of this study was to explore the effectiveness of an instructional approach introduced to pre-service teachers in an ICT core module. The design of the initial approach was refined based on feedback and observation data collected from the pre-service teachers. The crucial modifications made to the instructional approach was to make provisions for more hands-on exploration time, face-to-face team learning and team teaching which was complemented by e-learning packages which can be accessed anytime and anywhere by the pre-service teachers. In addition, as requested by the pre-service teachers in their suggestions for improvement, opportunities have been provided for them to share across teams so that their learning experience is far more enriched. It is not the technology that matters in the classroom; it is the teachers who conceptualise and design lessons to enhance the students' learning experience (Davis, 2008; Taber, 2003; Wood & Ashfield, 2008). Hence, how the teachers learn should be the focus of subsequent research. This new approach will be implemented in the coming semester and the author hopes to collect data to validate the new approach or to refine it further.

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Locating Technology Innovation within the Scholarship of Teaching

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We present a project that involves undergraduate nursing students working in small groups using a wiki to develop a collaborative glossary of health specific terminology. We locate our research – using a randomized control trial – within the scholarship of teaching and provide the rationale for adopting this approach to our research. We then provide two alternative evidenced-based approaches to innovating with technology –scholarly teaching and reflective teaching – and show how the three approaches can provide multiple pathways for technology innovators to take an evidence-based approach to their work so that we learn from the past and inform future teaching practice.

Keywords: Web 2.0, Wiki, scholarly, scholarship, reflective, evidence.

Research Project

Our research project involves undergraduate nursing students working in small groups using a wiki to develop a collaborative glossary of health specific terminology. Previously students were provided with a weekly list of relevant nursing and clinical terms that related to their lectures and case studies. Students were encouraged to be self-directed in becoming familiar with, and understanding the meaning of these discipline specific terms. The change of direction using wikis is aimed at providing students with a medium to gain a more in depth and contextual understanding of discipline specific knowledge and professional vocabulary. This is essential for their future communication in the healthcare environment. The project will also develop additional skills including learning to work cooperatively and collaboratively with each other.

We will be conducting a randomized control trial that will involve a control group (wiki group for an alternative group project) and an intervention group (wiki work for glossary terms). We will adopt a mixed method qualitative and quantitative approach to evaluate the impact of collaborative online learning on dependent variables. The dependent variables include participants' experience of the learning exercise, gains in knowledge and ability to apply their new knowledge to clinical scenarios. Students in both groups will be given: a pre-course test with video scenarios to establish their initial levels of knowledge; a post-course test with video scenarios to measure knowledge gains; and a post-course evaluation to gather information on their learning experiences. Students will also be interviewed to gather qualitative data regarding their experience of learning collaboratively using the wiki. Finally, we will analyze the wiki postings using a marking rubric. In addition to carrying out the research we are also interested in critically evaluating our research goals and research methods to determine the evidential value of this sort of research as compared with, for example, the design research approach championed by Thomas Reeves amongst others (Reeves, 2000).

Evidence and Innovation

As academic developers and discipline academics with a strong interest in educational research we are engaging in the scholarship of teaching and learning to ensure that we learn from the past and contribute to the broader evidential base for technology innovation as we move into the future. This means that we are following a number of distinct steps as we conduct our research (Richlin, 2001) Step one involves identifying a teaching a learning challenge and making a research informed decision regarding the solution to the challenge. Step two involves implementing a change in teaching practice and recording what happened as a result of the change. Step three consists of evaluating the impact of the intervention. Step four consists of synthesizing the results and placing findings in the context of the knowledge base. Step five consists of preparing and submitting one or more manuscripts for publication. Step six consists of disseminating findings through publication and adding to the knowledge base.

The scholarship of teaching is time consuming and likely to be an approach, for the most part, undertaken by educational specialists with research careers that centre on educational research. For this reason it seems prudent to provide alternative approaches to educational research that might be used by discipline academics with less time / less inclination to engage in educational research. This will help to ensure that educational innovations are informed by what has gone before whilst also contributing to the stock of educational research knowledge. Richlin (2001) distinguishes the scholarship of teaching from scholarly teaching by removing the publication process. On one line of argument this means that the findings are not disseminated and, therefore, the stock of evidential knowledge is not increased as a result of the research. However, findings can be shared locally through, for example, research seminars. The model of scholarly teaching therefore provides for drawing on past literature whilst also informing future developments within a local context.

There are those for whom even scholarly teaching will be a step too far. These individuals can engage in reflective teaching enquiry. Reflective practice involves educators thinking about and learning from their own practice and from the practices of others in order to gain new perspectives on the challenges that they face in their teaching. Reflective practice can help to improve judgment and increase the likelihood of taking informed action in teaching situations that are, by definition, complex, unique and uncertain. (Center for Support of Teaching and Learning, 2008). The initial act of reflective enquiry can, therefore, help to ensure that teaching practice is informed by past practice. Reflection can also help to inform future practice. Furthmore, reflective enquiry can be shared with colleagues in a local setting. With ongoing reflection, teaching practice can develop into a systematic inquiry that begins with reflection on teaching and learning experiences but becomes collective when informed by interactions with colleagues, students, and theoretical literature.

Discussion

If we make a distinction between the scholarship of teaching, scholarly teaching and reflective teaching, we can provide multiple pathways for technology innovators – no matter how busy and no matter what their particular career aspirations – to take an evidence-based approach to teaching improvement / enhancement. However, the current educational climate is defined by greater expectations with respect to both teaching and research and in this kind of situation the need for evidence based teaching improvement will need to be championed within institutes of higher education. This is particularly the case in research-intensive universities. One way to encourage evidence based teaching innovation is to connect teaching improvement with university reward and recognition processes so that individual academics are motivated to take an evidenced based approach to improving their teaching.

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Grounding the curriculum

Sean Dolan

This article argues that with the advent of online learning and the widespread use of discussion forums, there is an opportunity for faculty to encourage students to collaboratively reflect on their own teaching experience from their own unique viewpoints and contexts. Moreover, this shift towards active participation in online discussions has become essential to the student learning experience so that the full range of views and values from an increasingly diverse and non-traditional student base are shared and reflected. In this way it is suggested that traditional notions of curriculum as being defined and controlled by tertiary institutions are being transformed by the grounded experiences of student teacher practice.

Keywords: curriculum, participation, collaboration, cultural diversity

It is widely recognised that online learning has the potential to transform the teaching and learning paradigm in tertiary education (Garrison & Anderson, 2003). Traditional understandings of the curriculum as the object of study are being challenged as information technology and the widespread use of web 2.0 software transform the ways that students engage with learning materials and with one another (McLoughlin & Lee, 2008). Technological affordances of greater connectivity, participation and collaboration provide faculty with the opportunity to position the student and not the content at the centre of the learning experience (Siemens, 2008). Moreover, as the student body grows increasingly diverse, the need for a culturally inclusive curriculum design has become a central issue for learning (Hannon & D'Netto, 2007). The adoption of asynchronous discussion forums in formal education can be understood as a means of creating a more inclusive design which grounds the curriculum in the students' experiences. While the curriculum may remain static over the duration of the course, the way that it is interpreted and shared by students in discussion forums reflect a more dynamic and relevant approach to student learning.

Constructivist view of the curriculum

The traditional delivery of the curriculum positions students as receivers of information and imposed meanings through pre-packaged authoritative content such as text books or study guides (Boettcher, 2006). Based on principles of behaviourism, transmission metaphors of education view knowledge as being external to the student and transferrable from one person to another (Jonassen, Davidson, Collins, Campbell & Haag, 1995). In contrast, a constructivist approach to online learning is based on the notion that individuals construct their own understandings through experience, maturation, and interaction with the environment, especially active interaction with other learners and the instructor (Rovai, 2007). According to this approach knowledge can be conceived differently by each person (Anson & Miller-Cochran, 2009). Therefore, the defining characteristic of an online constructivist learning environment is dialogue which provides learners with opportunities to articulate their ideas, comment on previous postings and reflect on course content (Rovai, 2007). Discussion forums allow for students as a group to negotiate their own understandings and so the focus is not so much on the curriculum as the object, but students' interpretations of the curriculum based on their own personal experiences in the classroom. This is a very powerful message because it encourages students to regard established theory and concepts as objects to be explored, confirmed, or rejected in the light of experience (Smyth, 1989).

Asynchronous discussion forums have become the most widely adopted tool in online learning and according to Garrison (2003) their use signals a move to "the interactive and constructive potential of asynchronous online learning" (p. 48). Comparing face-to-face with online learning, Swan (2003) found that online discussions are more supportive of experimentation, divergent thinking, exploration of multiple perspectives, complex understanding and reflection. These knowledge and skills can be best elicited from students in lecturer led forums that encourage students to reflect on their own teaching experiences (Richardson & Ice, 2010). A greater disposition to exhibit higher order thinking in asynchronous forums can be partly explained by the time delay between postings which gives participants the opportunity to consider and reflect on their response prior to posting online (Maurino, 2007). In addition, all dialogue in the forums is archived creating a permanent record of students' learning which can be referred to as a means of continual reflection (Lea, 2001). The use of discussion forums allows students to mould and shape their own unique knowledge structures in dialogue with their peers. This means that the curriculum is no longer static or unidirectional, but is constantly evolving, adapting and reflecting a range of contemporary student perceptions and discourse. According to this perspective the formal traditional curriculum is being grounded by student voice and real-world experience. Such a trend in participation "harbinger[s] a radical transformation in who learns from whom, where, under what circumstances, and for what and whose purpose" (Haythornthwaite, 2009, p. 1).

Participation in community building

Effective use of discussion forums encourages the formation of social networks and relations between people. Haythornwaithe (2009) holds that participation connotes contribution to a community whose presence is vital for the effectiveness of online learning, a view supported in numerous studies (Liu, Magjuka, Bonk, & Lee, 2007). The forming of community not only has desirable outcomes for affect but also results in a pedagogical shift from focusing on the outcomes of an individual to considering the learning done by the group (Stahl, 2005). Whereas psychological theories of learning focus on the acquisition of knowledge by the individual, a sociocultural approach conceptualises educational environments as social and cultural situations where individuals and groups construct and express their identities. Social learning theories focus on learning that occurs within a social context and involves personal experiences, observations, and interactions with other individuals (Rovai, 2007). Wenger (1998) considers that learning involves participation in a social world where contribution is always based on situated negotiation and renegotiation of meaning in the world. Included in the community are members at varying levels of knowledge from the novice to the expert and part of the learning process is the novice's socialisation to the group through legitimate peripheral participation. In this way the community as a group evolves and learns, students "create explanations of phenomena that fit their local setting, re-supplying context that is often lost in decontextualised learning, and feeding that information back into the learning environment" (Haythornthwaite, 2009, p. 7).

Collaborative reflective practice

This move towards incorporating reflection and discourse, says Garrison (2006, p. 25), is at "the heart of a meaningful educational experience" and over the past recent decades, the concept of reflection has become a popular and core aspect of the discursive practice of teacher education. The importance of reflection is enshrined in the professional standards for graduating teachers as well as featuring in quality assurance initiatives, course accreditation and teacher selection procedures (Ovens & Tinning, 2009). The origins of the concept of reflective thinking are normally held to derive from Dewey's notion of pragmatic inquiry which posits that all knowledge and theory are ultimately derived from the reflections and experiences of others whose understanding is influenced by their own context, biography and culture. This implies that since all knowledge claims are contingent, new knowledge can only be learned through experiential learning that nurtures reflection on experience and the systematic testing of ideas. Schon extended this interpretation of experiential learning and argued for the promotion of practitioner-derived knowledge which he regarded as being more trustworthy and relevant than received wisdom (as cited in Smyth, 1989). By utilising discussion forums as a way of encouraging collaborative student reflection on teacher practice, the forums become powerful teaching and learning tools because what may be discussed in a forum one day can be applied and put into practice in the practitioner's classroom the next. In forums where there is a range of viewpoints and anecdotes of the student teachers' experiences, prospective teachers can best learn how to critically reflect on practice in social contexts where they have the opportunity to discuss practical problems with other teachers of greater and lesser expertise. Such interactions can not only help them solve immediate problems but also scaffold them from limited to more complex understanding and knowledge about teaching (Dyke, 2009).

Student diversity

Increases in student and cultural diversity emphasise the necessity for change in the way that curriculum is viewed. Curriculum can no longer propose to represent the views and experiences of an increasingly heterogeneous student body. It is widely recognised in teacher education that student teachers often bring with them the prejudices and misconceptions of education that they experienced themselves as students (Braun & Crumpler, 2004). Even when exposed to alternative views and concepts, students will often choose to retain outmoded or old fashioned notions of teaching and learning because to change current thinking requires a significant period of readjustment and confusion (O'Loughlin, 1988). In addition, students' reactions to the social-constructivist learning environments differ depending on their prior experience and communication norms across cultures. Rovai (2007) explains that teacher and students from a dominant culture may not consider how diverse students' cultural backgrounds affect their way of working on tasks and communication and Catterick (2007) questions whether students from backgrounds where more instructive pedagogies are dominant can adapt to the constructivist approach of online learning.

Increased cultural diversity implies a much wider range of opinions and backgrounds meaning that many of the assumptions and strategies that have been made on the part of the curriculum may run counter to the expectations of students from diverse cultures (Catterick, 2007). Pincas (2001) noted that students entering into professional education in a multicultural context not aligned with their culture can experience significant conflict. This is supported by Edmundson's (2009) claim that "e-learning courses are cultural artefacts, embedded with the cultural values, preferences, characteristics, and nuances of the culture that designed them, and inherently creating challenges for learners from other cultures" (Cultural accessiblity).This places greater emphasis on the instructional providers to be acutely aware of their own culture since their world views cannot be separated from the training that they develop (Parrish & Linder-VanBerschot, 2010). For example one of the principal drivers in the New Zealand early childhood curriculum is the fundamental belief on the role of free play for the child and the facilitating role of the teacher (Ministry of Education, 1996). This runs counter to many assumptions made by individuals who belong to cultures that have a tradition in transmission types of teaching that suppose the teacher to be the source of knowledge and the teacher's role to pass on that knowledge to their students (Hofstede, 1986). Because of the cultural divide, a curriculum that has been devised without awareness of how views and values are culturally specific may not take into account other students difficulty in getting to grips with underlying principles and concepts that drive such an approach to education.

However, in discussion forums this can be made the topic of discussion and learning can be enhanced through a consideration of context, experience and reflection on what the text books articulates and the student teachers own thoughts. In this context aspects of learning are rooted in social interaction and contextually bound by the participants own ability to contribute. Online learning acknowledges that theoretical move away from focusing on the individual's cognitive development and instead recognises the importance of social interaction. Interactive features that allow for Dewey-like reflection and group construction of knowledge are the new curriculum. Through support for these learning activities, the students are grounding the curriculum.

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Stop lecturing me, I want to learn

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Re-evaluation of pedagogical practice is driving learning design at Queensland University of Technology. One objective of the design for learning is to support approaches to increase student engagement and attendance in physical and virtual learning spaces through opportunities for active and problem-based learning. This paper provides an overview and preliminary evaluation of the pilot of one of these initiatives, the Open Web Lecture (OWL), a new web-based student response application that seamlessly integrates a virtual learning environment within a physical learning space.

Keywords: physical virtual learning environments, student response systems, engagement, OWL

Rethinking the traditional lecture

Traditional lectures are changing and thought must be put to how the alternatives for increasing student engagement and attendance in physical learning spaces are influenced by the elements within existing learning frameworks: pedagogy, space, technology and people (Radcliffe, 2009; Mitchell & White, 2010; JISC, 2006). If we examine these elements and correlate the pace of change against each one, an interesting paradigm emerges in which pedagogy is not evolving at the same rate as the other elements of the framework.

The pace at which technology is developing is intensifying and offers many opportunities for engaging learners in a variety of learning modes and also offers the possibilities of design-based research (Amiel & Reeves, 2008). The redevelopment of physical learning spaces has been the focal point for many universities seeking to engage staff and students with a range of new approaches to learning and teaching. This rich blend of technology and flexible learning spaces promotes both active and problem-based learning (Bonwell & Eison, 1991; Boud, & Feletti, 1997). In comparison, changes in pedagogical practice in higher education are happening at a much slower pace. Emerging from this disparity is a dynamic interplay between students, staff and technology. This interplay is challenging the value of attendance and engagement in physical learning spaces, especially for traditional lectures to large classes. Why should students attend lectures devoted to content delivery when web technologies and streaming replicate the learning opportunity in a more flexible mode (Corbin, Burns, & Chrzanowski, 2011; Kardong-Edgren, & Emerson, 2010; Dolnicar, Vialle, Kaiser, & Matus, 2009; Dolnicar, 2005)? Should we still just lecture? Empty seats in lecture theatres speak volumes regarding the pragmatic nature of student decisions (Corbin et al., 2011; Dolnicar, 2005).

Non-attendance poses risks for performance and motivation, and diminishes interaction with lecturers and other students (Arulampalam, Naylor, & Smith, 2007; University College London, 2007; Massingham & Herrington, 2006). Yet the decision to attend might be more heavily influenced by whether the student perceives the material or the lecturer to be interesting, or anticipates that the material will include assessable information not otherwise available (Gump, 2004; Westrick, Helms, McDonough, & Breland, 2009). This interplay of elements within the learning framework warrants a reconsideration of pedagogy with a view to improving the quality of the learning experience (Laurillard, 2008a), and this reconsideration should address student engagement and exploit attendance as an opportunity for active learning (Ramsden, 1992; Phillips, Preston, Roberts, Cumming-Potvin, Herrington, Maor, et al., 2010).

Design and concept

A re-evaluation of pedagogical practice presents opportunities to create effective learning environments in both physical and virtual spaces by increasing student engagement in active learning within large lectures (Laurillard, 2008b, 2009; Stacey & Gerbic, 2009). The Open Web Lecture (OWL) is a new web-based student response application developed by Queensland University of Technology to seamlessly integrate a virtual learning environment within the physical learning space.

The technology has been design to facilitate a *live collaborative*; a fluid collaboration between academics and students connected to OWL via the University's Wi-Fi network, using laptops or web-enabled mobile devices. The application offers opportunities for the lecturer and students to post comments, questions, and reply to or 'like' the comments of other participants. OWL facilitates polling of students and instant review of tabulated results. At the completion of the lecture the OWL session is automatically archived for subsequent review. Many of these features instinctively appeal to student users of social networking media, yet avail the academic of control within the University network. Student privacy is respected through a system that preserves peer–peer anonymity, a functionality that seeks to address a traditional reluctance to speak up in large classes. This offers new possibilities for active learning in physical spaces by providing increased opportunities for student engagement, supporting a range of learners and learning activities, and fostering a blended learning experience.

OWL has been designed to enable:

- a virtual learning experience within physical spaces for large group lectures, seminar groups, workshops and conferences
- the creation of a non-intimidating virtual learning environment in which to ask questions anonymously
- the promotion of a learning community
- instant exchange of feedback
- peer support
- opportunities for active and problem-based learning within the lecture.

The pilot

The OWL pilot began in 2010 across three faculties: Education, Built Environment and Engineering, and Law. Law introduced OWL within four core undergraduate units undertaken by second and third year students with five members of the academic staff, all of whom undertook training in the use of the application prior to its use. The faculties of Education and Built Environment and Engineering introduced the application within specific undergraduate units. OWL has also been used to facilitate a number of events for staff and students across the university.

Potential barriers to learning with this new type of technology were identified, including: technical issues in relation to connection and use; financial burden of using personal 3G data and not the university's free WiFi; lack of a device with which to connect; equity issues associated with the quality of the learning experience for those students unable to or electing not to connect; and the potential for misuse/inappropriate posts. These potential barriers were addressed through a number of initiatives. A preliminary and in-class support model, offering both technical and pedagogical support was introduced. The focus of the preliminary support was on the effective design of learning activities to integrate the technology within lectures and user training. The university's student help desk and the dissemination of instructional material provided preliminary support for students, while in-class technical assistance was provided for the first lectures using OWL. Students were encouraged to connect to the web application via QUT's WiFi, eliminating any financial burden on them. The QUT Library loaned laptops to students in need of a device to connect to OWL; however, there was a low student uptake on loans for this purpose.

Use of the OWL application was optional for students. In order to ensure that OWL could still be used as a springboard for active learning for students either unable to or choosing not to connect, a number of initiatives were implemented. Where OWL was used in lectures, the lectures were recorded with screen capture and made available via podcast and the units' websites. Where polls were conducted, hard copies were distributed and made available for download from the unit's website. The lecturer was able to display a live stream of posts or poll results to direct/stimulate class discussion on the projector. In this way students not wirelessly connected could still enjoy the benefits of the stimuli provided by the learning activities occurring within OWL.

Davies and Lee have warned that virtual education involving engagement with social networking technologies will increasingly have to cope with the potential for malign user behaviour as the 'virtual education world' expands (Davies & Lee, 2008, p. 260). While social networking sites offer effective and popular means of facilitating communication, there is no guarantee that student users will adhere to a university's internet use agreement. Universities seeking to minimise potential for offensive or potentially defamatory postings would prefer to have the capacity to take down posts. The OWL application provided functionality to 'warn' and 'block' students at the lecturer's discretion, and students were aware that the lecturer could see the identity of all student postings. While novelty posts occurred on first use of the application throught the pilot, the expectation of appropriate behaviour rendered the control functions obsolete without exception.

While OWL provided opportunities for greater connectedness within the lecture environment, 'connectedness per se does not ensure interaction let alone emergent learning' (Williams, Karousou, & Mackness, 2011, p. 51). Lecturers were encouraged to use the virtual environment created by OWL as a springboard to active learning through high quality face-to-face, peer–peer, student–lecturer interaction (Williams et al., 2011; Braxton, Milem, & Sullivan, 2000; Popkess & McDaniel, 2011). The live stream discussion was used *by the lecturer* to pose questions to students and *by students* making comments about the lecture content and posing questions to the lecturer or other students. In some units students were encouraged to use the live stream discursive to generate checklists and terminology dictionaries. A number of units used OWL as a platform for small group problem solving, followed by an OWL poll devised to provide feedback to students as to the extent of their understanding of the lectured material and how it should be applied to the problem.

Preliminary evaluation of the pilot of OWL survey results

The OWL student surveys captured a range of data regarding their use of the technology, level of engagement and method of participation. All students attending the last lecture of the semester for each unit were invited to participate in the survey and 283 students completed it. The data collected was de-identified and grouped by faculty and unit for analysis.

Table 1: Preliminary pilot survey results

Survey question	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
The lecture sessions using OWL were engaging	24%	52%	22%	1%	1%
OWL helped me to get involved in the lecture session	24%	38%	28%	7%	3%
The learning activities in lecture sessions using OWL were relevant	32%	49%	16%	3%	0%

As illustrated in Table 1, the data collected presents evidence of the impact on student engagement, with the survey results showing lectures that used OWL were 'engaging'. If we correlate these figures against the student response to the question 'OWL helped me get involved ...' the emergent pattern provides us with insight into the impact of this type of technology on the student learning experience. The relevance of the learning activities was a key aspect of this inquiry, showing a high proportion of positive feedback that was apparent throughout the whole sample and not isolated to engagement-focused questions. The trends in the survey results are consistent with earlier research into the effectiveness of using personal response systems or 'clickers' in lectures. The findings are consistent with those of Hunter Revell and McCurry, who found that students both enjoyed and were comfortable using the technology in class and, further, that students and faculties' perceived such technology to be 'effective in engaging students, fostering critical thinking and improving learning outcomes in both the small and large classes' (Hunter Revell & McCurry, 2010, p. 274). The low level of negative feedback from students was assessed through analysis of those students' responses to the survey's open-ended questions, particularly 'Comments and suggestions for improvement'. This revealed that their negative experience was related to the lecturer's use of the technology or the student's capacity to connect to OWL.

Conclusions

The rapid pace of technological innovation offers education unique opportunities for live web-based applications like OWL to continue to evolve, blending the physical and virtual space to engage learners and challenge the interplay between pedagogy, space, technology and people (Radcliffe, 2009; Mitchell & White, 2010; JISC, 2006). As we seek opportunities to rethink pedagogical practice, applications like OWL have shown their potential in learning and teaching. As the pilot of OWL continues throughout 2011, the preliminary data collected is serving to inform the future direction of these types of technologies within Queensland University of Technology.

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Recent developments in virtual worlds and their potential impact on their use in higher education

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Educators have been quick to spot the affordances of virtual worlds (VWs) for authentic learning, distance education and for creating community among students. Though the affordances for many disciplines are obvious, there have been significant barriers to the widespread adoption of virtual worlds in the higher education sector. This paper examines some of the recent developments in VWs, user interfaces and company policy that may have a significant impact on the uptake of VWs. Some of these developments include simplification of user interfaces, increased options for VW hosting and changes in pricing policy. Future developments such as the advent of Microsoft's Kinect and the availability of VW apps for both Apple and Android devices are also considered.

Keywords: virtual worlds, Second Life, Kitely, OpenSim, Multi-User Virtual Environments

Introduction

With the widespread availability and accessibility of Virtual Worlds (VWs), educators are no longer restricted to the physical and geographical limitations of their institution, community, state or even country. Just about anything that can be conceived can be created in a virtual environment. VWs enable educators to leverage social connections and learning methodologies in order to transform basic approaches to learning and communication. Generational, professional, historical or gender gaps become obsolete in an environment where users cooperate to create knowledge and experiment with identity in collaborative spaces. Users, via their avatars, learn how to solve problems in the design by means of creation and modification of their own content. This intrinsic culture of participation suffused with pervasive learning makes VWs dynamic and stimulating learning environments (Ondrejka, 2008: p. 229). In spite of the obvious potential of VWs to address many of the issues around authentic learning, distance education and the formation of student community, the uptake of virtual worlds in higher education has been piecemeal and limited. This paper investigates some of the recent developments in virtual worlds which may impact the perceived barriers around their wider adoption.

A Virtual world (VW) is a computer-, server- or internet-based virtual environment that allows participants to move around and use various forms of communication (text chat, voice chat or instant messaging). It allows participants to create a virtual identity which persists beyond the initial session (Maher, 1999: p. 322; Ritzema & Harris, 2008: p. 110). The term was coined by Chip Morningstar and F. Randall Farmer in 1990 (see Morningstar & Farmer, 1991: p. 273) and is often used interchangeably with 'Multi-User Virtual Environment' (MUVE) (see Castranova, 2001: pp. 4-5). Second Life is one of the most well-known VWs probably due to the intense media scrutiny it has attracted, but many others exist such as OpenSim, Active Worlds, IMVU, Twinity and Blue Mars. VWs are populated by motional 'avatars'; the term is derived from Sanskrit and used in Hindu mythology to denote the earthly form adopted by a deity, commonly Visnu (Leeming, 2001). In VWs, this term denotes the representation of a character, controlled either by an individual. The choice of avatar can reflect a player's personality, gender or ethnicity. It is also possible for a learner to assume a completely different identity which in itself may constitute a significant learning experience, particularly important in role-playing scenarios (Annetta, Klesath, & Holmes, 2008: p. 2). In addition, they are able to communicate with large groups of avatars (via voice- or text-chat or asynchronously with podcasting or notecards) or communicate more intimately with a single avatar (using instant messaging) (Tashner, Riedl, & Bronack, 2005: p. 6). Avatars are able to interact with and modify the virtual environment and are even able to interact beyond the confines of the VW if objects are linked to web pages (Tashner, Riedl et al., 2005: p. 6).

Recent developments in VWs

In line with other technologies, VWs have matured rapidly in response to user demand, developments in social networking applications and with improved performance of computing hardware. Other factors have also driven these changes including potential applications, a changing economic environment and an increased familiarity with comparable virtual environments such as those encountered in Massively Multiplayer Online Role Playing games (MMORPGs) such as World of Warcraft.

Second Life

The discontinuation of the Second Life education discount
Second Life is the most popular VW used by educators, boasting around 16 million user accounts. From the very beginning, Linden Lab, the creators of Second Life, encouraged educational institutions into the environment by offering a 50 per cent education discount on tier fees and the purchase of land. Many Australian and New Zealand universities entered the space including the University of Southern Queensland, the University of Queensland and the University of South Australia. The response was strong and a vibrant educators' community was soon established, along with the lively Second Life Educators Mailing List. From the first of January 2011, the education discount was discontinued by Linden Lab. The outcry was enormous – there were many expressions of anger and disbelief on the SLED List – and many institutions pulled out of Second Life entirely (Chapman, 2010). For example, the University of Auckland will move out of the environment once their current lease expires (Young, 2010). Two things happened as a result of this. First, many educators looked for low cost alternatives. For example, the University of Auckland increased its stake in OpenSim. OpenSim is a virtual world that looks very like Second Life but is instead based on open source software. It can be housed on an organisation's own servers or there are a number of external hosting services available. Though hosting costs are significant, they are generally less than the cost of maintaining a Second Life presence as long as the technical expertise to maintain the OpenSim instance is available. The second thing that happened was that educational institutions began to look more seriously at sharing Second Life sites. Most spaces are not used by an institution all of the time so it is practical for two or more institutions to share a space. This becomes particularly viable when considering institutions that do not share time zones.

The closure of Teen Second Life
Another significant change was the closure of Teen Second Life. Since the beginning, Second Life required that people who register be over 18 years of age due to the adult content (some sexually explicit, gambling and so on) present in Second Life. In parallel, a Teen Grid was set up with registered users between 13 and 18 years of age. Adults who wanted to work in the environment – for example educators – had to undergo rigorous security checks and were restricted to strictly circumscribed parts of the grid. Teen Second Life was closed in at the end of 2010 (Joseph, 2011). At the same time, Linden Lab decreased the required age for registrants in Second Life to 16. This was significant for higher education institutions because there had always been a problem taking first-year students into the environments as many students were just 17 years old in their first year and could not enter the environment without contravening the Second Life terms of service. This is now no longer an issue with the decrease in the age restrictions.

Changes to the User Interface
Though many saw it as a retrograde step, in March 2011 the Second Life viewer was released with two modes for use: beginner and advanced. In 'beginner' mode, the interface is much simpler with only a limited number of avatars to choose from, there are no menus, no inventory to tussle with and access to a mini-map (Nino, 2011b). To date, one of the biggest impediments to educator adoption is the learning curve associated with navigating the user interface and environment. Students have identified the difficulty of using a complicated interface as a significant issue when using Second Life (Sanchez, 2009: pp. 29-30). With the option of using the beginner mode, this problem has been significantly addressed. For most activities that students are likely to engage in, the

features of the advanced mode are not necessary. For example, most educational activities won't require students to teleport between destinations or rifle through their inventories. Time that was once devoted to interface orientations can now be redirected towards richer learning experiences. In addition, it is possible to switch between beginner and advanced modes such that students can familiarise themselves with the environment in beginner mode and switch to advanced mode once a level of familiarity and comfort has been achieved.

Ease of registration

When Second Life first came to the wide attention of the public in 2007, only some 90 per cent of users who registered went on to visit Second Life itself (Sanchez, 2009). One of the main reasons was perceived to be because of the difficulties associated with account registration. In these early days of Second Life, a user had to choose from a limited number of surnames and common first names soon became unavailable such that it could take several attempts before an account could be successfully registered. In November 2010, it became possible for Second Life users to register with a name of their choosing (Nino, 2011a). Also, users could also use a display name which could be changed as the need arose. Changes to web-based registration interface further simplified the process. Users could choose a starter avatar when they were registering via the Second Life webpage, before entering the environment. Previously they were required to choose an avatar and alter its appearance within the environment itself. A user's first minutes in Second Life are frequently stressful, and this was compounded by worrying about their avatar's appearance upon arrival when users feel most vulnerable. It also became possible for educators to post a SLurl (Second Life URL) on a webpage or in a Learning Management System to facilitate registration and to ensure that students emerge into the environment at the correct destination. When a student clicks on this link, he or she is guided through registration and when they log into Second Life, they arrive at a destination of the educator's choosing. This is helpful when students are using beginner mode as they are unable to teleport readily to other destinations.

For many institutions, Second Life remains the easiest way to access a VW and in spite of the removal of the educational discount, still is the most cost-effective way of maintaining a virtual presence, especially if there is a lack of appropriate technical expertise within the institution to maintain an alternative system. In addition, recent changes to the user interface and registration procedure have ensured that Second Life remains a popular choice for educators.

Kitely

As well as there being changes in how virtual worlds operate, there are significant developments in how they may be accessed and hosted. Kitely is an on-demand virtual world provider which enables users to visit the Kitely website, log in with their Facebook credentials and create a private virtual world region (or 'sim') (Touchner, 2011). Currently, Kitely is providing OpenSim regions but other virtual worlds will be available using this simple log in method within twelve months. As the owner of the region, a user is able to decide who can access the region – for example, a specific group or class – or it can be made public. The beauty of Kitely is that an educator will only pay for the time that the world is actually being accessed. Once there are no users in there, the region closes and the server resources are directed towards a region that is in use. There are a number of advantages to this approach:

- Very little technical expertise is required; the VW is hosted externally;
- The sim owner pays a small amount per user per hour the sim is in use. Very soon there will be revenue streams available to Kitely users so that it will be possible to monetise projects;
- Because each region is standalone, security issues are minimised. Only avatars that are authorised can enter the space; and
- Because Kitely is using OpenSim, it is easy to upload freely available OAR files which means that educators are easily able to upload one file and create a complete environment. OAR files are readily available from a number of sources. This also makes VWs infinitely scalable with many instances of the same region able to run concurrently, allowing large numbers of students to access the region. This has been an ongoing issue for Second Life and OpenSim where only limited numbers of avatars can be in the one region concurrently.

Though Kitely is already highly functional, a number of developments are planned that will enhance its useability, including increasing the number of login options to include the use of Twitter or Linked In credentials, and Learning Management System (LMS) integration. Kitely is a low cost and low risk way for educators to access virtual worlds, and should ensure that secondary educators will have increased opportunities to leverage the affordances of VWs.

On the horizon …

The ways in which we interact with VWs is set to change. Already a number of iPhone and iPad apps are available to allow limited access to VWs including Pocket Metaverse and AnsheX Client to access Second Life, a Blues Mars app can access that VW, and IMVU2Go, Hide and Seek by IMVU, and IMVU Chat to access that social space popular with teens. As yet, because iPhones and iPad are not compatible with Flash, the interactions are limited and don't offer the full VW experience. The range is even more limited with Android devices however there is an app called Mobile Grid Client which offers limited interaction within Second Life. It can be reasonably expected that given times, a greater range of apps will become available on both platforms that will allow greater interactivity within VWs. The Microsoft Kinect flags some changes in the way we will physically interact with VWs. Already the Kinect has been hacked to allow hands-free interaction with Second Life, The Nintendo Wii Balance Board was similarly hacked to allow hands free movement in the virtual environment.

With changes discussed including changes to the Second Life pricing and age structure, user interface and registration, the emergence of new hosting models as with Kitely, and the increased range of devices able to access virtual worlds, it seems likely that VWs will gain more traction within higher education, educators keen to exploit the unique affordances these environments deliver.

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Teacher engagement in a Web 2.0 world: Developing your online teaching and learning Community of Practice

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Recent developments in web-based tools have presented new opportunities for teachers and learners to engage in new ways, not only with their specific discipline, but also with themselves, with each other, and their learning. Online Communities of Practice (CoPs) serve not only as clearinghouses for what teachers already know about a discipline, but also as places where new knowledge and skills are developed. They can be a place where professional identities can be shared and grown as knowledge and skills are grown; they can provide space for ideas to be shared, considered, developed, and then used by all members of the CoP; and they are certainly a place where we are able to confront and develop the ways in which we learn.

The researchers are two academic developers currently at Unitec Institute of Technology. In the Spring of 2009, the researchers, as technology stewards, created “The Teaching and Learning Community at Unitec” (T & L Community), an online CoP (http://tlcommunityunitec.ning.com/). The T&L Community is where teachers share and develop teaching and professional resources as well as announce events such as professional development opportunities, conferences, and other gatherings. Members participate in conversations through blog posts and comments, real-time chat and themed chat sessions. This new tool for engaging teachers with each other and their profession resonated with the early members and the CoP began to grow twice as fast as the technology stewards had anticipated.

To accommodate this growth, the site architecture was revamped once and the site was redesigned twice. Today the T&L Community at Unitec is the largest online teaching and learning CoP in New Zealand, with more than 300 members from across the nation and the world. The site hosts a range of resources, smaller communities of practice, information and guidance. The site is well used by the members and the stewards continue to receive positive informal feedback.

This paper explores the background, context and aims of the research, presents preliminary findings, and

presents the methodology for further data collection. The paper draws early conclusions and implications about using online communities of practice in a teaching and learning environment.

Keywords: online community, community of practice, social media, collaboration, teacher professional development.

Background

In the course of our work as academic developers for a New Zealand Institute of Technology, the authors built a small handful of online Communities of Practice (CoPs) in September of 2009 for our teaching staff. One of these CoPs, "The Teaching and Learning Community at Unitec" (T & L Community - http://tlcommunityunitec.ning.com/) had by early 2011 evolved into New Zealand's largest and most active online teaching and learning CoP, with over 300 members from across New Zealand and around the world.

The T & L Community is a place where teachers share ideas and experiences, create resources, form their online professional identities, join groups and announce events. The site is, as Wenger, White and Smith (2009) remind us, a location for social learning with three basic characteristics, a Domain, a Practice and a Community. It's domain is Education, more specifically, it requires members to have education as a fundamental core in their professional identity; the Practice is a sustained, shared engagement with other educators in the areas of design, facilitation, assessment, evaluation, professional development, and scholarship; and the Community fosters social learning with relationships built on trust, mutual engagement, well-managed community boundaries, and members willing to take leadership roles to sustain and develop enquiry. The TLCommunity is where teachers connect and it has become an essential part of our work as academic developers.

Context

Budd told us back in 2005 that web 2.0 technologies can create a richer user experience, where it is easier for people to participate and collaborate. We agree. Taking our lead from Wenger, White and Smith (2009), who trained educators to create online "communities of practice" and encouraged educators to become "technology stewards" rather then transmitters of content, we created the T & L Community so that teachers could use the technology for something Wenger (2009) reminds us is fundamental to our humanity: social interaction. More specifically in our context, we saw it as an opportunity to facilitate the teacher-to-teacher interaction that builds a real sense of community as it builds teacher capability – focused, purposeful, and immediately useful conversations, resources and support.

However, practitioners (of any practice) will not necessarily move easily into an online CoP. Reynard (2009) identifies the key challenge for those who drive a CoP is to ensure that their members have the confidence, learner autonomy and collaborative learning skills to participate in any learning community. An online community invites members to develop the skills of active, engaged and productive participants in their practice and in their own professional development. Often, this can be as daunting as it is inviting – it makes us publically accountable for our practices and for our professional growth. Not every teacher is ready to dive headlong into those waters.

Here is the good news - the online CoP invites teachers to practice the three skills that both teachers and students will need in the future: to be confident in publicly publishing our ideas (representing ourselves and our thinking online as well as creating and developing an online presence); to be autonomous learners (evaluating content, creating and customising professional profiles, maintaining our public workspace and writing reflectively in a public space); and to be able to work collaboratively with others (sharing content, joining groups and networks, making and developing contacts, posting messages, using collaborative tools effectively, and so on).

This, of course, is the very business of a CoP, to share and manage the knowledge, skills and values around a specific practice. For teachers, the invitation is to be engaged and creative in our identities as teachers and practitioners in ways that we expect our students to be in their student identities and in their developing identities as novice practitioners in their disciplines. As the site grew, it became clear that an online CoP for teachers is an ideal way for teachers to build capability.

And grow it did. The first 15 months brought great development for the site and for the researchers (that story is at http://tlcommunityunitec.ning.com/profiles/blogs/our-story-so-far-the-tampl). The architecture and design have been redeveloped. The tone and the content of the site has a more global nature than before. We have noticed the growth of special interest groups and the rise in activity in those groups. The site is dynamic and continues to grow and evolve.

What has become apparent is the need to undertake some research to evaluate the quality of the participants' experience, and to ensure we continue to meet their needs. In 2011 we will undertake a small research project to evaluate effectiveness and gather qualitative data on which to base further interventions.

Aim

The aim of this project is to explore the ways in which teachers engage with the Teaching and Learning Community. We have two aspects we wish to explore – individual participation and community cultivation.

In addition, we want to explore the role of the technology stewards in the process and content of the community. We want to know how teachers perceive the planning, resources, organisation of events, responsiveness and contributions of the technology steward team.

Method

This study is of three months duration. It will employ a single survey and an examination of the Teaching and Learning Community website using platform observation and Google Analytics.

In the first phase of the study a literature search was conducted. The review was presented as a topical interest paper at the New Zealand Cooperative Education Conference in Napier in April, 2010 (Ayling and Flagg, 2011).

In the second phase of the research, the researchers have taken a two-pronged approach: we have sent out a survey to all members and we and have data-mined the site using Google Analytics and basic platform observation (of resources, member data and other artefacts) to gather basic demographic and usage information.

The purpose of survey is to find out how members are participating in the community, what they would like changed, and what they think of learning and technology from their experiences of participating in an online community. We will also glean data that demonstrates users' understanding of the Domain, application of the site's resources in their Practices, and how their sense of the Community is working in their social learning within the CoP.

The members will be asked to reflect on their engagement with resources in their role as a teacher. Our particular interest is in the development of teachers' confidence and capabilities in an online environment. The site is deliberately designed to support teachers to learn, so this information is critical to assessing the success of the site.

The members will be asked about how they interact with a regular update from the site. This information will provide us with the detail of how teachers participate with the technology stewards and communication. The members are asked to give details of the number of times they have interacted with various tools and processes.

The purpose of this question is to ascertain whether members are at beginner, novice, competent, proficient, or expert level of engagement. The members will be asked for feedback on the privacy settings of the site. This information will ensure the technology stewards respond to the members' desires. The members are asked to comment on how the site is functioning and invited to make suggestions for further improvement

To ensure that the date is academically rigorous, the researchers will triangulate by data mining the website. We have used Google Analytics to gather basic details of the number of people accessing the site daily and the most common use members make of the site. In addition, the researchers will be recording the number of members, new members, blog posts, groups, and exploring data which members have publicly shared on their profile pages. These observations and the results of the Analytics are discussed below.

Results thus far

Who are the members of this online Community? How do they identify themselves? What do they do online and where are they from? They come overwhelmingly from Auckland (81%), which one would expect at an institutionally-based CoP in that city, but members log in from Australia, Fiji, Bahrain, the US, Canada and all around Aotearoa / New Zealand. Not unsurprisingly, most members (81%) report working at Unitec at the time they signed up.

In terms of identity, almost twice as many members (31%) identify as female than as male (17%) while a slight majority of members overall (52%) preferred not to identify their gender. Most members are teachers (34%) or staff developers (29%), followed by institutional researchers (8%), librarians (6%), senior lecturers (6%) and programme directors (4%). The remaining members who provided an occupation at the time of joining the Community were divided between other tertiary institutional positions and private education providers and consultants. Overwhelmingly, the members are front-line teachers, working to develop either students or staff.

In terms of online identity, a simple majority of members (62%) claimed to have an online presence. As we might expect, slightly over half (52%) reported that presence to be on Facebook. A quarter (26%) of the CoP members claimed to have a website of their own while a tenth reported being on Twitter as their main online presence, and a handful each claimed to have blogs (6%) and LinkedIn Profiles (6%).

Interestingly, just over a quarter (27%) had uploaded a photo of themselves to their profile page in the CoP; we feel that uploading an identifying photo is one indicator of a strong presence in any Community, and as the literature show us (Wenger, et. al. 2009), more than three quarters of the members of any online community will take the valid role of passive consumers of community cultural artifacts (resources, knowledge, skills and values). This interests us because on the face of it, this indicator of online presence fits well with the definition of Community of Practice, and we want to know if our members and their online behaviour fit within the model we are using.

The last two indicators of a strong online identity we explored was members' confidence in finding ideas and publishing ideas online. When asked if they had confidence in finding ideas online, somewhat more than half (57%) said they were 'confident' and everyone else (43%) said they were 'very confident'. The more difficult skill is in publishing ideas - Many (30%) said they were 'not confident', about half (51%) said the were 'confident', less than a fifth (17%) said they were 'very confident', and a wee few (2%) said they simply were not interested in publishing their ideas online. As with all CoPs, the TLCommunity has drawn together experts, practitioners and novices into one digital habitat.

What behaviours are evident to indicate a strong online presence and leadership in the Community? Resources are created and developed through our blog posts while discussions on specialty topics in education are held in groups. A strong online presence would be demonstrated by the number of resources a member creates and shares (blog posts) and participation in a variety of discussions the Community hosts (groups).

At the time of analysis, 254 resources (blog posts) had been created, 223 of them (88%) by the two primary drivers of the CoP. Another 25 posts (10%) had been written by four other members of the Community, and the rest were one-offs by various members. While this behaviour seems to contradict members' perceptions of themselves, where a clear majority (68%) claimed they were 'confident' or 'very confident' of publishing ideas online, it seems to line up with the idea that most CoP members would be valued lurkers, reading others' ideas but not sharing any of their own.

The Community hosts fourteen groups, all of them education-related, with an average of 15 participants per group. Many members have overlapping interests so many of these participants will be the same members. This indicates that while there are only a few drivers of the CoP, and most members would prefer to consumer the Community's resources than produce them (again, this is perfectly normal for an online CoP) there is a circle of members willing to develop their knowledge and understanding through conversation. These three circles of participation pretty much define the behaviour of the typical CoP (Wenger et. al., 2009).

Finally, we have usage data for the month of August, which indicates that even though most members are not creating resources or sharing ideas, a great many are accessing what is on the CoP. In August 2011, the site received 904 hits, or slightly over 29 hits per day. With an average of 10% of users accessing the site daily, the large portion of members who do not produce Community resources seem interested in consuming them.

In the end, we have a well-used CoP, characterised by a wee core of members, primarily the technology stewards, driving the Community, who are essential to the sustainability of the Community; a slightly larger group of members trying their hand at sharing ideas and participating in group discussions; and on the vast periphery, the majority reading but not sharing. By all appearances, it is a classic, healthy Community of Practice, creating, developing and managing knowledge, skills and values.

Implications

By analysing basic usage data, conducting straightforward site observation and by anecdote, the T&L Community seems to be a place where knowledge is managed so that members develop their teaching practice, their collaborative skills, and for some, their confidence in sharing resources and ideas. For the drivers of the community, Wenger's 'Technology Stewards', it appears to be an excellent use of time, attention and resources in developing our academic staff. What makes this CoP interesting and successful? We suspect people come for the resources, blog posts, groups, events, and the ability to communicate quickly with colleagues who share the context of being in the CoP. We are hoping to confirm that with our survey.

The last piece of the puzzle for this project will be revealed by our month-long survey, already underway, which asks members about their understanding of the purpose and function of the CoP, their actual behaviours within the Community and their attitudes about its functioning. These findings will be shared with the ASCILITE community this December in Hobart.

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The role of tutors in facilitating online student engagement

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This paper discusses the role of the tutor in developing an online learning community to promote student engagement for large online cohorts. Information overload on the discussion boards was addressed by separating students into streams of 150 – 200 students promoting greater student and staff engagement. A new feedback strategy was introduced to streamline the assignment-marking process and this feedback process has proved to be more socially engaging than traditional feedback via comments embedded within student assignments. The new feedback model involves commentary on assignments, which becomes a "conversation" with the student rather than a series of comments embedded within assignments. In addition, easier access to comments allows greater opportunity for moderation of marks by tutoring teams and for "feedforward" for subsequent assignments. The importance of the level of engagement and commitment to teaching of the tutoring staff has been made apparent by the serendipitous changes to the tutoring role.

Keywords: teaching teams, online learning, student engagement, learning community

The importance of student engagement

Student engagement has been defined by Macquarie University (2009) as 'the extent or quality with which students are committed and actively involved in their learning" (Macquarie University, p.1). This definition suggests student ownership of their learning by emphasising the student's active involvement with the learning process, rather than emphasising interactions with other students, with academics or with institution. On the other hand, student engagement surveys such as American National Survey of Student Engagement (NSSE: 2009) and the Australasian Survey of Student Engagement (AUSSE: ACER, 2009) have an implicit definition of engagement embedded within their questionnaires. This implicit definition emphasises engagement with peers, with staff, with the institution and with specific technologies or types of learning activities, thereby ensuring that responsibility for student engagement does not lie solely with the student.

Macquarie University also suggests that student engagement requires staff engagement, however little is said about the nature of staff engagement. Is staff engagement a matter of quality or quantity of intellectual interaction with students? Does staff engagement also involve being socially engaged with students? Do teaching staff need to be deeply engaged with the materials they are teaching, or with the teaching process itself? Or should staff engagement reflect a strong identification with the institution offering the course they are teaching? Staff engagement is as difficult to define clearly as student engagement, and neither term gives a clear indication of what exactly is being engaged with. Whatever the concept entails, it is generally agreed that successful students tend to be more engaged with their studies, and this is facilitated by engaged and enthusiastic teaching staff within a supportive learning environment (Bryson & Hand, 2007).

Student engagement in the online environment

As more university services go online, and many of the incoming cohort of students have grown up in the digital age, it is becoming increasingly important to understand the effects of online learning practices on student engagement (Krause & Coates, 2008). Online students are, in general, positive about their study, particularly with regards to its convenience in terms of independence of location and time (see LaBay & Comm, 2004 and Li & Irby, 2008 for a review of the literature). However, mode of delivery has a significant impact on attrition rates, in that online students are more likely to drop out than on-campus students (Patterson & McFadden, 2009). Although some online students drop out of their courses for reasons specific to the individual student (e.g., work commitments, ill-health), Willging and Johnson (2004) report that i) feelings of isolation, ii) disconnectedness, and iii) technological problems are common explanations for the high attrition rates in online courses. In other words, many online students drop out from their study due to a lack of engagement with the online learning environment.

Online students also have higher expectations regarding interaction with teaching staff (LaBay & Comm, 2004; Li & Irby, 2008) than on-campus students, presumably because staff members tend to be more visible to them through the interface of the online course materials than their fellow students. Online study is, for the most part, a solitary pursuit, whereas on-campus students have greater opportunity to engage with their student peers in the course of their daily activities on campus than they do with the teaching staff. Online students, probably more so than on-campus students, need to be able to engage with their learning in an independent style, but it may be that overall academic engagement can be facilitated for this cohort by developing a greater sense of social engagement.

Online Learning Communities

Concerns have been raised that the technology comprising a university's learning management system ends up driving, rather than supporting, pedagogy (Deneen, 2010; Lane, 2009). Although this possibility is often cast in a negative light, learning technologies can also have positive effects on teaching practices and student engagement (Coates, James & Baldwin, 2005). With careful educational design, online courses are able to facilitate a sense of being part of a learning community despite the fact that students and staff are separated both physically and temporally (Rovai, 2002). Online activities, multimedia tools and discussion forums can increase emotional engagement in learning environment (Chih-Yan Sun & Rueda, 2011) and provide the necessary elements for a community of learners. Students who participate in a learning community are more engaged with their learning, which in turn is positively related to student outcomes and satisfaction (Zhao & Kuh, 2004). Temporally synchronised chat sessions and asynchronous discussion forums are both important tools in student engagement (e.g., Chih-Yan Sun & Rueda, 2011).

Role of tutor in building a learning community

The Bachelor of Behavioural Studies (BBS) offered through OUA incorporates a major in psychology. Students are able to enrol in OUA programs without a recent history of previous study, a formal high school or equivalent entry score, or undertaking a pre-entry examination. Therefore, teaching staff must cater for large cohorts of students who are very diverse in their literacy, numeracy and computer skills, and may be undertaking the psychology program for a range of reasons. For example, some are upgrading their qualifications, some are enrolling in individual units out of interest, and some are testing the waters before registering into the online program or articulating to on-campus degree programs. Although many students in the BBS program are high achieving students showing independent or intense engagement styles, the majority of students fall into the passive or collaborative category, and there is a very high attrition rate (around 50%) compared with on campus studies (around 10%).

The BBS pedagogy has aimed from its very beginning to build the sense of being part of an online learning community. To give a sense that the teaching team are real people, photos are provided of all the tutors (selected by the tutors themselves) and brief video clips of a range of different lecturing staff. Tutoring staff are mostly Ph.D students, D.Psych students, and practicing psychologists, but also include on-campus teaching staff. The most important criteria are that tutors are passionate about teaching, are technically adept, and have valued the opportunity to work as part of a team that is the online "face" of the university.

The team teaching model within the introductory psychology unit evolved rapidly in response to the unexpectedly high growth in enrolment (Fleckhammer & Wise, 2010). Initially, the Blackboard website was set up to accommodate the whole of the student cohort and a general discussion board was monitored by members of the teaching staff. The discussion board comprised a number of forums with specific functions (General Discussion, Assignments, Technical Support, Social), and synchronised chat sessions were also conducted each week by each of the teaching staff. Students could attend any of the chat sessions. It quickly become evident that, with the increasing number of students, students and staff alike found the discussion forums difficult to navigate due to the volume of information. For example, the "Greetings" forum, for first week introductions had over 350 posts which students found overwhelming. In assignment-related forums, there were too many posts to read and questions were asked and answered multiple times, exacerbating the problem of information overload even further. For example, there were more than ten different threads called "Hypotheses" and these contained very similar questions and answers within them. Although the level of interaction appeared to be high based on the sheer number of contributions, the actual level of individual *dis*engagement increased rapidly because many people could not keep up with the amount of traffic, creating an illusion that there was a conversation happening around them but that they were excluded from it (e.g., " I am a bit confused and maybe I am missing something due to being so overwhelmed"). Out of 2643 discussion forum posts on a discussion board servicing 323 students, almost 20% were written by the convenor in response to student posts. One other tutor contributed 84 responses, but the remaining 5 tutors only contributed between 1 and 16 posts. Disengagement occurred for students and tutors alike and many students turned to private email consultation with tutors rather than braving the alienating maelstrom of the discussion forums.

As student numbers were expected to keep rising, our major concern was to ensure that the teaching staff could facilitate engagement and establish an online presence to motivate student learning. We have established by trial and error that the optimal size for effective participation in discussion boards is between 150 and 250 students led by 3 to 4 tutors. Too many students results in too much information, and too few students fails to achieve a critical mass in terms of maintaining an ongoing level of interaction. Too many tutors can devolve responsibility too far so that no-one actually takes responsibility for maintaining a coherent staff presence, whereas too few tutors does not allow the tutoring team leeway to deal with the inevitable temporary absences due to illness or competing work/family commitments, particularly in the context of a year-long 4-study-period teaching cycle.

In the first study period to use tutor groups, there were a total of 3826 posts across 4 separate discussion boards, servicing between 150 – 200 students each. The same rate of staff student interaction was maintained as in the first iteration of the unit (23% of posts by staff), but in this iteration, half of the tutors posted more than 100 posts each and the convenor was not required to monitor discussion forums. Moreover, because of the separation of discussion boards, each stream of students were only confronted by 1000 posts during the course of the semester, rather than more than 2500 as per the first iteration.

The large online cohorts also necessitated the development of new process for assignment marking as described by Fleckhammer and Wise (2010). Rather than "correcting" student assignments (inserting comments that highlight specific errors, followed by a brief overall comment), tutors 'talk' directly to the student about their work, albeit asynchronously in the form of a written commentary of approximately 300 – 500 words. This is feedback strategy is more socially engaging than embedded comments, and, contrary to the original expectations of the authors, appears to enhance rather than dilute academic engagement. The increase in academic engagement is due to the need to comment at a higher level about content, rather than at the level of individual words and sentences, as tends to be the focus when comments are embedded into assignments. Academic engagement for teaching staff was unexpectedly increased through this method of providing feedback, due to the relative ease of access to comments. In order to read embedded comments, it is necessary to open each assignment document and read through it, which can be a time-consuming process akin to cross-marking the assignment. Comments are now visible directly from the gradebook so that, rather than cross-marking a subset of assignments, tutors can gain an overview of the level of feedback being offered by their peers across all assignments, and to see the range of interaction styles of their colleagues. Marks moderation is facilitated by being aware of types of comments led to what marks, and then cross-marking assignments targeted on the basis of specific feedback.

Not only does the use of tutor teams improve the tutor-student relationship and build on student engagement, but it builds the tutoring skills and overall academic development of individual tutors (staff engagement). The end result is that tutoring teams are now actively involved in setting the agenda for discussions, thereby improving their engagement with students. They are also responding to student inquiries about marking criteria, facilitating assignment preparation, and marking the assignments, thereby improving their engagement with the course content and the teaching process. This type of engagement gives rise a more involved relationship between tutors, and between tutors and individual students, which promotes academic engagement within a feedforward-feedback loop. Increased staff engagement can also lead to improved staff development, such that two of the online tutors without long-term academic career aspirations have now been motivated to convene their own online units. The emergence of tutoring skills can be seen in the increasing contribution of tutors to discussion forums, with experienced tutors tending to provide high levels of interaction (>100 posts per study period) and inexperienced tutors tending to interact less frequently (<30 posts per study period).

Concluding comments

The team tutoring approach has helped to build the level of student engagement among students completing the introductory unit, and there has been a decline in attrition (28% versus 20%), suggesting better engagement of the online cohort of students. Students are making more use of the online learning community fostered by the tutor teams, and the feedforward approach to learning has ensured that they are able to improve their level of academic engagement and acquire more effective study skills. There are also still a number of barriers to student engagement in line with those noted by Willging and Johnson (2004). For example, the implementation of the Blackboard learning management system used by the BBS program has technical limitations in terms of catering for large cohorts. Browser issues and technology challenges appear to be insurmountable for some students, and it can be difficult to address these issues remotely, particularly for under-engaged students.

We have established through our team teaching approach that the role of the online tutor is important in facilitating student engagement in the online environment. Although we have not improved overall student academic performance, there has been a modest reduction in student attrition and we are confident that the level of student engagement has increased for the students who remain actively enrolled in the program through the increased use of discussion forums and tutor interaction.

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Engaging training simulations for socially demanding roles

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Students in higher education preparing for socially demanding roles often encounter role play as a technique for mastering their future professions. Lawyers have ‘moots’ or scripted court sessions. Medical doctors attempt to diagnose the injuries or diseases simulated by actors.

Some pre-service teachers undertake micro-teaching simulations with peers pretending to be pupils (not necessarily compliant ones). However, this is an inefficient use of learning time for the peers, and work is proceeding to develop virtual worlds in which such training can be conducted with simulated pupils.

This paper describes the development of one such learning environment, and discusses the challenges to be met as this class of learning interactions becomes useful in teacher training.

Keywords: OpenSim, simulated pupils, pre-service teacher training

Introduction

Behaviour management is a foremost concern of new teachers and the schools in which they work. Good behaviour management results in more pupil time on task, and this can be measured with feedback (Hattie, 2009). Pre-service teacher training is often criticised for poor connection between theory and practice (Standing Committee on Education and Vocational Training, 2007). Behaviour management is a particular skill where this connection is crucial. Previous work has already been published in the area of behaviour management in social computing learning environments (Fluck & Cruise, 2008) and the social effects of computers in education (Fluck, 2001).

However, in the context of scaffolded learning in campus-based teaching, it is difficult to give all 250 students in a lecture an opportunity to practice behaviour-management skills. To do so would require 250 classrooms in close proximity to the lecture theatre so that new theory could be put quickly into practice. Additionally the 250 classrooms would ideally exhibit exactly that aspect of behaviour management discussed in the theory session.

These challenges mitigate making good connections between theory and practice, but a virtual classroom can overcome these difficulties. Through the use of OpenSimulator USB, it can be replicated 250 (or more) times with ease, and the behaviour of the simulated 'bot' pupils can be identical in each virtual classroom. Each pre-service teacher would be given a USB stick which when plugged into their computer would provide a 3D virtual classroom complete with furniture, interactive whiteboard and pupils. Copies of the USB can also support skills mastery for online/distance students, by downloading onto a local stick. Using Gee's transfer principle, skills acquired in the virtual practicum classroom will provide an introduction to their effective use in real school classrooms (Gee, 2003). This form of training for pre-service teachers will be analogous to the simulator training used by pilots, surgeons and ship captains.

Class based role plays can be very useful in professional training for socially demanding roles such as teaching, but they are extremely resource intensive. In such simulations of professional activity, some students take on client roles, and one individual acts out the professional character. Peer students who take on client roles obtain a useful insight into recipients of their future professional practice. If they seek to maximise their time in the role of the qualified professional, role-playing as clients detracts from this perspective. Therefore we sought to review existing simulation techniques in higher education, and build upon this experience to provide behaviour management training to pre-service teachers using a virtual world.

Literature

Simulations have the capacity to improve skills acquisition and assist understanding of the inter-relationships between theory and practical reality. Gatto (1993) had the view that students who interact with simulations are "better prepared to perform in real situations than those students who rely on other instructional media, such as text" (p.154). Simulations can also engage learners in experimental and experiential learning that provides an opportunity to reflect on the way the associated knowledge and skills can be used (Brown, Collins & Duguid, 1989). Participation in a simulation allows the trainee to observe the impact of each choice without adverse impact on real people/clients. They have the chance to experiment and explore the cause-and-effect relationships between certain clients and intended service outcomes.

A report requested by the government into the integration of ICT into school practice identified fundamental systemic flaws in the pre-service teacher education system in Australia in terms of developing teacher competence in embedding ICTs in pedagogy and practice. In recommending the way forward, Black, Smith and Lamshed (2009) suggested technology also provides an opportunity to transform the practicum through the use of virtual world simulations so that student teachers are able to experience 'real' teaching situations where newly developing pedagogy could be practiced and assessed. Their report proposed future directions related to a suite of virtual world schools as teaching and learning simulation environments.

Mitchell, Stanelis and Travers (2010, p. 66) mapped teachers' professional development to integrate ICT into classroom practice, and subsequently made the recommendation "that a set of online tools be developed to support preservice education in the use of ICT in teaching. This should include communication tools to share good practice and a real-time virtual environment that presents a range of classroom scenarios which feature high quality use of ICT." While the initial objective of this recommendation was to improve classroom practice with ICT, the suggestion that pre-service teachers have access to virtual classes to improve their training was of more general validity.

But how might this be done? According to Sasso (2006), 'Simentor?' is an authoring application created by Access Technologies Group (ATG) thatallows companies to create e-learning simulations that fit their company without requiring any computer programming skill. 'Social Simentor?', a product based on ATG's Simentor? software, is a program designed to help in the social development of individuals with disabilities. This example shows how a generic 'engine' for creating and running simulations can be tuned to a specific purpose.

The Mekong e-sim[8] was an early online role-play-simulation set in the Mekong region of South-East Asia in which participants learn to balance the social, political, economic, scientific and conservation based development conflicts (McLaughlan, Kirkpatrick, Hirsch & Maier, 2001). It is housed within the institutional

8 http://services.eng.uts.edu.au/~robertm/mekong/default.htm

learning management system at the University of Adelaide. However, this is a purpose-built simulation for a single specific purpose.

The 'DeakinSims: Experiences in Learning Experience Design' project funded by the Australian Teaching and Learning Council has produced a set of simulations for use in business studies, engineering, project management, systems analysis and professional practice. These web-based online activities were built on the LiveSim[9] architecture, an open source project providing the underlying functionality. A character server and text-to-speech licensed software are also required. This combination of technologies is hosted at Deakin University and the platform is offered to other institutions (Cybulski, 2010). Most of the simulations used a talking head metaphor, with the underlying activity derived from a set of state transition tables. To some degree this model might help with training in behavior management, but what is needed is interaction with a group of simulated pupils instead of a single individual.

An online simulation 'ClassSim'[10] for pre-service teachers was trialed in prototype by Kervin, Ferry and Carrington (2006). The work was funded by the Australian Research Council and used by 186 pre-service teachers at the University of Wollongong. During the simulation the 'pupils' facial expressions showed their emotional states, and the pre-service teachers could see samples of pupil work. Overall the simulation helped pre-service teachers better link theory and practice.

simSchool[11] is a classroom simulation that supports the rapid accumulation of a teacher's experience in analysing student differences, adapting instruction to individual learner needs, gathering data about the impacts of instruction, and seeing the results of their teaching (Zibit & Gibson, 2005). The simulation is web-based with two dimensional cartoon characters representing pupils in a classroom. Pre-service teachers can review pupil files, then select learning activities for each pupil as the simulated lesson begins. Interactions are from a menu of behavioural and academic topics. At the end of the 'lesson', the pre-service teacher can review a graphical display for each pupil illustrating engagement and internal emotional state. The strength of this simulation is the coherent theoretical background used to determine pupil behaviour to stimuli. A weakness is the stilted conversational style conducted through text alone, and the cartoon nature of visual presentation.

A project currently in train which shows great potential for achieving the desired training result with respect to behaviour management is Virtual PREX[12]. This is being developed in Second Life[13] and will provide a 3D virtual world for pre-service teachers to practice professional experience (also referred to as practicum or workplace learning). Through Virtual PREX pre-service teachers will practise teaching skills prior to practicum placements, use the space synchronously or asynchronously, by themselves or interacting with peers, academics and/or 'bots, record and play back video 'machinima', for self, peer, formative and summative assessment and practise teaching skills with the 'bots programmed to react to certain triggers (Gregory, 2010). This will give pre-service teachers the opportunity to experience a range of scenarios in a risk-free environment. The strength of this proposal is the three dimensional realism of the virtual classroom scenario, and the capacity for avatars to move around within this setting. The unknown quality of the theoretical background driving the interactions has yet to be published.

In summary, there are a range of generic simulation development tools and specific projects in associated domains which can inform the task of providing training in behaviour management in teaching. Our task was to build upon these proposals and come up with something which would serve this purpose and be practical in use. Our response was to transfer a classroom initially built in Second Life to the OpenSim environment, and implement this on a single USB drive. We then added additional avatars representing programmed 'bots which take the part of pupils in the virtual classroom.

Design Elements and Features

Creating an OpenSim USB[14] is simply a case of following the instructions at the Research: USB OpenSim page from the Tasmanian Polytechnic, or if you have an OpenSim USB already, you can copy all of the content

[9] http://livesim.sourceforge.net/
[10] http://edserver1.uow.edu.au/ClassSim/
[11] http://www.simschool.org/
[12] http://www.virtualprex.com/
[13] http://secondlife.com/
[14] http://vw-standards.wikispaces.com/Research+-+USB+OpenSim

to another USB to create a new one with the existing environment and objects on it. The OpenSim USB has been tested on Windows XP (32bit), Vista (32 bit), and Windows 7 (64 bit) operating systems. The software requirements for the virtual classroom are dependent on the user's needs: if you are only going to run the existing environment and edit the classroom, all of the software is contained on the USB and does not require installation on the computer. Running the executable program for the 'bots' will log them into the environment, and requires the installation of the OpenMetaverse library components. This is done the first time you run the program, and is simply a case of confirming that you allow the installation of the OpenMetaverse library. However editing of the code requires the installation of the full OpenMetaverse development library, Microsoft Visual Studio 2010, TortoiseSVN and the Microsoft .NET runtime environment. Exact instructions on how to configure each of these programs is available at the OpenMetaverse website[15].

Starting an OpenSim USB requires the running of three separate programs, each which must be running to be able to access the Virtual Environment (known as Localhost). To avoid a potential software conflict, exit any running copy of Skype, then execute the program \usb-opensim\mowes.exe. Once this is up and running, Apache and MySQL should be displayed as running as well. You then run \usb-opensim\diva-r13981\bin\OpenSim.exe. Next, find out if you are running a 32 or 64 bit operating system: check by right-clicking on 'My Computer' (or 'Computer' depending on your version of Windows) and selecting 'properties' followed by the system tab. If you are using a 32bit operating system, run OpenSim.exe; or for 64bit operating systems, run \usb-opensim\diva-r13981\bin\OpenSim32BitLauncher.exe. Once the corresponding OpenSim program has run and has ended at the point "Region <root> #" leave that program open and then run Imprudence.exe. All of these instructions are also in the ReadMe.pdf which comes on the USB in the root directory. The USB also contains some usefully pdf help guides in the \help\ folder and also includes simple video tutorials for using the Second Life-like environment in the \help\Video Tutorials\ folder.

Construction or editing of the classroom, or anything in the Second Life Environment, is done through the creation and altering of "Prims" which are just basic shapes (squares, tube, circle, triangle, pyramid, cone, etc). Most everyday objects can be created or manipulated by altering the size and position of these 'prims'.

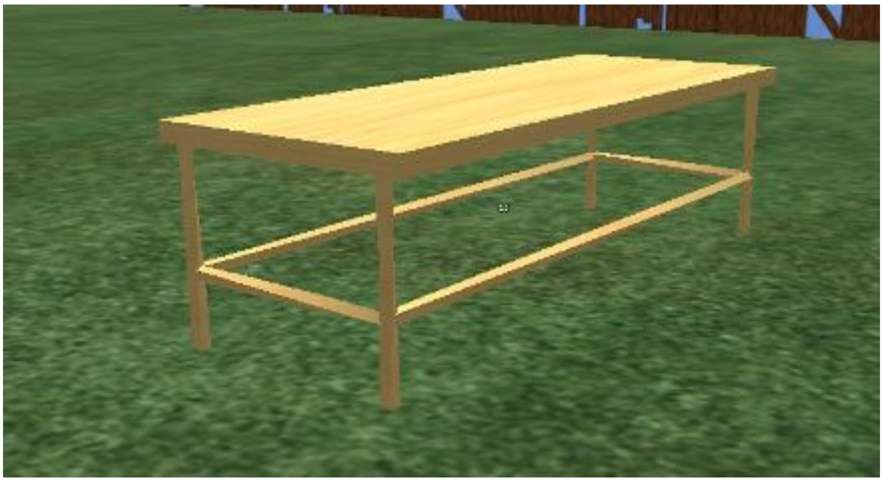

Figure 1: Example of a basic object created using prims

The basic table in Figure 1 is made up of nine Prims which are all cuboids re-sized and moved to make the tabletop (1), the legs (4), and the leg braces ¾ of the way down the leg (4). Once you have created an object, the prims can be linked together so the whole table is one "Object". That object can then be stored in the user's inventory and re-used multiple times. Extended to creating a classroom, the three dimensional veracity of the simulation can be quite accurate, and even the computers and interactive whiteboard in the current version have some limited functionality (see Figure 2).

[15] http://lib.openmetaverse.org/wiki/Getting_Started#How_to_compile_libopenmv

Figure 2: A fully rendered simulated classroom

The pupil bot avatars interact using the OpenMetaverse library of code developed to enable people to build remote controlled Avatars in second life. Using OpenMetaverse it is possible to create a C# program that when run, logs an avatar into the OpenSim USB environment (using the avatar's name and password) and then interacts with the users nearby. The code used is taken from the OpenMetaverse tutorial pages and was edited to suit the needs of the virtual classroom. The program basically takes the username and password given and logs onto that account and then interacts in the ways programmed. The two interaction methods built into the current prototype are reactions to specific words uttered in the public text chat dialogue, and the interactions from specific words said through the in-game instant message (IM) system.

Although the whole process described here relates to a single USB stick, these can be replicated very quickly using a suitable device such as those from NexCopy[16]. The advantage of this reticulation method is that pre-service teachers are able to use the 3D simulated environment and work through a series of behaviour management situations at their leisure using any available computer. The exercise does not require a high bandwidth internet connection free of firewall restrictions, and is therefore less demanding of resources. Also, there is no monitoring of failed attempts to control the class – and thus a more supportive environment to try other approaches to the challenges presented.

Procedures and Rationale

On entry to the OpenSim USB virtual world, the pre-service teacher is able to build and manipulate all of the objects in the classroom. The inventory of the Teacher avatar is kept empty but they can also log in with an Admin avatar and have access to all of the objects used to create the classroom. The preliminary goal of the Virtual Classroom Project was to create a prototype classroom that simulated the visuals of a real life classroom, and create a basic program that could remote control another avatar which would eventually represent an interactive responsive pupil bot. Once the program had been built to allow the bot to read the text comments of users around them, it was possible to link certain commands to actions that the bot performs. The finished prototype pupil will sit down on the command "sit"; stand at "stand"; jump at "jump" and stop jumping at "stop. Also, in this proof of concept phase, pupil bots will repeat phrases after the word "say" and log off the virtual environment at the phrase "goodbye".

Given pupil bots that can be interacted with, the possibilities of scripted conversation, movements around the classroom, etc. are limited only by the programmer's creativity. The next development of the virtual classroom was the expansion and rebuilding on the OpenSim USB to make it portable and thus easily accessible. This step removed the need for an internet connection, and at this point the realism of the classroom was stepped up a notch with the inclusion of miscellaneous objects and specific real world classroom components usually forgotten in virtual worlds (electrical sockets etc.). The next step in development will be the collection of real

[16] http://www.nexcopy.com/

world data and the programming of interactions and responses between the pre-service teacher controlled avatar "teacher" and the program controlled pupil. Our goal is to create an artificial intelligence that will respond to commands from the pre-service teacher based on a database of collected real world responses. A drawback of the prototype is its response to all instances when the trigger words are used in text chat. For example using the sentence "The quick brown fox will jump over the lazy dog" would cause the bot to jump (see Figure 3) even though that was not the intended purpose.

Figure 3: Example of pre-service teacher's avatar interacting with the pupil avatars

This issue is avoided by sending commands through the instant message (IM) system, but this restricts giving commands to each bot individually. It may be possible with a more advanced C# program to include a whole class IM function, or specific person public chat commands.

Discussion and Conclusion

Computer-based systems are used in much professional training to provide extended simulated experience. There are flight simulators for pilots, shipping simulators for naval bridge officers, life-sized computer operated mannequins for nursing students and haptic feedback for trainee surgeons. They have the advantage of providing repeatable training, where mistakes can be analysed and approached again with this insight. To a degree, these simulations can be scaled – made available to very large populations of trainees.

Few such computer-based simulations have been researched to determine their effectiveness imparting the expertise of behaviour management in teaching. This should include the design of each lesson, nature of each pupil, verbal and non-verbal communication – a whole host of socially demanding skills. 'Social Simentor?' and 'SimSchool' are two that focus upon related skills. Other funded projects are active in Second Life, which allows role plays involving geographically dispersed participants. This has a few major drawbacks since access to Second Life requires an excellent connection to the internet to create a viable realistic experience.

A locally hosted virtual environment on a portable USB Flash Drive avoids that problem, because there is no need for an internet connection at all. Our project is based on a virtual classroom built to be as close to a realistic classroom as is possible, developed within the OpenSim framework. Our current classroom is designed to simulate a high school computing classroom, but could easily be duplicated and rearranged to simulate any other subject space with memory capacity to spare. The most important feature of the virtual classroom is the ability to create virtual pupils, the end goal being the creation of artificially intelligent pupils that respond to commands from the teacher's avatar. Using voice recognition and speech to text we hope to make this become an aural/verbal interaction. Pre-service teachers can then try different behaviour management approaches in difficult simulations, to see the outcome of each approach.

Seven simulated scenarios are initially planned in the virtual practicum classroom (see Table 1). At the start of each session an avatar taking the role of the assistant principal will orally introduce the behaviour management policy and the individual pupils of the class.

Table 1: Planned initial scenarios and expected pre-service teacher behaviour management strategies.

Scenario	Expected behaviour management strategies
A range of classroom layouts will be provided.	Choose the layout which will minimise student interaction during circulation. (Dymoke & Harrison, 2008, p. 118)
'Bot' pupil behaviour (standing up, sitting down on their chairs) will be directly related to the volume of the pre-service teacher's voice. This will be replicated into as many classrooms as necessary by putting the current pilot into a USB stick version of OpenSimulator.	Rule reminder: teaching routines (Rogers & McPherson, 2008)
Simulated students will be learning independently and the pre-service teacher will be able to interact by keyboard or voice with each one individually.	Encouragement and re-direction (Morgan, 2009)
Individual simulated students can be directed to undertake a specific learning activity and the pre-service teacher will be able to monitor compliance.	Direction
An individual simulated student (selected at random) will demonstrate off-task behaviour and if addressed in the required way will resume learning.	Scaffolding, proximity and rule reminder (Fields, 2005, p.12)
As #5 but a specific warning will need to be given before the 'bot' student resumes learning.	Support, warning, choice consequences.
As #6 but this time the 'bot' student will repeat the behaviour with a necessary escalated response from the pre-service teacher required.	Defiance responses, cool down chair (Charlesworth, 2008)
A small group of simulated students will undertake off-task behaviour and the pre-service teacher will need to use a variety of strategies to get them to resume learning.	All

If time and resources permit, the range of scenarios can be extended and link to specific aspects of behaviour management theory as advised by experts in the area. We will trial extensively with small groups of pre-service teachers (with ethical approval) and gradually extend this to include larger groups. Data will be collected through short surveys and focus groups to ascertain the perceived usefulness of the simulations.

As we proceed, we see a range of challenges before us. We seek a simulation which:

- is engaging and convincing
- has a theoretical background for artificial intelligence 'engine'
- caters for 'mob rules' – balancing collective v. individual behaviours
- incorporates the affective domain
- is realistic
- includes audio interaction – speech recognition for input and text to speech for output
- is replicable – the same interactions generate the same responses
- contains a series of escalating behaviour management scenarios

To succeed we will need to build upon established artificial intelligence principles. Much artificial intelligence behaviour appears to be database driven, or to derive from exploration of possible system states (e.g. game move variations) for a target pattern. In one possible model "the belief network model updates the stochastic / fuzzy belief assigned to the facts embedded in the network until a condition of equilibrium is reached, following which there would be no more change in beliefs" (Rios, 2010). Other tools that could be deployed include fuzzy Petri nets, for handling both imprecision of data and uncertainty of knowledge by a unified approach. Looking at the other simulations mentioned previously, we believe our front end and user interface are highly attractive and becoming extremely useful. The challenge ahead will be to couple this aspect with theory-driven functionality such as that in simSchool, and engaging these artificial intelligence techniques to overcome the challenges we have identified.

The program is very much in its infancy, with only the ability to react to basic text-based instructions (sit = the pupil sits; goodbye = the pupil logs off) but with a specialist in C# the coding of a fully interactive experience is easily possible. OpenSim works almost identically to Second Life, building, interacting, 3D modelling, and we are expecting to incorporate audio-based input and output shortly. The babble of virtual pupil's voices will be quelled by a gentle instruction from a well-trained pre-service teacher!

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In search of ‘graduateness’: Reframing equity of student experience, a transformational approach

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This poster depicts key considerations around adopting a transformational approach to curriculum renewal at Charles Sturt University. This enhancement of the student experience must be built on a transformation of the university organisation culture and working practices of academic and support staff alike.

Entitled the Charles Sturt University Degree Initiative (CSUDI) the process necessitates a *shared sense of responsibility* for planning the *total* student experience amongst those who coordinate and teach a course to create a distinct “CSU student experience” culminating in “CSU graduateness”. In a nutshell the aim is for CSU undergraduates, in addition to an in-depth understanding of their chosen disciplines

and professions, to have their studies underpinned with integrated and embedded principles equipping them for the modern world.

Whilst the CSUDI is clearly the mechanism for the "student experience" to happen – unless the transformational *design-based approach to curriculum renewal* is truly collaborative, incorporates a wider vision, and a different approach, the concept of "graduateness" will not take place.

Keywords: student experience, engagement, equity, curriculum renewal

Introduction

This poster depicts the development of a design based approach to degree level curriculum renewal at CSU. To be introduced progressively to students from 2012, this approach integrates CSU's learning and teaching expertise with pedagogical innovation; to enhance the student experience. CSU is in the process of developing an integrated framework of design principles, course analysis processes, course exemplars and course approval processes. The design principles that will be integrated and embedded within the CSU approach are discussed below.

Content design principles

The disciplinary and professional knowledges that students engage with are influenced by the degree type and the degree purpose. The CSUDI wishes to embed the following engagement within each degree:

- The opportunity for international experiences and to develop an international perspective in their discipline or profession;
- An engagement with the responsibilities of global citizenship;
- The opportunity to develop cultural competence;
- The opportunity to engage meaningfully with the culture, experiences and histories of Indigenous communities;
- Understandings of financial, social and environmental sustainability;
- A firm understanding of ethics;

Innovative learning and teaching design framework

Each discipline area and degree have traditions and pedagogies that have developed within a particular culture. The curriculum renewal process seeks to influence that culture by creating a development framework that values (and adds to) the learning that our diverse students bring to their study. The ways that students will be supported include:

- Engagement in activities that foster web-based proficiency and innovative ways of learning.
- A supported transition into the first year of university; and thereafter throughout the undergraduate student experience;
- Employability and generic and transferable skills such as effective communication; analytical skills; critical and reflective judgment; problem-solving; team work; and time-management; Education based in practice;

This horizontal and vertical alignment is allowing a holistic understanding and therefore development of a course to take place. This has previously not been a wholly transparent process in a subject based approach. The increasingly diverse cohort profile and changing markets demands this approach and this aims to provide an increased equity of student experience and outcomes.

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Teaching Teachers for the Future: Exploring the different interpretations, applications and experiences of TPACK

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Abstract and Symposium Plan

As part of the national Digital Education Revolution (DER) all pre-service teachers need to develop both understanding and competency in embedding information and communication technologies (ICTs) into the content areas through a TPACK framework (Department of Education, 2008). A Government scoping study indicates that the most common forms of ICT currently used in classrooms are PowerPoint and basic Internet searches (Education Services Australia, 2010). These forms of ICT do not make best use of the potential learning possibilities of ICT. This project is aimed at developing the technological pedagogical content knowledge (TPACK) of pre-service teachers via sustainable integration of ICT in pre-service teacher education programs for both primary and secondary teachers.

Each of the speakers will discuss their understanding of TPACK and their areas of research:

Vilma Galstaun will provide a broad overview of curriculum re-design using a TPACK framework at the University of Sydney

Shannon Kennedy-Clark will provide examples of embedding ICT into History and Science units of study across the pre-service teacher degrees and will report on survey findings on pre-service teachers' TPACK.

Lina Markauskaite and Peter Goodyear, Yael Kali, Agnieszka Bachfischer in the paper "Unpacking TPACK: exploring knowledge in eLearning design teams" will discuss some findings from a study of eLearning design teams, in which they applied some key TPACK concepts for researching teams' collaborative design practices and knowledge. The symposium will commence with a discussion, which will be followed by interactive presentations by each of the speakers and will conclude with a final discussion that synthesises the main ideas raised by the audience and presenters. The symposium is intended to generate discussion and feedback from the audience. All of the presenters will address several shared questions: a) how is TPACK being interpreted, b) how is ICT being embedded to develop technological, pedagogical and content knowledge in a subject-specific context, c) how is ICT being embedded into the Faculty and graduate standards, and e) how do Faculties sustain this type of systemic change?

Shaista Bibi and David Ashe will discuss a knowledge in pieces theoretical framework which may allow a more detailed exploration of the nature of TPACK. Knowledge in pieces was developed as a theory to explain the nature of physics knowledge and has since been used to explore diverse aspects of knowledge such as epistemology, pedagogy and transfer. This theory may help in gaining a better, more nuanced understanding of how different knowledge elements are integrated.

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Exploring the Use of Audio-Visual Feedback within 3D Virtual Environments to Provide Complex Sensory Cues for Scenario-Based Learning

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The continuous quest for ever increasing fidelity in 3D virtual worlds is running parallel to the emergence and adoption of low-cost technologies to implement such environments. In education and training, complex simulations can now be implemented on standard desktop technologies. However, such tools lack the means to represent multisensory data beyond audio-visual feedback. This paper reports on a study that involved the design, development and implementation of a 3D learning environment for underground mine evacuation. The requirements of the environment are discussed in terms of the sensory information that needs to be conveyed and techniques are described to achieve this using multiple modes of representation, appropriate levels of abstraction and synesthesia to make up for the lack of tactile and olfactory sensory cues. The study found that audio-visual cues that used such techniques were effective in communicating complex sensory information for novice miners.

Keywords: synesthesia; human-computer interaction; serious games; engagement, e-learning

Introduction

Explore any website and it is immediately apparent that text and graphics and, to a lesser extent, audio dominate as the primary modes of digital information. Such approaches, however, are inherently limited in the nature of the information that they convey. In e-learning settings, where concepts such as authenticity and situatedness are often cited as powerful means to promote transfer of learning (Brown, Collins, & Diguid, 1989), then the abstract nature of much media becomes increasingly problematic. As technologies mature and 3D representation becomes increasingly easy. 3D game engines are providing effective alternatives to workplace learning because of their low cost and limited need for programming skills to develop rich applications (Garrett & McMahon, 2010).

One way in which 3D game engines frequently provide sensory cues is through the use of a Heads Up Display (HUD). While a very common approach to information presentation, HUDS have recently come under criticism for the abstract nature of their representation of information:

> Many elements found on a typical HUD are there not out of necessity, but out of convention; they represent a sort of "info overkill" that, for the vast majority of players, has no impact on gameplay at all. For every piece of information you offer the player, ask, "Is this information essential to the game experience?" In doing so, you might find that you don't need to bombard the player with quite as much data as you once thought you did. (Wilson, 2006).

As a potential refuge of lazy design, it is certainly true that HUDs are not always necessary. It can also be argued that not all authentic information needs to be represented within a given simulation. Factors that relate to aspects of the learning such as the nature of the task to be performed and the feedback inherent within that may need to be represented with a high fidelity, however this is not true of all situations and hyperfidelity may be as disorientating when there are specific learning goals as hypofidelity may be inadequate (Stone, 2008).

However, the continued existence of HUDS highlights that even in the most realistic 3D environment there are some sensory cues that are extremely hard to replicate. Since the 1970s the dominant mode of computer interaction has been through a keyboard, with typical output in the form of video on a monitor and speaker-based audio. Despite the introduction of the mouse and more recently surround sound, the standard computer interface has varied little over the years. With that in mind, consideration needs to be given to how existing technologies can best represent the multisensory feedback that is so relevant to real-world decision-making.

Modes of sensory feedback

There have been various attempts to augment audiovisual experiences with other sensory cues. Some, such as the notorious ‘Smell-O-Vision’ of b-grade cinema, later refined as ‘Odorama’ by director John Waters, can best be viewed as gimmicks that are used for comedic or promotional purposes (Gilbert, 2008). The sense of taste is even more problematic in that any taste ‘interface’ is likely to be quite invasive, which may explain the paucity of examples of such interaction modes in traditional media and interface research.

Haptic interfaces on the other hand have fared far better. From early manipulators, through to desktop systems, the history of haptic devices is one of continuous refinement and development (Stone, 2000). Their value lies in their capacity to provide kinaesthetic and tactile feedback that allows the user to experience both texture and movement associated with authentic tasks (Hayward, Astley, Cruz-Hernandez, Grant, & Robles-De-La-Torre, 2004). As such they are highly suited to a range of training scenarios which require the representation of physical motion, force feedback and touch at a high level of fidelity. The cost of such systems are also coming down, with, for example, the Nintendo Wii which uses accelerometers and cameras in its ‘wiimote’ to register motion and the Novint Falcon, which operates as a haptic mouse providing force feedback, entering the consumer marketplace. However the range of software for which these devices have drivers is still somewhat limited.

In most cases, a developer is required to represent such forms of feedback using other means. While the sensations of sight and hearing may seem somewhat removed from those of taste, touch and smell, research into synaesthesia suggests that specific senses may be stimulated by alternate modes of representation.

Pierce (1911) noted this phenomenon in a range of specific cases including, ‘colored hearing’ where certain French vowel sounds were perceived as belonging to a certain color. Put simply, it is the crossover of sensation, where certain sensory stimuli are perceived by other senses. For the most part, this has been considered something of a rare neurological phenomenon experienced purely at an individual level (Harrison, 2001). Some experiments, however, such as the classic Booba/Kiki effect by Gestalt psychologist Wolfgang Köhler, suggest that certain visual cues are quite salient in terms of how shapes are perceived as sounds. In examining two irregularly shaped objects (Figure 1) 95-98% of participants select the left angular shape for Kiki and the right rounded shape for Booba (Ramachandran, 2004).

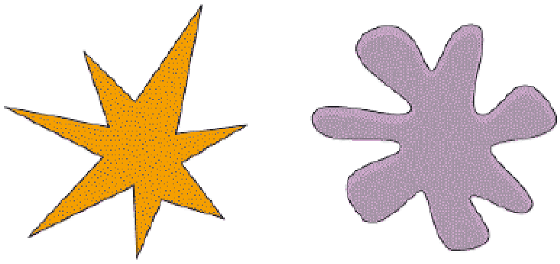

Figure 1. Kiki (left) and Booba (right)

Ramachandran (2004) suggests that a natural link is formed by the circular shape of the mouth when making sounds such as ‘ooh’ in combination with the softer sound of ‘b’ to the more rounded shape of Booba compared to the more acute sound of‘eeh’ and ‘k’. Similarly, the shapes of the objects are more closely aligned with their counterpart consonants. In any case,it is evident that there are some predictable relationships between concepts that are represented across a range of sensations that could prove useful for game interfaces.

Alternative and multimodal sensory representation

Synaesthetic cues have been used in games in informal ways for a long time. Weir (2004), for example, notes how music can enhance the tactile experience of a game, using the case of a dark first person shooter game where bumping into a metal chain hanging from the ceiling could play a sinister chord, the pitch of which modulating as the chain swings. The Gears of War game series (Epic Games, 2006) also demonstrates this in the way that health is represented. The physical sensation of poor health cannot be fully replicated within the game so instead the character grunts when he is hit and, at a more abstract level, the periphery of a screen turns blood red and vision is obscured the more damage your character receives. The blood motif is a reminder in that sensory information has the potential not only to be provided in the form of informational cues but also at a higher level of abstraction through metaphor. Iconography is one primary means of achieving this. Icons can exist at a variety of levels of representation. Preece (1994) identifies the following modes in descending order of concreteness:

- Resemblance Icons
- Exemplar Icons
- Symbolic Icons
- Arbitrary Icons

While resemblance icons accurately represent the concept to be communicated (e.g. a ‘rocks falling’ road sign), exemplars provide a specific instance (such as a knife and fork representing the availability of a restaurant). Symbolic icons are readily identifiable but may not actually be a specific example. A fractured wine glass, for example, may denote fragility even though it may not actually be glass that is fragile. As the name suggests, arbitrary icons do not have a direct meaning. In computer terms, for example the USB icon does not directly map onto a recognizable concept, just as the biohazard icon operates at an equally high level of abstraction. While the USB icon’s three-pronged form seeks to mimic the physical process of plugging a device in and transferring data, it could be argued that the biohazard sign, while deliberately designed to be ‘memorable but meaningless’ (Cook, 2001), operates synaesthetically because the combination of soft circular imagery and sharp points where they intersect provide resemblance to molecular structures with a sharpness suggestive of penetration (Figure 2). As such it is a very relevant sign for devices like needle disposal bins.

Figure 2. Biohazard Symbol

Audio also operates at similar levels of abstraction. Audio can function in both direct and ambient ways to achieve a range of functions such as:

8. Localization, which lets you know where you are
9. Sonification, turning information into sounds
10. Ambient effects, to add depth and realism
11. Sensory substitution, which replaces one sensory stimulus with a sound
12. Annotation and help, to guide the user (Ardito, Costabile, De Angeli, & Pittarello, 2007)

Sensory substitution in particular operates at a synaesthetic level to reproduce other physical stimuli through audio. It has found widespread acceptance, especially in the domain of design for the disabled such as those with visual impairments (Proulx, 2010). There is therefore a range of audiovisual cues that can be used to enhance the types of feedback in 3D serious game environments where direct representation is not possible.

Such interface features need not be used discretely. Media Richness Theory argues that providing multiple cues including communicative modalities through rich media can facilitate shared understanding. Research into multimodality suggests that multiple channels for information delivery and presentation assist in the sense-making process in learning (Ritterfeld, Shen, Wang, Nocera, & Wong, 2009). Proponents of serious games based education have successfully utilised such an approach to convey the impression of severe weather conditions in a levee patroller training application (Houtkamp, Schuurink, & Toet, 2008) and facilitate memory and navigation training in virtual representations of real world environments (Larsson, Vastfjall, & Kleiner, 2001), for example. Consideration, therefore needs to be given to how both audio and visual cues can represent the full range of sensory information required to effectively complete tasks in serious games that that make the best use of the affordances of those modes. In particular consideration of the synaesthetic quality of those cues and the potential for multimodal representation may greatly assist in providing effective interfaces for such environments.

About this study

Alternative and multimodal representation was explored through the design, development and implementation of a problem-based learning scenario, using 3D game technologies. An industry partner was selected to provide a real world context in which to situate the design of the simulation environment. Dominion Mining was selected for this purpose with a focus on their Challenger underground mining facility located in South Australia.

Dominion had acknowledged that a computer-generated simulation environment could be used to conduct emergency evacuation training within a virtual representation of the Challenger underground mine. Such a training platform could be used to develop knowledge of Dominion's existing evacuation procedures which could be transferred and applied within the real world mine during an emergency. Dominion's existing procedures direct personnel to locate a refuge chamber in the event that an evacuation is required. Refuge chambers are self-contained steel structures that are capable of accommodating multiple miners with independent power and oxygen supplies which are utilised in the event that the supply of these essential services from the surface is interrupted. The Challenger facility has a number of these refuge chambers situated in specific locations in order to provide coverage for the entire mine in the event that an emergency evacuation is initiated.

In order to assist personnel to reach a refuge chamber safely in the event that smoke, excessive dust, or noxious fumes are present within the mine, personnel are outfitted with a self- rescuer, which is a portable gas mask which supplies oxygen via a controlled chemical reaction. Self-rescuers have a finite supply of oxygen which is depleted at a rate proportional to how quickly and deeply the individual who is wearing it is breathing. Dominion protocol mandates that during an emergency, personnel are to equip their self-rescuers if their breathing is obstructed, and that personnel should minimise the amount of physical effort they expend on the way to a refuge chamber in order to prolong their oxygen supply.

Thus, during an emergency evacuation, personnel need to reach a refuge chamber as quickly and efficiently as possible in order to maximise the duration of oxygen supplied by their self-rescuer. To this end, personnel have to be aware of the levels of physical effort required to traverse the mining environment and the effect that this has on their breathing rate and subsequent oxygen consumption in order to be able to evacuate effectively during an emergency underground.

Development of the simulation environment

Given the objective of developing knowledge of Challenger's emergency evacuation procedures, the simulation environment was designed in accordance with the Simulation, User, and Problem-based Learning (SUPL) design framework (Garrett & McMahon, 2009), whereby learning was situated within problem-solving activity with the goal of facilitating learning transfer.

The simulation was constructed using the DirectX-based DX Studio development suite (http://www.dxstudio.com) which provided an integrated platform for the development and configuration of necessary content. The development suite consisted of a mouse and keyboard operated GUI which enabled content to be imported, arranged, configured, and previewed dynamically as changes and modifications were made. In this manner, a virtual representation of the mine was able to be rapidly prototyped which was desirable given the available time frame for development and financial constraints imposed by the study.

The simulator, designated FUMES (Fire in Underground Mining Evacuation Scenario), was developed in this manner in order to expose users to a three-dimensional, simulated representation of an underground fire emergency situated within a section of the Challenger mine. In order to facilitate the development of knowledge that could be utilised during a similar emergency in the real world mine, users were tasked with evacuating to a refuge chamber within the virtual mine in accordance with Dominion's existing evacuation procedures. To this end, users were provided with the ability to walk, run, and orientate themselves from a first person perspective and could equip a virtual self-rescuer in order to safely negotiate simulated smoke. User interaction was facilitated via a standard mouse and keyboard based setup common to many First Person Shooter (FPS) games, with the mouse being used to control orientation, and the keyboard handling movement and the use of the self-rescuer.

The virtual mining environment itself was modeled using AUTOCAD architectural data from the Challenger mine supplied by Dominion such that FUMES could accurately depict the spatial characteristics of the real world mine in three dimensions. The speed at which users could be expected to be able to walk and run, the resultant physical effort required to do so, and the effect this had on oxygen consumption when using the self-rescuer were also modeled as authentically as possible using information supplied by subject matter experts at Challenger.

Depiction of sensory modalities

Developing an understanding of the significance of movement, physical exertion, and self-rescuer oxygen consumption during an emergency evacuation of the Challenger mine necessitated the representation of these concepts, their characteristics, and interrelationships within the simulation environment. The nature of these concepts within the real world mine was identified via consultation with subject matter experts at Challenger in order to inform the design of the simulation environment in this regard, as detailed in Table 1.

Table 1. Concepts relating to movement, physical exertion, and self-rescuer oxygen consumption

Concept	Characteristics	Interrelationships
Movement	Personnel can remain stationary, walk, or run within the mining environment.	Remaining stationary requires a low amount of physical exertion. Walking requires a moderate amount of physical exertion. Running requires a high amount of physical exertion.
Nature of the terrain	The underground mining terrain can be level or on a slope.	Traversing level terrain requires the least amount of physical exertion. Traversing downward sloping terrain requires more physical exertion than level terrain. Traversing upward sloping terrain requires more physical exertion than downward sloping terrain.
Physical exertion	The amount of effort required to conduct physical activity	The extent of physical exertion is proportional to breathing rate
Breathing rate	The frequency at which personnel are breathing	The frequency of breathing is proportional to the rate at which oxygen is consumed in a self-rescuer
Self-rescuer oxygen consumption	The rate at which the finite oxygen supply provided by the self-rescuer is consumed	

Given the technical capabilities of standard desktop computer hardware, representing the concepts detailed in Table 1 necessitated the use of visual and auditory feedback to approximate the sensory information which would be implicitly available within the real world mining environment. Table 2 details the manner in which the feedback representing movement, physical exertion, breathing rate, and self-rescuer oxygen consumption was represented within the simulation environment to this end.

Table 2. Representation of movement, physical exertion, breathing rate, and self-rescuer oxygen consumption using visual and auditory feedback

Feedback	Representation	Details
Movement	Auditory cues for footsteps.	Sound effects depicting walking or running on gravel in response to user movement
	Visual cues for movement speed	Icon representing user movement speed (stationary, walking, or running)
Nature of the terrain	Visual cues for inclination of the terrain	Icon representing inclination of the terrain that the user is moving over (level, uphill, or downhill)
Physical exertion / breathing rate	Auditory cues representing breathing	Sound effects depicting breathing at different rates depending on the current extent of physical exertion.
	Visual cues indicating the user's current physical exertion	Animated icon depicting a heart which beats more rapidly as physical exertion increases.
Self-rescuer oxygen consumption	Auditory cues representing breathing with a self-rescuer	Standard breathing sound effects are replaced with those of breathing with a self-rescuer

The visual icons described in Table 2 for representing movement speed, inclination of the terrain, and physical exertion were collated into a two dimensional interface which was rendered along the bottom of the screen, as detailed in Figure 3. Tables 3, 4, and 5 denote the states these icons could assume in order to represent movement speed, inclination of the terrain, and physical exertion as the user moved throughout.

Figure 3. Screen-shot from the simulation environment, with two dimensional icon interface rendered along the bottom edge of the screen

Table 3. Icons used to represent movement speed within the virtual mine

Concept	**Icon states**					
Movement speed		Statio nary	Walkin g			Running

Table 4. Icons used to denote the inclination of the terrain within the virtual mine

Concept	**Icon states**					
Inclination of the terrain		Level sloping terrain	Downw ard sloping			Upward sloping

Table 5. Animated icon used to represent physical exertion within the virtual mine.

Concept	Icon states		
Physical exertion	 Animated heart beats slowly for low physical exertion	 Animated heart beats moderately for moderate physical exertion	 Animated heart beats quickly for high physical exertion. Additional text also denotes high physical exertion

Movement, inclination and physical exertion were considered key to the training outcomes for this scenario and the above icons were supplemented with five further status icons that existed as a single toggle on/off. They were:

- The self-rescuer, which is lit when the user is wearing it. This icon reinforces the fact that breathing apparatus is in use and therefore the user has a limited level of oxygen available
- A walkie-talkie, which is lit when the user is receiving verbal instructions via audio
- A ladder, which clearly marks whether an escape shaft is in the immediate vicinity
- A cap lamp, which combines with the simulated light within the scenario to reinforce whether it is switched to high or low intensity
- Stench gas. An onion odour is released into the mine when noxious gas is detected to remind the miners to use self-rescuer equipment

The first four of these operate at quite a clear level of resemblance. The second is inherently synaesthetic in that it seeks to replicate an odour in a visual form. Ironically, this level of abstraction is carried through into the mine itself because many poisonous gases that can be released during the mining process are in fact odourless and colourless. In all cases, multimodality was used to enhance the icons. The first three were visually represented within the scenario itself while the final was supplemented with an audio cue.

In order to reinforce the concepts detailed in Table 1, auditory cues were also implemented to complement the icons representing movement speed and physical exertion within the simulation environment. Auditory cues depicting footsteps walking and running over gravel were played in response to user movement through the virtual mine. These were played concurrent to additional auditory cues which depicted breathing both with and without a self-rescuer, with relaxed breathing sounds utilised where the user's physical exertion was low, and rapid breathing sounds utilised where the user's physical exertion was high. A rapid beating heart auditory cue was also utilised in the event that physical exertion was high in order to reinforce the user's heightened level of physical activity.

Results

The feedback mechanisms described in Table 2 were evaluated in the resultant product FUMES in order to determine their effectiveness to approximate real world sensory information and facilitate an understanding of movement, terrain inclination, physical exertion, and self-rescuer oxygen consumption during an emergency evacuation.

A total of 41 participants comprised of personnel with varying levels of experience at Challenger were tasked with completing three emergency evacuation scenarios within FUMES in which they were tasked with safely reaching a refuge chamber in accordance with Dominion's existing emergency evacuation procedures. The user's starting position, the location of the fire, and the severity and spread of the resultant smoke varied in each of the three scenarios such that the scenarios became progressively more demanding. At the end of each scenario, the user was provided with feedback in relation to their performance, detailing how long they took, how far they traveled, how much effort they exerted, how much oxygen they consumed, and whether or not they took the best route to the refuge chamber, with this information being recorded in a database.

Analysis of the performance measures recorded in the database generally suggested that users were able to effectively perform the evacuation procedure within the virtual mine, with 100% of users successfully able to reach a refuge chamber in the first scenario, 85% in the second scenario, and 43% in the third. While this did demonstrate a general decline in performance across the series of three scenarios, this could be attributed to the deliberate design decision to make the second and particularly third scenarios more challenging in terms of the user's initial proximity to the fire, the severity of smoke, and the subsequent effects this had on visibility within the virtual mine. This was reflected in the data recorded in the database denoting the time taken and effort exerted by participants, which tended to be greater during the second and third scenarios, on average. While the database data did not provide a great deal of insight in relation to whether the feedback mechanisms provided within FUMES were effective in approximating real world sensory information, it did suggest that this sensory information was at least sufficient enough to allow participants to perform Dominion's emergency evacuation procedure within a virtual representation of the Challenger mining environment.

In order to determine how effectively the feedback mechanisms approximate real world sensory information that was necessary during an emergency evacuation procedure, participants were required to complete a questionnaire in relation to their experience at the conclusion of the third scenario. More detailed interviews were also conducted with five of the participants.

Movement

Questionnaire responses indicated that users could discern their movement speed during the simulation, with 82% of participants agreeing or strongly agreeing that they were aware of how fast they were moving within the virtual mining environment. This suggested that the icon used to represent movement speed and the auditory cues which represented footsteps were sufficiently adequate to allow the user to know the difference between when they were stationary, walking, or running.

Inclination of the terrain

Participants indicated that they were aware of the inclination of the terrain they were traversing, with 75% of participants agreeing or strongly agreeing that they knew whether they were moving uphill, downhill, or over a level surface within the virtual mine. These responses implied that the icon used to denote changes in the inclination of the terrain was effective in informing the user as to the nature of the mining environment in this regard.

Physical exertion

Participants demonstrated an awareness of their physical exertion during the simulation, with 79% of participants agreeing or strongly agreeing that they knew how much physical effort they were expending within the virtual mining environment. Interview responses reflected this awareness, with participants making repeated references to the role of the auditory cues which represented breathing in informing them as to the extent of their physical activity. This suggested that the animated heart icon depicted in Table 5 in conjunction with the aforementioned auditory cues were effective in establishing the user's level of physical activity within the simulation environment.

Awareness of relationships

Questionnaire responses further indicated that participants understood the effect that movement speed had on physical exertion, with 90% of participants agreeing or strongly agreeing that running required more physical effort than walking within the simulation. Furthermore, participants were also aware of the effect that the inclination of the terrain had on physical exertion, with 87.5% of participants agreeing or strongly agreeing that moving up an inclined surface required more effort than moving down one, and 95% of participants agreeing or strongly agreeing that the physical effort they expended was affected by the slope of the terrain. These responses demonstrated that participants were successfully able to acknowledge movement speed and the inclination of the terrain as factors which affected physical exertion within the simulation environment. This indicated that the participants were able to establish a connection between the feedback mechanisms used to denote movement speed and the inclination of the terrain, and those used to represent their physical activity.

Additionally, participants indicated that they understood the relationship between physical effort and self-rescuer oxygen consumption, with 77% of questionnaire respondents agreeing or strongly agreeing that they had to be aware of their physical effort when using their self-rescuer, and 80% of participants agreeing or strongly agreeing that the physical effort they expended affected the rate at which oxygen was consumed. Interview responses again predominantly referenced the auditory cues used to represent breathing in delineating the relationship between physical exertion and self-rescuer oxygen consumption. All interviewees also stated that the relationship between movement speed, physical effort, and oxygen consumption was clearly demonstrated within the simulation environment. This provided evidence to indicate that the feedback mechanisms used to delineate movement speed, the inclination of the terrain, and the subsequent effects on physical exertion and self-rescuer oxygen consumption were effective in developing an understanding of these concepts and their interrelationships within participants as a result of using the simulation environment.

Findings and conclusion

Responses from participants indicated that the simulation environment provided a clear sense of movement speed, the inclination of the terrain, and physical exertion. This information was effectively conveyed via a combination of visual and auditory feedback which was used to approximate sensory information which would be implicitly available within the real world environment being represented. These feedback mechanisms were deemed effective enough to facilitate an understanding of the relationships between movement speed, terrain inclination, physical exertion, and self-rescuer oxygen consumption which could be applied during an emergency evacuation of the real world Challenger mining environment.

While the use of such cues do impact on the fidelity of the environment and therefore potentially the transfer of learning that can occur, it was evident in this study that learners were quickly able to formalize the meaning of the visual an auditory stimuli in a manner that facilitated their performance in the simulation. It is a tangible reminder that even the most abstracted symbols can be powerful and useful performance cues once their meaning is internalized by the end user. One interesting finding from the study was that while the techniques identified here proved effective cues for mine evacuation, some subtle real-world cues that were not represented within the simulation were seen as a limitation by the participants. For example, the crude depiction of cabling in the interior of the mine was seen as a limitation for those participants who found value from it as a tool for navigation and identifying waypoints within the mineshaft. Also, one participant argued that in an evacuation scenario he would also use the real-world tactility of the tunnel wall to guide his movements, particularly where visibility could be hindered by smoke. The first of these is something that could be remedied with a higher level of fidelity in the visual representation of the cabling. The latter could either be represented using a haptic mouse or, given the success of the use of synaesthetic cues in this study by providing collision feedback in the form of an audible brush against the rock wall.

Despite such limitations, therefore, it is evident that approximating complex sensory stimuli using visual and auditory feedback can be effective in 3D training scenarios using simple desktop technology. Such stimuli may be depicted using multiple modalities, represented at variety of levels of abstraction, and using sensory substitution to provide a synaesthetic experience for end users.

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Student perspectives of eportfolios: Change over four semesters

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Universities are currently under pressure to provide evidence of graduate attributes and at the same time to improve learner engagement. Eportfolios and their associated pedagogies have the potential to support students' learning and development and to provide evidence of their progress against standards or attributes. Research reports about eportfolio introductions provide guidance on this new technology however student voices are underrepresented and most studies occur over a single course. This paper reports early data from a three-year longitudinal study of students in a Bachelor of Education. Survey results across four semesters, which included first-time users in each semester, indicated (1) increasing recognition of the eportfolio for learning in the areas of evaluation, reflection on the learning process, and keeping track of learning experiences and (2) decreasing concerns about using the technology and technology as a barrier. There were also a steady increase of enthusiasm and positive feelings and a decrease in feelings of uncertainty, confusion, anxiety and negativity.

Keywords: electronic portfolios, longitudinal research, Mahara, student perspectives

Introduction

For some time, university graduates have been able to provide evidence of their degree capabilities solely through their university qualifications. Now, contemporary professional, and workplace communities and other stakeholders exert greater pressure on universities for more accountability (Clark & Eynon, 2009) as they increasingly demand graduates who can evidence their employability skills. This is now also well recognised within government policy contexts (Hallam, Harper, McGowan, Hauville, McAlister & Creagh , 2008). Universities must establish how best to respond to these demands, which are somewhat summative in nature while, at the same time, developing more personalised forms of learning which engage their learners and support their development as reflective professionals and confident and autonomous learners (Chau & Cheng, 2010).

Eportfolios have been identified as a technology which has the potential to benefit 21st century models of learning, teaching and assessment (JISC, 2008). While eportfolios bring digital advantages such as portability and flexibility, their use for learners also involves changes of habit, not only regarding the technology but also the accompanying pedagogy. This raises challenges for tertiary teachers in terms of creating an engaging learning environment where students must not only understand the technology but, more importantly, its role in their learning and development.

The purpose of this paper is to present part of a larger project which is investigating student perspectives of eportfolios over three years. We present and discuss some early results from four semesters of questionnaire data. Perspectives over time are especially valuable for technology innovations because they can document change, growth and development, if any. A common theme in the eportfolio research literature is the impact of the eportfolio technology itself on the student experience. We are interested in the ways in which contextual factors in the learning environment not only influenced student perspectives of using the eportfolio technology but also their learning.

Eportfolios and Learning

Stefani, Mason and Pegler (2007) refer to portfolios as "another tool in the e-learning armoury" (p.7) and argue that the key concept is the potential of a portfolio approach to learning rather than any digital characteristics. The elasticity and flexibility of the eportfolio as a personal learning space which can have different roles over the lifespan leads them to identify the transformational potential of the technology, however, they note that the technology is still immature and widely and variously defined. We have adopted the JISC (2008) definition of an eportfolio because it seeks to integrate the technology with pedagogical processes:

> *"An eportfolio is the product, created by the learner, a collection of digital artefacts articulating experiences, achievements and learning. Behind any product or presentation, lie rich and complex processes of planning, synthesising, sharing, discussing, reflecting, giving, receiving and responding to feedback. These processes referred to here as 'eportfolio-based learning' - are the focus of increasing attention, since the process of learning can be as important as the end product" (p.6).*

The JISC (2008) definition also attempts to conceptually connect the process and product roles of eportfolios and there is some support for this. In Chau and Cheng's (2010) study of first time university eportfolio users, most students (and teachers) saw the eportfolio as supporting both the development of a product and the learning process. However, the researchers highlighted the tension between these two aspects and argued that the pressure to demonstrate criteria (such as university graduate attributes) could lead to 'clone' (p. 940) performances and suppress individuality and creativity which could be fostered when eportfolios were used in a more personalised fashion.

Eportfolios are generally located within a constructivist perspective (Stefani, Pegler & Mason, 2007; Barrett, 2005) and their pedagogies often feature reflective and evaluative approaches to professional development and learning (Lin, 2008). In the case of teacher education, the concept of the reflective practitioner is a professional and cultural cornerstone, and there is widespread acknowledgement in the literature of the use of portfolios to develop 'habits of reflection and analysis' (Zeichner &Wray, 2001, p.614). However, in some cultures and disciplines (Vernazza, Durham, Ellis, Teasdale, Cotterill & Scott, Thomason, Drummond & Moss (2011) students have found reflection to be a difficult process and Orland-Barak (2005) observes that the quality of the reflection is not necessarily influenced by the portfolio, and other processes such as collaborative discussions, can produce higher levels of critical reflective thinking. Eportfolios are also valued for their ability to provide more authentic forms of learning and assessment (Emmett, Harper & Hauville, 2006) although the role of experiential concepts and approaches to learning has received sparse attention in the eportfolio literature.

The literature on eportfolios emphasizes the potential of the technology to be transformational. However, the research into student perspectives indicates that there is often a gap between institutional and teaching visions and the reality of student experiences. Some studies have reported positive student perspectives. Lin's (2008) one year study of 38 student teachers reported , from survey data, positive attitudes to eportfolios and identified benefits for learning such as improved self assessment and reflective skills, enhanced organisational, synthesis and ICT skills, and the value of learning through peer collaboration. However, the students were enrolled in an ICT course where the focus of the paper and its learning and assessment strategies provided a rationale for the eportfolio for students. Bolliger and Shepherd's (2010) survey-based study of 40 students over two semesters also reported positive perceptions from students around the value of goal setting, evaluating progress, reflection and communication with peers and the teacher. Their students were engaged in postgraduate study and were distance students and these factors may have influenced their perceptions. Ring and Foti's (2006) study of 1025 student teachers identified benefits including raising consciousness of professional teaching standards, addressing the challenge of explaining the connection between their teaching practice and the standards and making links between theory and practice. They claimed that there was a shift in responsibility to their students and that eportfolios were transformational because students were engaged in new learning processes which involved making decision about their practice and then justifying and explaining them against standards. While the US university context has its own special characteristics, the findings of this study are noteworthy because of the size of the sample, and because this was a longitudinal study over four years.

Some studies have illustrated negative student views of eportfolios. One widely identified issue is frustrations around learning to use the technology (Lin, 2008; Singh & Ritzhaupt, 2006, Tosh, Light, Fleming & Haywood, 2005). The other commonly mentioned issue is demand on student time which is not only related to using the technology but understanding the associated pedagogy (Lopez-Fernandez & Rodriguez-Illera, 2009), especially regarding learning and assessment activities, particularly reflection (Vernazza et al, 2011), but also the role and value of collaboration (Carroll, Maukauskaite & Calvo 2007). Singh and Ritzhaupt (2006) identified student resistance to the eportfolio arising from insufficient support and training, lack of understanding and buy-in from their teachers, an annual charge and a requirement to produce an eportfolio before graduation. Negative student perceptions have also been identified by Tosh, Light, Fleming and Haywood (2005) who identified buy-in, workload and inadequate assessment return, challenges in learning to use the technology and student motivation and engagement. Student opinions about the eportfolio were ambivalent in that while they did not think that the eportfolio was an obstacle in their study they did not think that working with it had assisted them in the course. The findings of this research are notable because this was a three-year study which followed the planned and phased introduction of eportfolios in one British and two Canadian universities.

Some studies have investigated psychological factors related to eportfolios. Researchers report that students may feel challenged and overwhelmed and express anxiety, confusion and uncertainty about the purpose and audience for the eportfolio (Lin 2008). Other student concerns are anxiety about the scope and nature of tasks, the absence of models, their general lack of preparedness for developing a creative and personal work (Darling, 2001). Also identified are teachers' expectations and requirements, keeping track of paper placement reports and then getting them into the eportfolio (Pincombe, McKellar, Weise, Grinter, & Beresford, 2009). In a relatively large study for this field (364 students), Tzeng (2010) highlighted the important role of student attitudes i.e. beliefs about the advantages of the technology and identified these as more important than perceptions of value around costs and benefits, usefulness and institutional support. Many studies endorse the importance of the broader context for the eportfolio in terms of the learning design and the role of the teacher in developing positive attitudes and addressing concerns and anxieties.

A range of methodologies have been used to investigate student perspectives of eportfolios with much of the research being insider research in the nature of case studies carried out by enthusiasts (e.g. Lin, 2008; Pincombe et al, 2009). Surveys have been carried out, however the numbers of participants have often been less than 100 students, with greater numbers of students being less common (Tzeng, 2010; Parker et al. 2009; Singh & Ritzhaupt, 2006; Tosh et al, 2005). With the exception of Tosh et al (2005), and Ring and Foti (2006), most of the studies we have located gathered data from a single semester and from a single class (e.g Lin, 2008) and did not survey students from a range of courses. Bolliger and Shepherd's (2010) results were based on data across two semesters and they observed that 'it was not clear how time would influence students' perceptions (p. 310). Housego and Parker (2009) have noted the limited availability of studies of longitudinal use of eportfolios and student perspectives. We argue that the area of development of student views of eportfolios over time is under-researched. This research study seeks to address this gap in eportfolio knowledge by investigating student perspectives in a Bachelor of Education (Primary) programme across three years. The outcomes of this research will contribute (1) to pedagogical and institutional knowledge about eportfolios and (2) to better understanding of issues involved in students' adaption to new technologies.

The Research Study

The research discussed here is part of a larger study which was described at the ascilite 2009 conference (Gerbic, Lewis and Northover, 2009). The aim of the overall research is to investigate student experiences of eportfolios and their impact or otherwise on their learning. The research questions are:

1. How do students experience an eportfolio?

2. How does an eportfolio help students to learn?

3. What hindrances or challenges are there for students when they use an eportfolio in their learning?

Our intention is to investigate changes (if any) over time in student perspectives after the eportfolio is introduced. Part of the value of such a study is to consider the relationships between student changes of perception with the expansion of teacher understanding of the technology and the development of a responsive pedagogy. The project also enables us to see whether, with the passage of time, students can move past the technological and other challenges and become more confident learners with their eportfolios.

Context

The Mahara eportfolio (Eduforge, 2007) was first introduced into the B.Ed (Primary) programme in semester 1, 2009 to second year B Ed students and then extended into Years 1, 2 and 3 of the programme over the next 18 months. The eportfolio was initially embedded within the Practicuum programme where it where it was used by student teachers while they were in schools to reflect on their teaching experience. It was also used for goal setting and self appraisal against teacher graduating standards and was assessed. In Year 1, students were introduced to the eportfolio, using it formatively to support goal setting and reflection.

In 2010, the eportfolio was introduced into a Technology course where it was used as part of a learning assessment. For the first two semesters, there were technical issues with the eportfolio software but these have now abated and a variety of training approaches (workshops, online and printed materials, teacher modelling and peer coaching) have raised overall student comfort with the technology. The teaching team has remained the same for four semesters, however their understanding of eportfolios has significantly increased and they have continued to extend and incorporate authentic eportfolio tasks across the programme. Building student understanding of the role and value of the eportfolio in their development as professional teachers has been embedded within the programme as a significant and an ongoing activity.

Methodology

This study has been designed as a longitudinal study with the aim of building a picture of student perspectives over three years. Longitudinal research is a research design where (a) data are collected for each item or variable for two or more distinct time periods; (b) the subjects or cases analyzed are the same or at least comparable from one period to the next; and (c) the analysis involves some comparison of data between or among periods (Menard, 2002, p. 2). A longitudinal approach is useful for investigating the dynamics of change, growth and development over time (Cohen, Manion &Morrison, 2000) and to identify general trends. It is therefore valuable for investigating innovations such as eportfolios and their impacts on student learning. Longitudinal studies may include different participants over time. Here, for pragmatic reasons, we chose not to follow a single cohort of students, but used instead a rolling sample (Gorard, 2001). After the first semester, all classes using the eportfolio were invited to participate, and consequently, each semester, in addition to first time users, the sample included a proportion of students who had previously used the eportfolio and were likely to have completed a questionnaire.

We have adapted the questionnaire used in the Australian ePortfolio Project (Hallam, Harper, McGowan, Hauville, McAlister & Creagh, 2008). This had the advantage of being used in a relatively similar educational context, and had been rigorously developed and tested prior to its use. The resultant anonymous questionnaire comprised six closed questions, one open question and seven closed questions with space for students to comment. The questions covered a range of pedagogical and psychological issues such as benefits for learning development of professional skills, getting employment, challenges and outlooks. The project received ethical review and approval and recruitment and data collection was carried out by the researcher who did not teach the students and the research assistant. SPSS software was used to collate the questionnaire data and present it by semester and responses to open ended questions were coded using NVivo. The research team then carried out a descriptive analysis of trends.

Participants

Two hundred and sixty-eight questionnaires were completed over 4 semesters and by 86% of students enrolled in those classes. Details of the student participants are provided in Table 1 below. This shows the programme year of student study, and the number of students participating over the enrolled number. The arrow indicates the movement of that group of students in the following semesters. Across the four semesters, 145 students were initial users and 47 students had three semesters' experience. Across the four semesters, students were aged predominantly 25 years and under (58 – 79% across the four semesters) and were mostly female (81- 97% across the semesters). The percentage of students with a Web presence such as Facebook was high, with a range of 91 – 97% across the semesters.

Table 1: B. Ed (Primary) Questionnaire Participant Information

June 2009 ***(Semester 1)***	**November 2009** ***(Semester 2)***	**June 2010** ***(Semester 3)***	**November 2010** ***(Semester 4)***
Year 2(A)* 35/35 →	Year 2(B)** 26/30 →	Year 3(A) 25/28	
	Year 1(B) 38/40 →	Year 2(A) 38/40 →	Year 2(B) 22/30
		Year 1(B) 12/15 →	Year 2(A) 12/15
			Year 1(B) 50/70
			Year 3(A) 10/10
35 students	64 students	75 students	94 students

* (A) = first semester of the programmeyear
** (B) = second semester of the programme year

Results

We present selected results from four semesters of data. Because of the introduction to Year 1 students after the first semester, the results for semesters 2, 3 and 4 include first time users and it is only in semesters 3 and 4 that student perceptions are available from students who have used the eportfolio for three semesters. However, there was a high level of survey participation in each class (from 71 – 100%) so the data has captured a large proportion of the available student perceptions, rather than those of enthusiasts. These results have been considered in the light of key contextual factors associated with the eportfolio introduction. In semester 1, there were issues with the performance of the software and many of these continued into semester 2. As the semesters proceeded, software issues disappeared, and the stable and committed teaching team deepened their understanding of eportfolios and the importance of scaffolding activities to improve student understanding. Findings from the associated qualitative project provided more in depth student perspectives which were also fed into the eportfolio development and facilitated a responsive learning design process. Learning support options were widened to address variation in student competence and confidence in using eportfolios and the introduction and rationale for using eportfolios was continuously refined in response to student perceptions and teacher insights.

Role/Use of the eportfolio for learning

Students were provided with a list of possible outcomes of eportfolio use and then asked to indicate the extent to which the eportfolio had helped them in their current papers. Students' responses were measured using a 5-point Likert scale.

Providing a Place to Store Examples of Coursework

Figure 1 below shows the proportions of students and their levels of agreement and disagreement with the statement about storage. The graph shows an upward trend of students who agree and strongly agree. In semester 1, this combined proportion stood at 66% and by semester 4 had risen to 86% of the students. At the same time, the proportion of students who disagreed or strongly disagreed declined and by semester 4, no students expressed this view, although 13.3% of students were neutral on this issue. This trend direction is notable because just over half of the semester 4 students were using the eportfolio for the first time.

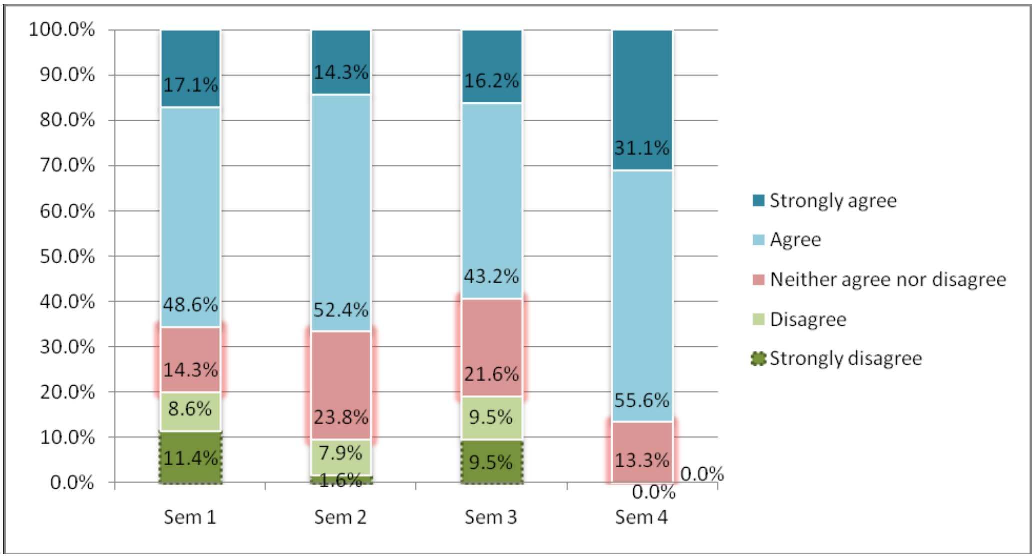

Figure 1: Providing a Storage Place

Allowing evaluation and reflection on the learning process

Figure 2 below shows the proportions of students and their agreement or disagreement with the statement. Across the four semesters the graph shows an upward trend of agreement. In semester 1, only 17.1% of students agreed with the statement and no students expressed strong agreement. By semester 4, 17.8% of students strongly agreed with the statement and when combined with students who agreed (66.7%) a total of 84.5% regarded this role positively and there was no disagreement or strong disagreement. This is a positive trend, especially, when taking into account the large number of first time users in semester 4. The high proportion of neutral students in semester 1 may be attributed to the technology issues. In subsequent semesters, neutrality levels may be affected by Year 1 students' views of their Practicuum reflections. This was their main use of the eportfolio and it was not assessed so it is possible that students may not have associated the reflections with their learning.

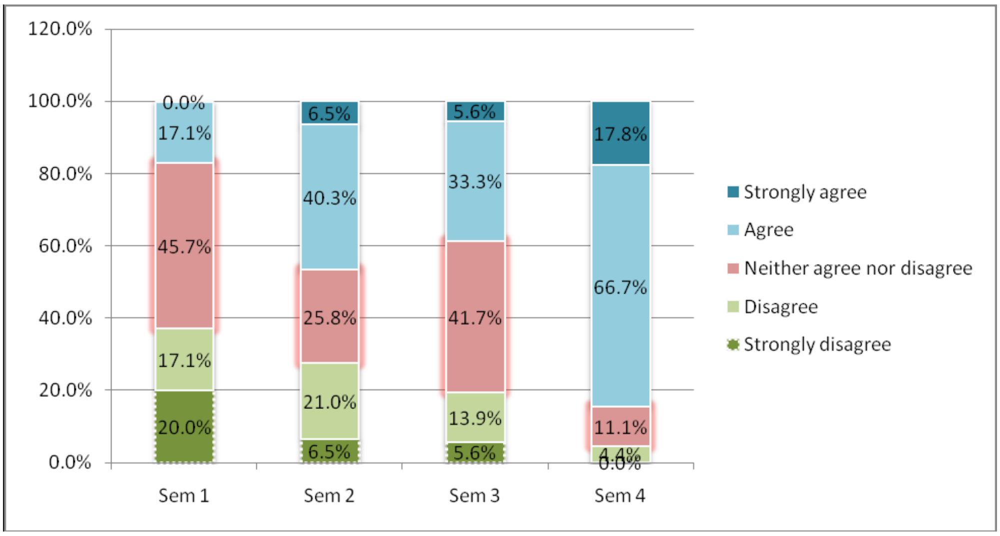

Figure 2 : Allowing evaluation and reflection on the learning process

Keeping track of learning experiences and reflecting on weak areas

Figure 3 below shows proportions of agreement and disagreement for this statement which focuses on the students' own progression rather than the learning process (above). There is a trend of increasing recognition by students of the value of the eportfolio for learning. In semester 1, 17% of the students agreed with the statement and by semester 4, 70.5% of students agreed and strongly agreed. The number of students who neither agreed nor disagreed remained somewhat static (31.9% - 34.3%) for the first three semesters and then decreased slightly to 23.9%. This may reflect the nature of assessment work and its direct links to the eportfolio from Year 2 onwards.

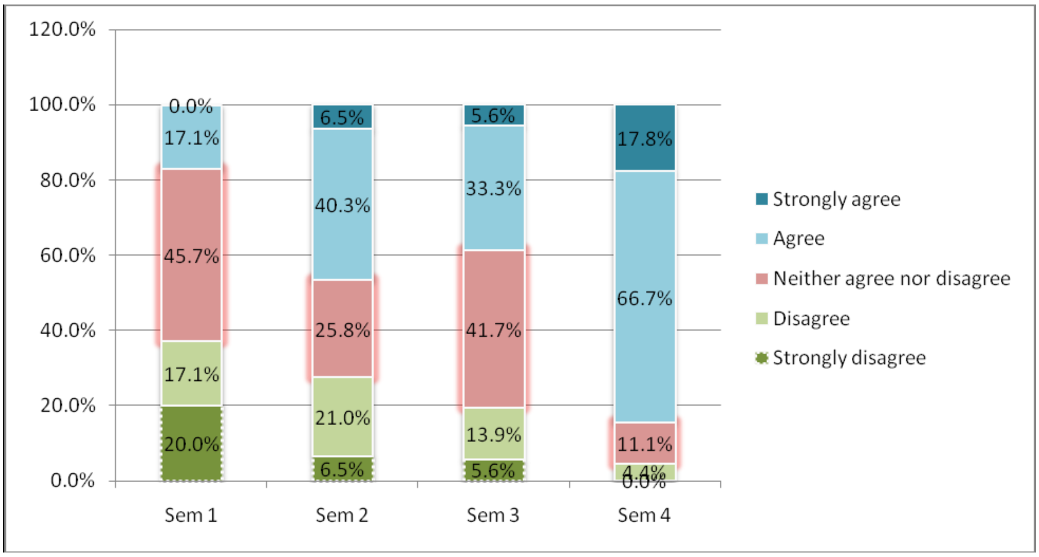

Figure 3: Keeping track of learning experiences and reflecting on weak areas

Helping students to become more effective and independent learners

Figure 4 below provides students' perceptions of their development as autonomous learners and here, data across the four semesters indicates a smaller increase in agreement. The proportion of students who agree and strongly agree rose from a modest 17.1% in semester 1 to 44% in semester 4. While the proportion of students who disagree/strongly disagree with the statement has reduced from 50% in semester 1 to 5.6% in semester 4, the proportion of students who are neutral has increased from 32.4% in semester 1 to 43.3% in semester 4. Possible influences on student perceptions here are likely to be related to the strongly scaffolded assessment tasks which students might not perceive to be building their capacity for independent learning.

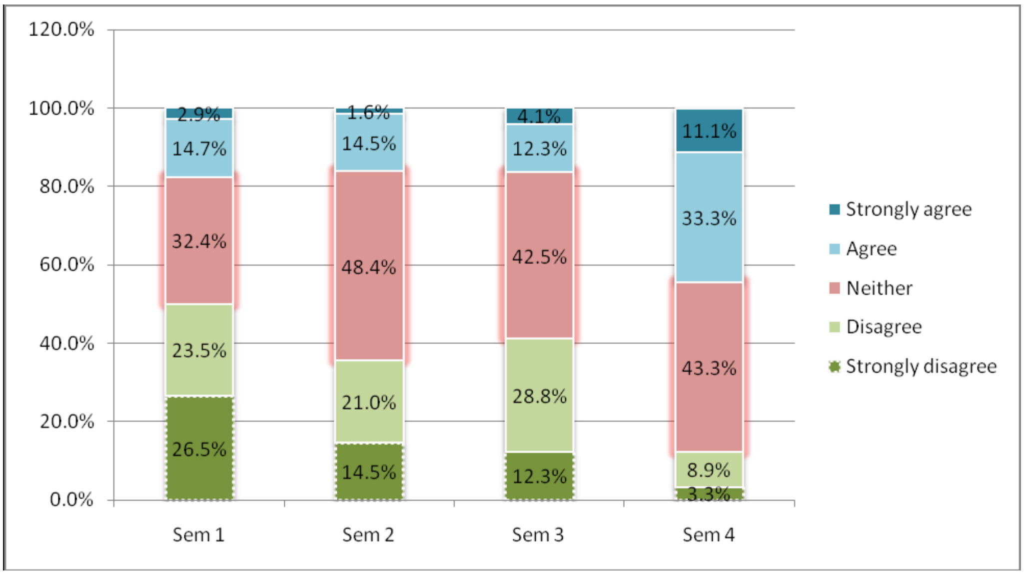

Figure 4: Helping students to become more effective and independent learners

Psychological Perceptions of Using the Eportfolio

Students were asked to indicate how they felt about using the eportfolio so far and in answering this question,they were allowed to choose more than one of the responses. Student perceptions are presented in Figure 5 below. This question may not be well constructed in that while the negative emotions are well represented in the literature, there are only two positive emotion choices for students and four negative ones. However, the data shows a trend of increasing enthusiasm and positive perceptions (from 3% and 17% respectively in semester1 to 17% and 49% in semester 4 and decreases in negative emotions such as uncertainty (from 20% in semester 1 to 12% in semester 4) , confusion (from 20% in semester 1 to 7% in semester 4) and anxiety (from 14% in semester 1 to 12% in semester 4). The proportion of students who remain neutral has stayed at a similar level at 26% although increasing in semester two and three to 34% and 36% respectively. While it is pleasing to see a reduction in negative feelings about the eportfolio, at semester four, still a quarter of students are neutral about it. This may be so because in semester four, half of the students were first time users and had limited use of the eportfolio in their course.

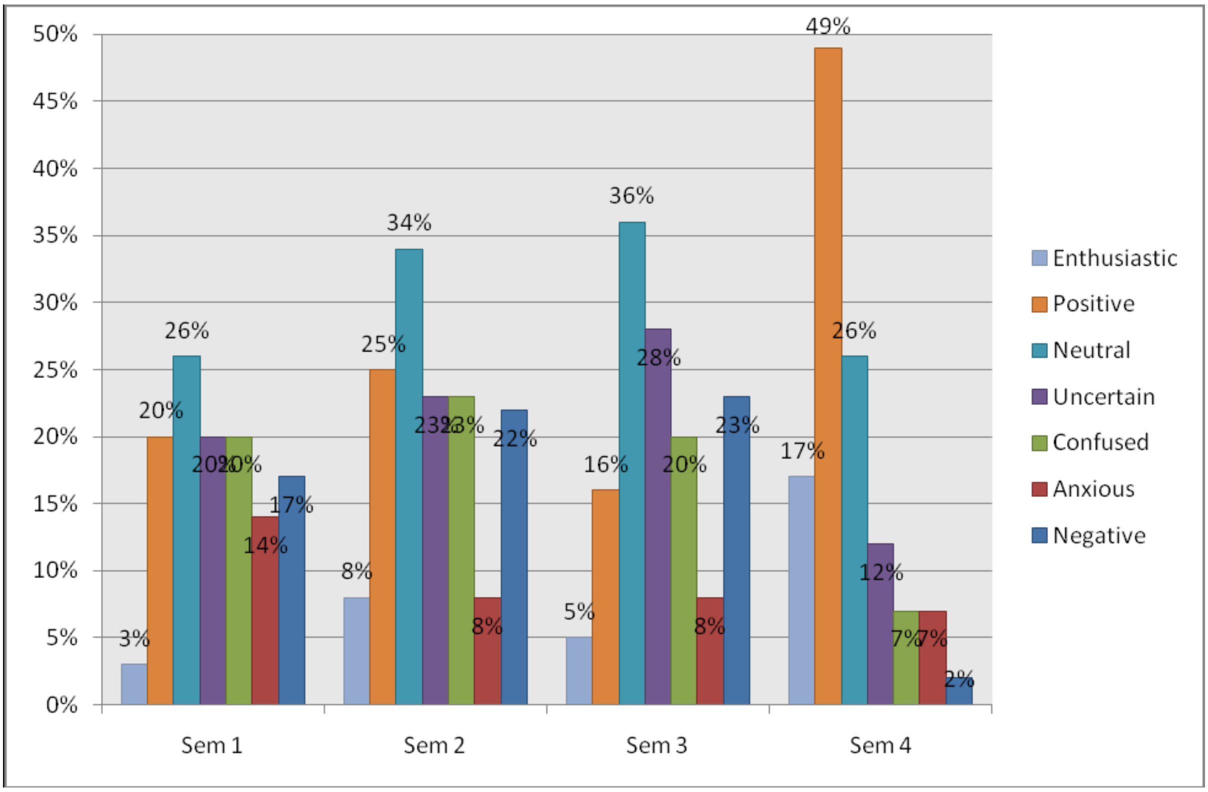

Figure 5: Psychological Perceptions of Using the Eportfolio

Challenges

Students were asked to identify in open text format the biggest challenge in using their eportfolio. Across the four semesters, 247 students (average of 92%) made 268 responses. Almost all of the comments were about developing their competence with the technology, for example, getting to know how to work with the Mahara ePortfolio - to navigate, to create and edit views and to allow specific views for lecturers and /peers:

> *It was hard to work out how to put things in and giving people views of your profile, and if you get a message, there needs to be a notice on the profile page (Semester 2 student)*

There were also emotional dimensions in that students described the familiarizing process as difficult, complicated, confusing, time consuming, not user friendly and involving many steps. The trend over four semesters showed that issues reduced in frequency. A student in semester 4 commented that**:**

> *[The biggest challenge was] the initial set-up, until becoming familiar with the process; just getting used to getting to know how to use it, but once I played around with it, I found it very useful.*

Discussion

The results indicate positive trends in the student body as a whole as the eportfolio technology and its accompanying pedagogy was developed within the programme. Results for the first three semesters are likely to be influenced by software issues and the residual impact on students. However by semester 4, these were addressed and the results are noteworthy because they indicate that as students have more exposure to eportfolios, in a context where teachers are increasingly knowledgeable about their learning benefits and responsive to student issues, that students do begin to appreciate the ways in which they might help them to learn. Alternatively the results indicate that students are adaptable and can get on with their learning in a changed technological and pedagogical environment. The overall results also have value because they represent the views of students across Years 1, 2 and 3 of a programme from 10 classes and include most of the students in each class.

The high levels of recognition of the value of the eportfolio for storage and organisation is well represented in the literature. Lopez-Fernandez and Rodriguez-Illera (2009) found that students considered that the main advantage was the pragmatic one of "a private VLE" (p.614). This illustrates the very basic role of the eportfolio as a digital repository (JISC, 2008). The literature indicates that there is a challenge in moving students beyond the digital dimensions of the technology and on to recognising its potential for supporting learning and learning processes. Our results provide some evidence of growing recognition of this over time by these students in the areas of evaluating and reflecting on the learning processes and keeping track of their progress and considering areas of weakness. This research confirms the findings of Bolliger and Shepherd (2010) and Lin (2008) who all identified similar benefits around these learning processes, although at slightly higher proportions for reflection (80% and 87% respectively). The results validate a major benefit of eportfolios in their support of reflection which is recognised as fundamental to the construction of knowledge and differentiates the role of the eportfolio as a mere repository of knowledge (Riedinger, 2006)

The role of the eportfolio in helping students to become more effective and independent learners was less established over four semesters. Chau and Cheng (2010) found that independent learning can be supported by eportfolios but they also identified obstacles to its development. In addition to the students' focus on the eportfolio as a product rather than a process, they also discussed the role and identity of teachers and the need to reconstruct the teaching relationship to be more student-centered. Lastly they noted the tension between universities' current focus on the eportfolio as a showcase for its graduates' attributes versus it use as a personal learning space for students. From our (New Zealand) perspective, there are broader issues associated with equity goals for universities. The elasticity of eportoflios means that it can support and encourage learning and self expression in a variety of media and across diverse experiences and therefore support a wider range of students. The tension between institutional and personal goals for eportfolios is complex and unexplored and mirrors broader national issues such as student mobility and the need for systems which can support transition and credit moving (Hallam et al, 2010) however in a manner which protects citizen's privacy.

Despite the challenges of learning to use the technology effectively, levels of enthusiasm and positive feelings increased steadily across the four semesters and feelings of uncertainty, confusion, anxiety and negativity decreased commensurately. The extent of change is not as great as that measured by Lopez-Fernandez and Rodriguez-Illera (2009) who reported that students were initially equally either calm and confident or confused and bored, but by the second month of use, 79% of students were positive. These results contrast with Tosh et al's (2005) study where many students had negative feelings about the eportfolio which were expressed through lack of buy-in and lack of motivation. These appeared to be associated with the time involved to learn to use the technology and the limited functionality of the platform which was frustrating for students. Our research tracks a developmental pathway which sits between these two studies.

More direct comparison might be made with the results of the survey of 101 Australian university students as part of the Australian ePortfolio Project (Hallam et al, 2008) because our questionnaire was adapted from this Australian one. However student participants were drawn from four different tertiary institutions and across many disciplines, so the context was quite different. Briefly, technical issues were not significant and students identified the greatest challenge as selecting experiences and the reflection process. In the area of learning, Australian students reported slightly higher levels of agreement regarding supporting evaluation and reflection on the learning process (84%) and similar levels of agreement concerning keeping track of progress and reflecting on weak areas (71%) and helping students to become a more effective and autonomous learner (less than half).

One of the themes in the research on student perceptions of eportfolios is that it takes some time for students to recognise the value of eportfolios to support their learning and development. Instead, students are either engrossed in learning to use the technology (Tosh et al,2005) or more interested in the pragmatic aspects of the eportfolio such as its ability to act as a repository and organiser (Lopez-Fernandez & Rodriguez-Illera, 2009) or to work as a showcase of their abilities for employment. This research provides some evidence of a trend of increasing recognition of the role of eportfolios in supporting reflection, and evaluation of learning, and, to a lesser extent, independent learning. The main challenge remains that of moving attention away from the technology and we are cognisant of student opinions that the eportfolio is not as easy to use as Facebook. We would like to see the eportfolio become part of the university learning landscape, and viewed in much the same way as its LMS. Our students have indicated that they would like to be able to access the eportfolio software after graduation for employment purposes and increasing availability might raise student perceptions of the learning and developmental value of the eportfolio.

Ramsden (2003) emphasizes the importance of contextual factors in influencing student perceptions of the learning context. The literature on eportfolios (e.g. Stefani,Mason & Pegler , 2007; Wetzel & Strudler, 2005) provides a significant body of pedagogical advice, however, there may be other factors which are influencing student perceptions. In the context of blended learning, Orton- Johnson (2009) found that students who did not engage with online materials acted in this way because they had concerns about the academic authenticity and trustworthiness of online materials. They wanted to remain with reading lists and books because they were reliable, safe and academically familiar. The challenge for students was to “reconfigure existing understandings and expectations of academic scholarship and reconstruct academic boundaries in new spaces" (p.837). Eportfolios, with their emphasis on digital media, representation, reflection, evidencing and synthesis also introduce new forms of academic scholarship which require students to construct new learning practices and change is not always easy, as this research indicates, and there are issues of sustainability.

Our results from this study provide some evidence of positive changes over time in students' perceptions of eportfolios. The results need to be considered in the light of particular contextual factors – the participants were student teachers who were already familiar with some dimensions of the eportfolio, particularly reflection. Students also came from classes of fewer than 50 students and this small class size is likely to have created a more responsive and interactive learning environment with ongoing professional feedback from teachers. The results also reflect the wording of the questions, which may not always have been clear to our participants. While this survey has provided an overview of student perceptions, there is little description or rationale for our student's perceptions and a qualitative study is being carried out to provide this complementary perspective.

Conclusion

The preliminary results from this three year project have demonstrated some trends of positive student engagement with eportfolios and the introduction of new learning spaces where students can focus on their development as reflective professionals. There may be a tension between this learner-centered focus and the broader use of eportfolios to evidence university accountability and graduate employability. In this case, strategies for reconciliation of the product and process aspects of eportfolios are highly desirable.

When students are learning to use a new technology and there are pedagogical changes associated with this, then challenges of the kind identified here may be unavoidable. Wetzel and Strudler (2005, p.26) argue that costs for students, such as time to learn to use eportfolios, can be substantial and this must be acknowledged by researchers and teachers who also must build understanding of what makes eportfolios meaningful and worthwhile for students. More longitudinal studies are needed to provide further insights into student perceptions of learning with eportolios.

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The role of asynchronous discussion forums in the development of collaborative critical thinking

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Blended learning approaches often make use of asynchronous discussion forums (ADFs) to enhance face-to-face learning, collaboration and co-construction. One aspect of research for such online tools focuses on the development of critical thinking. But what, specifically, is the role of such technology in such efforts? Over a semester, we collected data through classroom observations, semi-structured interviews and online postings. In our cyclical thematic analyses, we identified *virtual presence*, *timing*, *display presentation*, and *skill development* as influential factors regarding the development of collaborative critical thinking. Students, nonetheless, were often very frustrated with the tool. Improvements to the actual use of the tool, combined with greater guidance, may yield stronger results.

Keywords: critical thinking, collaboration, asynchronous discussion forums, higher education

Introduction

Blended learning approaches, which combine online technologies with face-to-face learning, are now an integral part of higher education (Amhag & Jakobsson, 2009; Edwards, Watson, Nash, & Farrell, 2007; L. Lee, 2009; Sharma, 2010). Because online tools used in higher education are predominantly text-based, several researchers have focused their attention to the role of asynchronous discussion forums (ADFs) within blended learning (Suthers, Vatrapu, Medina, Joseph, & Dwyer, 2008). Increasingly, investigators consider the possible affordances that ADFs may offer in enhancing learning, collaboration and co-construction of knowledge (Haavind, 2006; Land, Choi, & Ge, 2007). ADFs are seen to provide students time for thoughtful reflection, analysis and negotiation in evolving discussions (Yang, Newby, & Bill, 2005); if designed appropriately, the fora can facilitate truly collaborative activities (Janssen, Erkens, Kirschner, & Kanselaar, 2009).

Because a major aim of higher education is to develop critical thinking, it is important to investigate the role of ADFs in the development of critical thinking within blended approaches. For Kern (2006), such a search for "transversal relationships" (p. 202) investigates the transferability of learning from one communicative context or modality to others. Rovai (2007) highlights that participating in ADFs is a kind of collaborative activity which can give rise to critical thinking. ADFs can help learners engage in continual and extended reflection by allowing them to return to the online postings any time (Lea, 2001). In turn, sustained reflection can lead to a kind of thinking necessary to make connection between old and new information, and to synthesize these. Such reflection is proposed to result in the formation of new knowledge (Kol & Schcolnik, 2008).

Over 100 years ago, Dewey (1916) suggested that successful learning is dependent on the development of communities that engage in meaningful and critical communication. Smith (1994) stated that when a group collaborates effectively, its stages of cognitive development (e.g. exploring dissonance among ideas, synthesizing opinions, testing proposed syntheses) can be recognized as demonstrations of higher level thinking. Clearly, learning develops in the light of social interactions: within a community, individuals are challenged to demonstrate their ability to question, analyze, synthesize, evaluate, and make decisions (Deloach & Greenlaw, 2005). In turn, other community members respond by suggesting justified and supported insights and criticisms that lead to solving problems and generating new ideas. We recognize that collaboration in and of itself, however, does not necessarily lead to improved critical thinking as it is necessary to have a type of social interaction that moves beyond information exchange to one which encourages a more reflective and in-depth analysis (Abrams, 2005). Further, we understand that the potentiality of online learning tools to foster collaboration and co-construction of knowledge has been yet to come to fruition (Kreijns, Kirschner, & Jochems, 2003; Reeves, Herrington, & Oliver, 2004). As pointed out by Hovorka and Rees (2009) integration of well-crafted and engaging online tasks is time consuming, and access to multiple information and learning sources may decrease learners' participation. They add that ways of structuring threaded discussions (i.e. ADFs) and multiple blogs are valuable areas for future research. What we do not yet know, however, is what role the ADF itself plays in fostering interaction and learner development.

The aim of this paper is to examine the role of ADFs in the development of critical thinking. To achieve this aim, we report on the analysis of semi-structured interviews in a blended graduate subject at a large Australian research university. Following a brief review, we set out our approach to qualitative research. Next, we detail a cyclical analysis of the data in which four themes emerge. We define each theme, provide examples and then seek to expand current theoretical perspectives. We conclude the paper with an agenda for further research.

Research approach

One initial step in research is to set a *paradigm* that is defined by Kuhn (1970) as "the entire constellation of beliefs, values and techniques, and so on shared by the members of a community" (p. 175). The researchers' paradigm (i.e. their worldviews) affects the research design, data collection, data analysis, and interpretation. In this study, we adopted a qualitative interpretivist approach. At an ontological level, interpretivists view the world as a socio-cognitive construct where multiple realities shape a unified whole rather than assuming that social reality is external to the individual. Therefore, from an interpretivist point of view, the social world is best understood by taking into account the frame of reference of individuals in action within the social world. For us, we believe that individual thought processes, including critical thinking, cannot be investigated in a social vacuum. A range of multiple factors, both external and internal, influence the development of critical thinking within real life settings; clearly, our limited study cannot begin to capture each of them. We limit our investigation to demonstrated and observable critical thinking within an academic setting.

Site of the study

The site of this study was a once-a-week-2-hour face-to-face seminar called Technology and Language Learning

(TALL) supported by an online platform (the university's Learning Management System-LMS) where students used two asynchronous online tools: 1) ADFs (whole-class online discussions triggered by the subject coordinator), and 2) wikis (for students to discuss their final projects in small groups). We only looked at participants' experience of the ADF.

Participants

Participants in the study consisted of 12 graduate students and their subject coordinator within an intact subject at a large Australian university. Each agreed to participate in semi-structured interviews, and allowed analysis of their postings. Table 1 presents demographics of participants. For the sake of anonymity, pseudonyms were used.

Instruments

Over one academic semester, we collected data through classroom observations, conducted semi-structured interviews with the student participants and observed the ADF postings. Because of a limited word count for this paper, we focus on data from semi-structured interviews.

The semi-structured interviews were intended to provide an opportunity for participants to express ideas about their experience of the ADF, to identify factors affecting collaboration and critical thinking online, and to suggest ways of improving collaborative and critical engagement in the ADF. One-to-one interviews were conducted toward the end of the semester (week 9, 10 & 11). Interviews with blended students were conducted face-to-face and audio-recorded (except for one blended participant, Trung, who asked to be interviewed via online text-chat). Interviews with fully online students, on the other hand, were conducted online via text-chat or instant messaging. At the end of the semester, we interviewed the subject coordinator about student collaboration, critical thinking development and ways to improve the efficacy of the ADF.

After some transcription, the interviews were analyzed with the help of NVivo 9.0 through several cycles until a number of supported themes emerged (see Heigham & Croker, 2009; Miles & Huberman, 1994).

Table 1: Demographics of each participant in the intact class

	Name	Gender	L1	Mode of study	Level of study	Experience with ADFs
1	Sinta	Female	Indonesian	Blended	PhD	None
2	Trung	Male	Vietnamese	Blended	MA	High
3	Kalid	Male	Arabic	Blended	MA	Medium
4	Fahimah	Female	Arabic	Blended	MA	None
5	Maznan	Male	Malay	Blended	MA	Low
6	Grace	Female	English	Online	MA	None

7	Hung	Female	Vietnamese	Blended	MA	Low
8	Danny	Male	English	Online	MA	High
9	Carl	Male	English	Blended	MA	Low
10	Nancy	Female	English	Online	MA	N/A
11	Azin	Female	Farsi	Blended	PhD	None
12	Kamran	Male	Farsi	Blended	PhD	None
13	Alex	Male	English	Blended	Coordinator	High

Factors and indicators

As a focal point in our interviews, we asked participants what factors had affected their interaction and the development of critical thinking in the ADF. Taking into account both student and subject coordinator perspectives, four broad factors related to technology, English as a Second Language (ESL), task and curriculum were identified. Table 2 provides a summary of the factors and indicators that we found affected interaction and the development of critical thinking in the online discussions.

Table 2: Factors affecting collaboration and critical thinking in ADFs

Themes	Indicators
Technology	Display presentation Virtual presence Timing
ESL	Cultural background Cross-cultural communication patterns Previous educational experience (practice vs. lack of practice of critical thinking)
Task	Online discussion questions (uncontroversial topics/ close-ended vs. open-ended) Teacher-presence (teacher feedback absent vs. teacher feedback present) Online discussion rubric (general & implicit vs. specific & explicit guidelines) Assessment criteria (general & implicit vs. specific & explicit criteria) Focus on critical thinking and collaboration in offline and online classroom (implicit vs. explicit)
Curriculum	Focus on individualistic/ competitive learning vs. collaborative learning at the departmental level Focus on vs. lack of focus on collaborative critical thinking at the departmental level

In most studies of critical thinking in online asynchronous/synchronous discussions, participants did not demonstrate collaboration (Heckman & Annabi, 2003; Leng, Dolmans, Jobsis, Muijtjens, & Vleuten, 2009; Marttunen & Laurinen, 2009; McLoughlin & Mynard, 2009; Vaughan & Garrison, 2005). These researchers, and others, have found that the possible reasons that stifle collaboration include 1) the short time allocated to online discussions; 2) unstructured instruction or guidance (lack of sufficient teaching presence); 3) a lack of motivation or goals in online discussions; 4) the type of online tasks and triggering questions posed; and 5) the learners' educational experiences and cultural backgrounds. Perhaps not surprisingly, the results of our analysis of factors confirmed a number of these findings: Participants stated items 2, 4, and 5 as among the factors inhibiting their collaborative critical thinking online. Interestingly, however, none of the participants mentioned items 1 or 3 were inhibitors.

Affordances and hindrances of ADFs

As we continued our analysis, we focused specifically on the technology-related factors to better understand the role that the tools themselves may play in learner development of critical thinking. Four themes emerged: *virtual* *presence*, *timing*, *display presentation*, and *skill development*, and we expand on them below:

Virtual presence

Virtual (online) presence in ADFs in addition to the face to face presence in the classroom can serve as an affordance and/ or hindrance for interaction and/ or critical thinking.

Affordances

In interviews, participants were asked whether they enjoyed participating in the ADF. In response, many students noted that the ADF gave them an extra opportunity to share ideas with other students:

> There are many times when you might not think of something that you felt to be important while you're right there in the class but later on you have another idea and it's easy enough to just go to the discussion board at any time and let everybody else know what u think. (Carl)

> There were couple of points I could not mention in the classroom because of the shortage of time but in online discussions I could raise them and it could have bit of a discussion with our classmates. (Kamran)

Furthermore, some students mentioned that the ADF was a point of contact because, in the classroom, they would not normally talk to each other:

> I think it was important for me to almost like getting to know the other people in the class a bit better because you tend not to talk all that much with the other students in class and [the ADF] is something that lets you to certain extent get an insight into other people's ideas, other people's personalities in a way that you might not in a classroom setting. (Carl)

One reason why students thought that the ADF helped them in knowing other students better is that the TALL subject face-to-face sessions were in the form of lectures; therefore, students have little opportunity to engage in peer/ group activities.

Interestingly, many students preferred participation in the ADF as a way of avoiding face-to-face interaction:

> If you're facing this person, especially if you know that that person is more knowledgeable than you, then sometimes you feel reluctant; that it is not free for you to really open up yourself to give your own opinions towards the people, but as in the discussion board there, you don't necessarily meet with the people, right? So you can freely post your opinions there without the face threatening act. (Sinta)

Based on their responses, students' inclination for online rather than face-to-face interaction can be attributed to their personality. Anxiety, discomfort, and shyness were among reasons for preferring online interaction. These results confirm those of previous studies such as McBrien, Jones, and Cheng (2009) and Rovai (2007) which found learners' increased comfort level with Internet-based communication since anxiety of face-to-face interaction and criticism are eliminated online.

In addition, some students appreciated the fact that the ADF could be accessed and viewed only by other classmates and the subject coordinator (semi-public nature of the ADF). It was not an open forum where anyone browsing the Internet could enter and view their postings:

> I know that I personally would probably have big misgivings about putting my opinions up if [the ADF] was a completely open forum and everybody on the Internet could read it but as long as it stays within the subject I'm much more comfortable. (Carl)

Hindrances

Although most students appreciated the *virtualness* of interactions, some students mentioned lack of face-to-face contact with other students as one of the aspects of the ADF they did not like about the online discussions:

> Although [the ADF] is a wonderful tool in allowing us to feel part of the class, in reality we are not. Students don't know me, and I don't know them. I am a very chatty person:D and would readily take part in a classroom chat, because I am there to negotiate or clarify any misunderstandings. (Nancy)

Again, it would appear that personal preferences are at work. While many students preferred online interaction due to anxiety, discomfort and shyness, some preferred face-to-face interaction due to the more immediate social nature of physical co-presence. This issue is not problematic in blended learning contexts where the availability of both offline and online modality responds to different personalities and communication preferences. Unfortunately, Nancy who was a fully online student did not have the option offline (i.e. face-to-face). At another point during the interview, Nancy said that sometimes the written modality of the online discussions caused misunderstandings:

> I suppose there is also the notion of not knowing how your response is going to come across through a written post, for just as with email when the communication is not f2f [face-to-face] it leaves a lot open for interpretation. For example I had someone respond to one of my posts & I felt they were being a little negative, but I am sure in reality they were not. (Nancy)

Furthermore, the idea of posting ideas online where everyone in the class could see them made some students such as Grace, hesitant to post:

> The hesitation to post is because of the thought of] how to phrase it and then posting it for all to see, then it is open for criticism! You know the worry of 'what if I'm wrong!'. (Grace)

Although the affordances and hindrances of ADFs regarding virtual presence are not explicitly expressed by the participants to affect their collaboration and critical thinking online, they are still important to be considered. One of the main factors to take into account when evaluating applicability and suitability of an online learning tool such as asynchronous CMC (computer-mediated communication) is its potentiality to provide a platform for generating a sense of community or social presence among online members (McBrien, et al., 2009; Rovai, 2007).

Timing

The time spent on reflecting on and structuring posting on ADFs may serve as an affordance and/ or hindrance for interaction and/ or critical thinking.

Affordances

In line with the results of most studies (e.g. Kol & Schcolnik, 2008; McBrien, et al., 2009), students in our study enjoyed the flexibility of time and space which was afforded to them by the ADF:

> I think the best thing is that you can have discussion with a group whenever you want. You don't have to set a meeting time and everybody be present at that time, like I might post something on, I don't know, Wednesday and somebody might join me the day after that and that's really good. I like that best. (Azin)

Most students said that they preferred the written mode of the ADF to the oral mode of the face-to-face classroom. When we asked the reason, many students said that the ADF would afford them more time to structure their posts and to reflect on them:

> When writing I am having more time, more control on the grammar and on structures and the way I'm expressing my ideas and opinions rather than speaking. (Fahimah.

> Writing' rather than 'speaking' in online discussions affects my critical thinking process and answers; I have time to draft, think, rethink, edit, read aloud, read other people's posts and make sure I'm on the right track, explore other viewpoints I hadn't considered before adding my own post, perhaps even

change my line of thinking after considering other posts. The online mode particularly for the subject where I'm not so 'up with technology' is effective in that it allows room for the nurturing of critical thinking at the learner's own pace. If I were attending the subject in class I'm not sure I would be pushed to develop the same set of skills. (Nancy)

Hindrances

Since most students worked either part-time or full-time while studying or had workloads for other subjects, they admitted that they could not dedicate enough time to read and respond to others' posts and/ or to reflect more on their own postings:

> I'm working and also studying part-time so then it's quite difficult to find times to involve actively in the discussion board. That's the main problem actually, because at the end of the day after working hours we're very tired. Yes, I think that's the main problem. (Maznan)

> I want to give more time for the online post but I know that I have other assignments, other readings to do that makes me restrict myself to certain amount of time and just do it individually rather than collaboratively. (Fahimah)

Danny, a fully online student, was quite frustrated with the ADF due to lack of student-to-student interaction. Among the reasons he gave for why he thought there was no interaction among students (e.g. narrow questions, assessment criteria for the online postings, and lack of time due to working full-time), he mentioned that the delay in responses limited interaction among students:

> Given that we're placed all over the world, the delay in response times doesn't help [with student to student interaction. (Danny)

When there is little interaction and discussion among students, it is predictable not to find instances of co-construction of knowledge and collaborative critical thinking among students. This was in fact the case; through the content analysis of online postings we found few indicators of critical thinking in a collaborative/ dialogic fashion.[17]

Another factor expressed by one of the participants as a hindrance to online interaction was the time and effort needed to write her comments online. She felt that presenting her comments in the face-to-face classroom would be more spontaneous and interactive:

> In the ADF] you need to be more concise I think. You need to have your ideas sorted before writing. In class, you can start saying something, have a pause, someone else can add something. You can work on ideas together or at least start thinking about new ideas together. (Grace)

> [The hesitation to post is because] of the time needed to think about my view, how to phrase it. (Grace)

As evident in students' responses, time plays an important role in the quality (e.g. structure and content of postings) and the quantity of online interactions (e.g. number of postings and responses to others). Most students appreciated time affordances of the ADF. However, for some students delay in responses, the time spent on the online postings and on writing their comments became problems for collaboration and hence collaborative critical thinking.

[17] Due to space limitations, in this paper we do not report on the results of the analysis of online postings. The authors are planning to write a paper focusing on the indicators of collaborative critical thinking in ADFs.

Display presentation

Thread layout and appearance of ADFs may serve as demotivators for online discussion and interaction.

Hindrances

When we asked the students what they thought were some of the ways that the ADF could be improved, some students said that they would have been more comfortable if they had remained anonymous online:

> If there's nickname [in the ADF], we can see nickname or, for example the other students did not know that it is my response, just for example I can write Melbourne not my name Kalid. Just Melbourne or Sydney or just any nickname, I would felt more relaxed. (Kalid)

Another student found the presence of multiple threads decreasing the chance of interaction among students:

> [ADFs are] sometimes individualistic and sometimes looks like very collaborative once we get more people get involved with the one thread rather than making a new thread. (Maznan)

As it is clear in this excerpt, Maznan felt that much discussion occurred when comments were in one thread than in multiple threads. This was in fact the case; In week 9, when Alex, the subject coordinator, asked the students to stick to one thread and to respond to others' comments, students not only posted more (the average weekly postings increased from 18.33 to 26.66) but also responded more to each other's comments.

When participants were asked what factors affected their postings on the ADF, some of them such as Hung, mentioned the unengaging design of the online discussions:

> I guess that the discussion board is not very inspiring; I mean the layout or the design. It's not really friendly. (Hung)

This is an important issue to consider. Students use myriads of online software for communication and networking that in order to keep them attracted to the online tools used in higher education, IT and course designers need to adapt and use latest software that resembles the online communication tools students use outside the classroom.

Skill development

ADFs have the potential to help learners develop skills of writing, comprehension, and critical thinking.

Affordances

One of the interview questions was: What were some of the functions of the ADF for you? In response, many students mentioned that posting on the online discussion board 1) made them understand the weekly topics of the face-to-face classroom better, 2) helped them improve their writing, and 3) led them to develop their critical thinking:

1. Better understanding of topics

> I find that [the ADF] helps me get my head around some of the concepts discussed in the readings especially when everyone has experience teaching and different experiences using technology. I think it also makes me take more notice of the reading rather than just reading them because we have to. (Grace)

2. ADF improves writing

> Each time I post I learn something, and not to mention the language, I practice the language when writing the post [...] in the beginning I had to be careful and check everything before I post but then it turned out

to be interesting to monitor my language whenever I try to write so it makes me more careful to my writing. (Fahimah)

3. ADF Develops critical thinking

Before I post something into the discussion board I have a question of particular issue and then from there I'll read of course. I'll read the literature and then analyse it myself and then when you come to the discussion board there you have other's opinions and then you're gaining knowledge as well from them and you start to synthesize your own opinions from the literature from the question as well with the opinions from the other members of the discussion board. (Sinta)

The last excerpt shows that Sinta would employ critical thinking skills of questioning, analyzing and synthesizing, as outlined by Gunawardena, Lowe, and Anderson (1997), before, while and after posting on the ADF.

Students' responses in this regard confirm research by Kol & Schcolnik (2008); Haavind (2006); and Land, et al. (2007), where ADFs were expressed by students to afford them time for reflection, more attention and focused analysis of the learning content.

Hindrances

Lack of familiarity with the ADF, computer skills and slow typing negatively affected some participants' expression of thoughts and critical thinking in the ADF, such as for Hung:

> I'm not very good at technology skills and computer skills and stuff. I'm not really comfortable with opening a discussion board, typing in. Sometimes I just find it kind of stopping me from thinking when I'm typing so sometimes I even have to get back to writing [on paper]. Typing takes more time so maybe when you are thinking and you are typing, the speed of typing cannot catch up with what you are thinking. (Hung)

Participants' perspectives on affordances and hindrances of the ADF indicate that apart from factors such as educational and cultural background, online task designs, and how the curriculum is designed, technology can affect the extent of interaction, collaborative discussion, and critical thinking. Table 3 below summarizes the affordances and hindrances of ADFs as emerged from the interviews.

Table 3: Affordances & hindrances of ADFs

Themes	Affordances	Hindrances
Display presentation		Non-anonymity of ADF Large number of threads Unengaging ADF layout
Virtual Presence	Extra opportunity to share ideas Way to avoid f2f interaction Point of contact with other students Semi-publicness of ADF	Lack of physical contact for online students Misunderstandings due to written mode Publicness of ADF & concern for criticism
Skills	Better understanding of topics ADF improves writing ADF Develops critical thinking	Lack of familiarity with ADF Typing
Timing	Flexibility of time and space in ADF Time to structure your post Time for reflection	Delay in responses Time to dedicate to the ADF Time & effort for writing

Theory development

Computer-meditated online learning tools in general and ADFs in particular with their potentiality to provide a platform for co-construction of knowledge are proposed to support a number of theories such as Vygotsky's (1978) socio-cultural theory, social-constructivism, and Moore's (1993) theory of transactional distance (Anderson, 2008; McBrien, et al., 2009; Moore, 1993). According to socio-cultural theory and social constructivism, cognitive development takes place first on the social level and is then internalized on the individual level (Vygotsky, 1978). Extending this notion to learning, based on these theories, learning is a social activity and learners make meaning through dialogue. According to the theory of transactional distance, three main elements in online learning contexts are dialogue, structure, and learner autonomy (Moore, 1993). The main overlapping key concept among these theories is the concept of *dialogue*. Creating dialogue in the form of learner-instructor, learner-learner, and learner-content interaction is of utmost importance in online learning contexts such as ADFs (Anderson, 2008; McBrien, et al., 2009; Rovai, 2007). However, based on previous research, it appears that dialogue in the form of learner-learner interaction is less common online, and if learner-learner interaction is happening, it is less likely to be in the form of an interaction which moves beyond the exchange of information to a more reflective and in-depth discussion (Lee & Tsai, 2011; Leng, et al., 2009; Marttunen & Laurinen, 2009; McLoughlin & Mynard, 2009). Having examined the results, we also found that learner-learner interaction, in which students would engage in co-construction of knowledge and collaborative critical discussion, did not happen in the online discussions.

As mentioned before, many online learning researchers have celebrated the potentiality of online learning tools for creating an interactive and collaborative learning context. However, according to the responses of participants in our study, we found that there are a number of factors such as those related to technology, ESL, task, and curriculum which compete with notions of social nature of learning. In our study, we highlighted the role of technology-related factors, among others. We realized that ADFs can work both as an affordance and hindrance for collaboration and critical thinking. In this regard, for instance, Reeves, et al. (2004) highlighted the deficiency in commercial course management systems that are commonly used in higher education. Alongside other scholars, such as So and Bonk (2010) and Vonderwell (2003), they found that such systems tend to be used as replication of traditional face-to-face classrooms. They suggested that instructional designers in higher education need to see collaborative online learning tools as *a complement* to the traditional classroom rather than as a replacement to it.

Lee and Tsai (2011) have highlighted that collaboration takes place through a variety of influences. That is, for each learning context which involves collaboration, there arises a local perception and application of collaborative task or what it means to be collaborative; accordingly, different contexts give rise to different collaborative activity. In the same vein, Anderson (2008) has highlighted the drawback of prescriptive theories of online learning which try to prescribe how interaction and learning should take place. Alongside Anderson, we believe that the most appropriate theory of online learning is a descriptive one; a theory which embraces particularities and limitations of an online learning context and accommodates for them accordingly.

Conclusion

In line with other studies, we found that text-based online learning tools provide a number of affordances when integrated into the face-to-face classroom. Some of the affordances are opportunities to express and share ideas, time for reflection, better understanding of in-class topics, and developing critical thinking. Nonetheless, further research must present a more realistic account of the hindrances of ADFs, some of which were expressed by the participants in this study; such as the fact that ADF required a lot of time which students could not dedicate, did not permit anonymous postings, and that there was a delay in responses. While further research is needed to investigate the roles played by factors related to ESL, task, and curriculum in developing collaboration and critical thinking in online discussions, this paper suggests that technology be further problematized; that is, rather than a silent assistant, ADFs in and of themselves require greater attention in their role in shaping online discourse.

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Achieving meaningful online learning through effective formative assessment

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An online course was studied to investigate how integration of formative assessment enhanced the course design to facilitate learner engagement with meaningful learning experiences within the context of ICT–related professional development for teachers. The study employed case study methodology. Participants included postgraduate students enrolled in an ICT-related online course and the course teacher within a New Zealand university. Based on the findings, integrating ongoing authentic assessment activities within teaching and learning processes engaged the students actively, and provided opportunities for ongoing monitoring and assessment. These in turn, elicited appropriate formative feedback to support and scaffold learning. These formative processes also fostered development of an effective online learning community. The interplay between formative processes and an interactive learning community sustainably fostered learners' engagement with critical learning experiences including active, interactive, contextual, collaborative, reflective, multidimensional perspectives, and self-regulated aspects of meaningful learning, which ultimately supported development of robust and transferable knowledge.

Keywords: Online learning, formative assessment, effective pedagogical strategy, meaningful engagement

Introduction

The concept of formative assessment is underpinned by three defining processes: "establishing where the learners are in their learning [in relation to the expected learning outcomes]; establishing where they are going; and establishing what needs to be done to get them there" (Black & Wiliam, 2009, p. 7). Convergence of formative assessment with the affordances of web-based technologies leads to the concept of online formative assessment. Effective integration of online formative assessment has the potential to facilitate and sustain meaningful interactions among learners and the teacher, and in turn foster development of effective learning communities to support meaningful learning and its assessment (Sorensen & Takle, 2005). Moreover, this can provide a systematic structure for effective support and learning scaffold through ongoing monitoring of learning and provision of adequate formative feedback. Ongoing learner support has been identified as a critical requirement for effective online learning, and can be essentially facilitated through sustained interactive collaboration among the teacher, peers and the individual learner (Ludwig-Hardman & Dunclap, 2003). In effect, this supports learners to engage productively, and stimulates self-regulation, which in turn supports learners to assume primary responsibility for their learning, an important requirement for success in online learning.

However, a recent review of literature in this field barely revealed any study that has holistically exemplified integration of online formative assessment, especially from the perspectives of supporting meaningful learning within the context of ICT-related professional development for teachers. This study aimed to fill that gap with a focus on how formative assessment supported online learners in developing transferable learning in an ICT in education course for teachers (among other educational professionals). The study also aimed to elucidate the critical factors that influenced its successful implementation.

Methodology

The study employed case study method to facilitate an in-depth investigation into the design and implementation of online formative assessment to establish its effectiveness in relation to enhancing learners' engagement. The study context was the online learning setting of a New Zealand University within a postgraduate program in education. The participants included the students enrolled in an ICT in education online course and the teacher who was also the course designer. The study was framed within authentic learning theoretical perspectives (Barab, Squire, & Dueber, 2000). The data collection techniques included online observations, analysis of the archived course discourse, and semi-structured interviews. The data from multiple sources was analyzed using inductive and deductive analytical techniques, which were subsequently triangulated to corroborate the evidence.

The study findings and their implications

Online formative assessment was exemplified through various elements in this online course. These included a variety of ongoing and authentic assessment activities, adequately defined learning goals and expected outcomes, and opportunities for ongoing monitoring, assessment and formative feedback. These enhanced learners' engagement with critical learning processes including active, interactive, contextual, collaborative, reflective, multiple perspectives, and self regulated aspects of learning. These aspects are critical to supporting meaningful learning as identified in a recent review of literature by Gikandi, Morrow and Davis (2011).

The current findings showed that integrating open-ended and flexible assessment activities that were relevant to real-world applications created a contextualized learning environment that facilitated learner autonomy and active cognitive engagement. This engaged students in meaningful ways, which confirms the findings by Gikandi et al. (2011). The teacher role as an expert facilitator was evident in the course through fostering shared purpose and understanding, scaffolding learning, detecting misconceptions and providing formative feedback. However, one particular student who was a unique case experienced extreme challenges within this authentic learning environment. This was particularly due to his learning style that did not fit well in online settings and was not flexible enough to adapt it fittingly despite the teacher's support and encouragement, and he voluntarily withdraw from the course towards the end. This confirms the findings of Gikandi et al. (2011) that identified learner's commitment as an important ingredient in achieving effective formative assessment in online learning.

The course design revealed a collaborative learning pedagogical approach that was facilitated through asynchronous threaded discussions. This fostered dynamic interactivity, co-construction of knowledge through multiple viewpoints, peer formative feedback, and promoted shared understanding of expected outcomes as the indidividaul students engaged with the assessment activities. This is consistent with findings of Vonderwell et al. (2007), and Sorensen and Takle (2005) that online formative assessment can foster opportunities for collaborative learning and assessment. Through these formative processes within the asynchronous discussion forums, the students were also able to share their ongoing work and/or ideas with peers and recieve critical feedback that supported them to improve their work and close their performance gaps.

Another key finding is how opportunities for ongoing monitoring and assessment were enhanced through ongoing documentation (archiving) and sharing (by being public to all participants) of learning and assessment processes and products. This also served an important purpose in informing formative feedback processes and serving as exemplars. The ongoing sharing of processes and products including publicity of learning needs and the received feedback also enhanced effectiveness and efficiency of feedback because the students benefited from their peers' feedback both cognitively and affectively. Effective formative feedback was critical to the effectiveness of formative assessment in this asynchronous setting particularly in relation to its immediacy, adequacy and interactivity. Feedback was timely and characterized by clues and probes as opposed to direct solutions. As a result, feedback was not an end in itself but an iterative and dialogic process that promoted reflective thinking and self regulatory strategies among the students, which in turn fostered deep inquiry. More importantly, the adequacy and interactivity of feedback was enhanced by the uniqueness of the online setting (as compared to face-to-face settings) in relation to offering the participants opportunities for revisiting previous postings (contributions by self and/or others within the online discourse). This greatly enriched formative feedback processes in two important ways: firstly, it facilitated internal feedback (self reflection or interaction with self) as the students had sufficient opportunities to review the feedback they received (the responses from others) and revisit other related previous postings. Secondly, the students had ample time to review and rethink upon previous contributions before they composed their responses as feedback to peers.

The findings also reveal that effective integration of online formative assessment promoted students' engagement in self-monitoring and assessment, reflectivity and self-regulatory processes. The students progressively developed mutual responsibility and recognized themselves as source of learning support for their peers. This lead to development of a supportive learning community within this online course which reciprocally nurtured the formative processes. Through these aspects, it is evident that the teacher and students' roles were reconstructed because teacher and students alike assumed new roles as facilitators and co-participants. Notably, the role that the teacher played in fostering shared understanding of purpose and responsibility cannot be underestimated; in effect, it required the teacher to be vigilant and open-minded in order to effectively facilitate the online discourse and ensure the efficacy of the shared role within formative processes and responsively manage the emerging issues.

To this end, it is clearly evident that framing online formative assessment within authentic learning perspectives offered an effective learning environment by creating an authentic environment that fostered learner engagement with meaningful learning experiences. This implies that online educators can exploit the potential of online formative assessment to develop learner and assessment-centered environments that focus on enhancing learning experiences as opposed to teacher-centered environments where the teacher is the expert and learners assume a passive role. Online formative assessment can offer a means to create effective environments where learners are actively engaged with valuable experiences and take primary responsibility for their learning, which is critical for successful online learning. These experiences inevitably supported development of robust knowledge, and enhanced learners' ability to effectively transfer ICT knowledge and skills in their own professional practice.

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A community approach to the development of widgets to support personalised learning for disabled students.

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The rapid pace of change of the knowledge intensive era, supported by the emergence of Web2.0 and the consequential growth of personalised applications, has fuelled debate on the notion of Personal Learning Environments (PLEs). The concept of personalisation, adaptability and accessibility is particularly pertinent in terms of creating a learning environment that meets the individual needs of disabled learners that cannot be met by standard approaches and could affect the student's ability to access learning at all. This has led us to explore the potential of the personalised development of learning applications to provide the choice of tools, applications or services to support the learning experience of disabled students. This paper examines a community approach to the design, development and evaluation of open source widgets, through a project funded as part of the JISC Distributed Learning Environments initiative: Widgets for Inclusive Distributed Environments (WIDE).

Keywords: accessibility, widgets, community of practice, personal learning environments

Introduction

Developments in Web 2.0 and cloud computing bring new opportunities for selecting and using tools to support communication, self organisation, independence and self regulation. The global learning landscape of the twenty-first century is being transformed and shaped by the uptake of digital communication tools and ubiquitous networked applications, along with the changing characteristics, needs and demands of students (McLoughlin & Lee, 2009). This transformation is supported by the convergence of three trends: the growing number of Internet-capable mobile devices, increasing flexible web content and continued development of the networks that support connectivity (EDUCAUSE Horizon Report, 2011). At the same time, the rigidity of established learning management systems (LMS) is being challenged by the potential to connect and mash up different web based applications and the considerable growth in the widgets/mobile applications market. The concept of a mash up Personal Learning Environment that allows the learner to select and configure their own set of applications is receiving considerable attention. This is particularly pertinent in terms of meeting the needs of disabled learners who may have very individual needs that may render standard interfaces and environments inaccessible and affect the students' ability to access learning.

A recent survey on the e-learning experiences of disabled students in HE (Seale et al., 2010) has highlighted an 'all or nothing' approach to assistive tools, in which you either have the technology or not. Students who use proprietary access technology have little or no way to adapt it or select individual components to suit their own needs. Free or open source software offers the opportunity for disabled users to take control of their own computing, to select software fit their needs rather than passively accepting whatever developers choose to offer them. Focusing on enhancing the e-learning experience of disabled learners, this study explores the design and development of small discrete applications and tools that support the, sometimes, very specific requirements of learners, in an attempt to move closer to the goal of inclusive, accessible and personalised learning.

Widgets for Inclusive Distributed Environments (WIDE), a project funded as part of the UK JISC Distributed Learning Environments initiative, explored the potential of widgets as a component of a mash up personalised learning. It begins by discussing the potential of widgets in enhancing the learning experience of disabled students by offering support in terms of personalised assistive technology tools and learning aids. The paper continues with an overview of participatory approaches in e-learning and then goes on to describe a mixed methodology for the design of widgets to support disabled learners that draws on principles from participatory design and agile development methodologies. Each phase of the study is presented and discussed in terms of the participants' involvement. The findings of a preliminary evaluation of the widgets developed as a result of the project is presented and the paper concludes with a discussion of further work required to support the wider creation and adoption of widgets to support disabled learners.

Background Research

Advances in technology supported by the emergence of Web2.0 and consequential growth of personalised applications, has fuelled debate on the notion of Personal Learning Environments (PLEs). This means that software applications need no longer be monolithic and can naturally be separated into distributed components (Raman, 2008). The application logic and the data resides in the network cloud, while the presentation and interaction can be presented to the user in a form suited to the user's needs. The concept of a Mash-up PLE is to provide an open set of learning tools for the users to gather as they see fit in order to build his own environment rather than offering a monolithic platform which can be personalisable or customisable by users (Wild et al., 2008). The third model of the JISC CETIS models of Distributed Learning Environments (DLE) (MacNeil, S. & Kraan, W. 2010) illustrates an example of how a mash-up of a variety of sources can provide personalisation through the use of different services gathered within a Virtual Learning Environment (VLE).

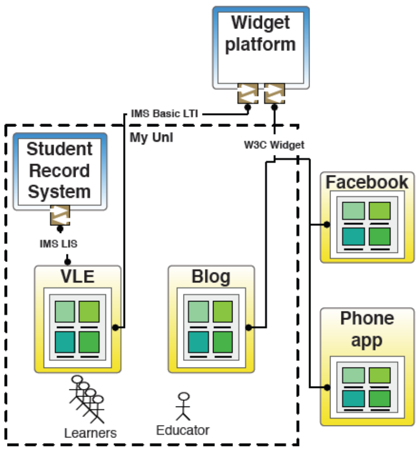

Figure 1. JISC CETIS model of distributed learning environments (Model 1)

The diagram (Figure 1) illustrates one possible instantiation where a single hosting service 'in the cloud' serves a collection of educationally useful, standardised widgets to a VLE, a blog, a social network and a smartphone app. A collection of services is gathered in one place and from there broadcast to a range of platforms.In terms of this project, we have identified the need for an additional platform that, in a Community of Practice development approach, might exist parallel to the Widget Platform. Widgets –especially those created to meet the specific needs of disabled students who may require particular adaptations – are dynamic and not necessarily static in content or structure.

This concept of distributed learning environments, led to new ideas in the e-learning community to promote adaptability and personalisation of virtual learning environments especially for adaptation to specific needs and preferences. The experience of using a set of widgets in a learning environment supports the concept of mash-up PLEs in that it allows students to use applications or tools as they see fit. A mashup of different widgets can serve as front-end applications for distributed learning aids and services in a mash up based personal learning environment (Taraghi et al., 2009). The way widgets are conceived promotes the granularity of web applications, which in terms of e-learning means a more adaptable, flexible learning environment.

Widgets represent discrete tools, applications, assistive technology or other learning supports to perform specific functions. In the context of the research reported here, a widget is considered as a discrete, self-contained application that works across a range of browsers or platforms (Pearson et al., 2011). The widgets, applications and gadgets (WAGs)market has had considerable growth over the past several years, as we turn to mobile applications for immediate access to many resources and tasks that once were performed on desktop computers.. In education, though, the opportunities for choosing and using such software are limited. A quick search of the Opera widget site (http://widgets.opera.com/category/) and Google gadget site reveals no specific category for education or for accessibility. (http://www.google.com/ig/directory?synd=open). These emerging technologies provide an opportunity for the creation of small, bespoke widgets that perform specific functions and act as assistive technology and learning aids to support learners with disabilities. In terms of widgets to support disabled learners, examples include widgets that support learners with motor difficulties in completing web forms, widgets for creating high contrast view/themes or activating voice recognition for students with vision impairments, or symbols-based calendars for students with learning disabilities or cognitive disabilities that are non-text users.

Nevertheless we acknowledge the danger of systems designed specifically to support disabled learners is that they can be costly, and may be limited in their potential for sharing and re-use. Secondly the expertise and best practice of local practitioners producing specific solutions is difficult to identify and adopt by the wider community (Sampson & Zervas, 2010). For this reason, the aim of this research is to make widgets that meet specific needs, but at the same time could be easily adapted to suit other specific needs as WAGS are often proprietary and application specific. The intention is not to provide a wholesale solution, but rather to support the use and development of widgets individually, or in collections of other widgets and learning resources.

Widgets for Inclusive Distributed Environments (WIDE) Project

This research integrates participatory design and agile development approaches through a project funded as part of the JISC Distributed Learning Environments initiative: Widgets for Inclusive Distributed Environments (WIDE). WIDE is a joint project that comprises accessibility experts, academics, researchers, teachers, tutors and other practitioners from the Higher, Further and Specialist College education sectors. The project aims to develop resources that extend the functionality and flexibility of virtual learning environments to meet the needs of learners with disabilities who may require their learning resources to be adapted to meet their specific needs (MacNeil & Kraan, 2010) and contributes to the vision of an adaptable and personalised learning environment (Pearson & Gkatzidou, 2010). The study adopted a participatory approach in that it enabled researchers and technologists (WIDE team) to work together with disabled students and practitioners (in teaching or support roles), to identify a student need, and to explore the potential issues and impacts of potential solutions to that need. The ideas were then translated into a design document, which represents a learning design for a widget that will best support the student. The WIDE development team then adopted an agile development approach to produce iterative prototypes of the widgets in close cooperation with the designers to produce a bank of high quality widgets that can be plugged in to a range of learning environments, developed by and for those responsible for supporting disabled students in further and higher education and in specialist colleges.

THE WIDE Methodology

The WIDE project adopts a mixed methodology that draws on principles from participatory design and HCI under the umbrella of agile development. This methodology responds directly to the call for methods that empower learners to be the ones who highlight the issues which are important to them (Sharpe et al., 2005). Participatory design can be defined as an approach to design that attempts to actively involve all stakeholders in the design process to help ensure that the product designed meets their needs and is usable. In the context of the WIDE project and in order to avoid the dangers and pitfalls of a technology-driven pedagogy (Salaberry, 2001), the community of practice involves disabled students, researchers, technical experts, teachers and specialist teachers.

Stakeholders	**Interest/Stake**
Disabled students	Creators and end users with specific needs.
Teachers of students with disabilities	Users of widgets. Established needs for flexible solutions to student support learning.
Researchers	Understand issues of e-learning development to support personalisation and accessibility.
Tutors/Carers	Understand needs of disabled learners.
Practitioners from HE, FE, Specialist Colleges	Need to understand how widgets can be used to provide flexibility to VLE.

Table 1. Stakeholders Table

Nevertheless, it's the use of participatory design together with agile development methodology that distinguishes the project from other studies that have researched the experiences of disabled learners, in that participation is conceptualised as involving them more than as research informants. Agile development is not a single, well-defined process, but a common name for several processes and methods, sharing a set of core ideas, values and principles of software development (Blomkvist, 2006). The core values and principles as defined in the Agile Manifesto (Agile Alliance 200) place less emphasis on the process and its deliverables, and focus instead on the people involved and their co-operation in order to produce results more quickly with reduced risk of failure or delays. The driving force behind the agile perspective is to shift the overall focus of software development to a more agile or lightweight perspective (Cockburn 2002). For this reason, agile methods provide a lightweight approach to development where requirements and solutions evolve through collaboration and through iteration. The nature of widgets lends itself to agile iterative methods (Leeder, 2009) as a basic functional widget prototype is straightforward to develop and deploy to users in a series of design iterations. Nevertheless, from an HCI perspective, agile processes do not inherently provide the required support for user-centred design, but can function as one pillar on the way to an integrated approach (Memmel et al., 2007).

With regards to the participation of the community of practice in the WIDE study, there were three key phases of participation:

- Phase One: Opportunity to contribute own experiences of e-learning and identify potential tools to support their learning.
- Phase Two: Opportunity to conceptualise and design the widgets to meet the identified needs.
- Phase Three: Opportunity to evaluate their 'own' and other widgets developed.

In the first phase of the study and in preparation for the workshop, the teacher participants were invited to identify with their students what they think would be the most useful means of support in terms of widgets. In the case of tutors working in specialist colleges with students who are not always able to articulate their needs, then the tutors would contribute their own ideas from direct experience of supporting their students. In the second phase of the study, the Community of Practice (CoP) was involved in producing learning designs to encapsulate their ideas for widget. In the third phase of the study, different stakeholders evaluate different aspects of the study; users evaluate the widgets they have designed, disabled students who have not been involved in the workshops evaluate the widgets and external consultants evaluate the process of setting up and supporting the community of practice. Each of these phases will be described in detail in the following sections.

WIDE Pre-Workshop participation (Phase 1)

Teachers and students discuss the problems and difficulties the students experience in using the VLE, organising their work, carrying out assessments or completing assignments. They identify the kinds of tools that would help them to achieve these tasks or support their learning. These discussions would be encapsulated later on in the Phase 2 workshops in the form of personas and scenarios, so that, although students may not be directly involved in that phase, their requirements are captured.

WIDE Widget Design Workshops (Phase 2)

During the second phase of the project, through a series of workshops and follow up activities, the participants were given the opportunity to identify appropriate learning designs (digital and non-digital) derived from practice that can be re-purposed as widgets. The WIDE workshops were run on three separate occasions at three different locations, at Teesside University, at a specialist FE college in Mansfield, and at the JISC TechDis in York). The workshops involved a total of 11 teams of four to six people (49 participants in total), with an average of 15 participants at each workshop. During the workshops, participants were divided into groups of five, where each group would include a disabled student, an academic/teacher, a researcher, a tutor/carer, and practitioner where possible in order to obtain detailed and highly contextualised learner voices. Each group was assigned to a developer and was facilitated by a member of the WIDE team, whose role would involve bringing together the diverse expertise of the participants and overcoming the common challenges of participatory design in terms of gaps in communication (Segalowitz et al., 2010) and alignment of expertise with the community (Nwigma, 2009). Wenger (1998) indicates that leadership and facilitation roles are crucial to all CoP and that should be filled by "recognised experts [who] need to be involved in some way, even if they don't do much of the work", and that their presence is needed to legitimise the community "as a place for sharing and creating knowledge".

The outline of the workshops included:

- Overview of open source and freeware accessibility software
- Introduction to creation and use of mobile prompts
- Widget design brainstorming in small groups (including design facilitators)
- Working collaboratively on poster templates to create designs in small groups
- Presentation and discussion of designs
- Widget development and evaluation plans

At the workshops, participants were introduced to examples of learning supports, briefed and prepared for the activities. The brainstorming session elicited a number of ideas (typically six or seven from a group of four) from which the groups then select one or two to develop full designs.

During the design process each group developed their initial ideas further with the aid of a set of specially adapted templates learning design and storyboard templates. For these we used A0-sized laminated posters (Figure 2 and 3) in order for the participants to organise their expert knowledge to produce a learning design that encapsulates the necessary information on the interface and functionality of the widget. These posters templates were designed to be user-friendly, requiring no technical expertise and therefore suitable for our participants and suggestive rather than prescriptive. They include some simple prompts and principles, from which ideas can be developed and knowledge can be captured and expressed.

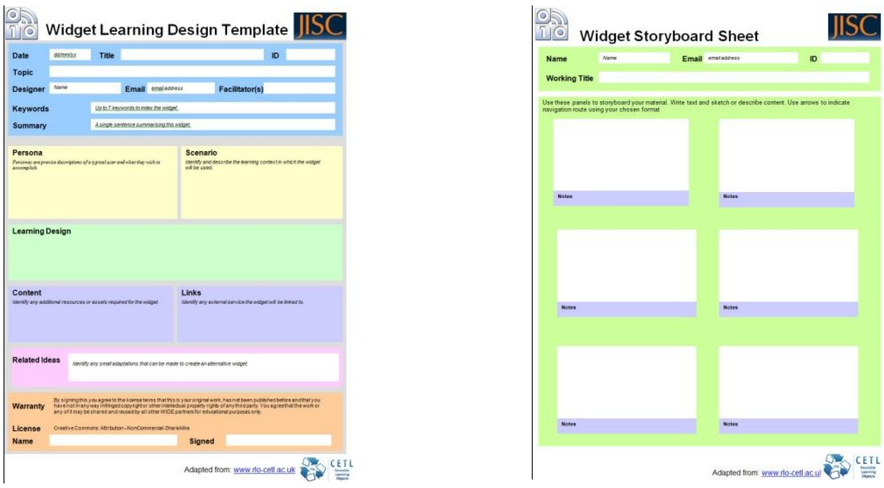

Figure 2 and 3. Widget Learning Design Template and Storyboard

The Widget Learning Design Template provides all the necessary information on the interface and functionality of the widget. It consists of a number of sections that the participants need to fill in to describe the widget in detail. Participants were required to complete the following sections on the template:

- *Persona*: a precise description of a typical user of the widget and identifies what the user needs to accomplish
- *Scenario:* identifies the learning context in which the widget would be used
- *Learning Design:* describes exactly what the widget will do and how it will operate
- *Content:* identifies any additional resources or assets that would be required for the widget For example a 'calendar widget will require the designer to provide a list of events
- *Links:* identifies any external service the widget might need to be linked to. For example a mobile widget using GPS
- *Related Ideas:* participants are encouraged to identify any small possible adaptations that can be made to create an alternative widget
- *Warranty:* a short statement signed by the designer to license the work under the Creative Commons License

The storyboard template allowed the participants to document and design the interface of the widget. In some cases, participants were required to provide information not only for the user interface of the widget but details on the design and functionality of the administrative side.

On completion, the learning designs were photographed, archived digitally, and made available on the WIDE wiki where the final widgets are available for download and distribution. This approach was adapted from the learning object design approach used by the Reusable Learning Objects-Centre of Excellence in Teaching Learning (Leeder, 2009). However many of the elements such as personas and scenarios are commonly used in user-centred design or user-experience design.

Widget Development

A total of 31 widget designs were produced during the WIDE workshops, which meant that each team produced more than one design. These designs include a wide range of widgets such as:

- Visual shopping list widget that provides symbol-based task list (Figure 4).
- Digital abacus, a learning aid widget to assist students with motor difficulties in their math calculations (Figure 5).
- Sentence jumbler widget that shuffles the words in a sentence requiring the user to put them in the right order.
- ‘I am here widget’, a widget that allows the user to report that they have arrived at a specific location.
- ‘Ruler’, is a simple widget that supports dyslexic students reading and tracking text.

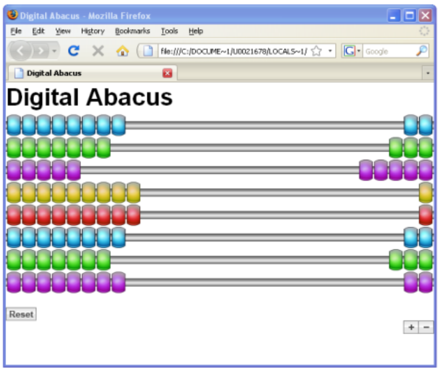

Figure 4. Visual Shopping List Widget **Figure 5. Digital Abacus Widget**

The widget designs were classified into three categories:

- Tools: self-contained widgets that might require access to a Web service but do not store or edit data.
- Applications: complex widgets that use Web services to store and retrieve persistent data.
- Learning Objects: independent self standing units of learning content.

The widgets were most commonly classified as tools (61%) with around a third (26%) being considered as applications and only a few were classified as learning objects (13%).The designs identified by the participants included a wide range of different types of widgets – all designed to meet particular needs - categorised as time management widgets (13%), task management widgets (16%), assistive technology widgets(16%), learning aids (16%), independence tools (19%), social network widgets (3%), content-free apps (3%) and learning objects (13.5%).

Following the design process, each of the widgets were classified in terms of a number of factors grouped into technical elements (such as whether they needed access to a database, web-services, operating system or GPS) display features (widget window, desktop, full-screen, movable, resizable, dockable etc) and application compatibility (such as to mobile device, browser or VLE). These features determined the development platform of the widget. As each widget was developed, a liaison from the WIDE development team contacted the designer to seek clarification or request additional content and invite feedback on the widget (design, interface, functionality etc). This ensured that the designer was aware that 'their' widget was being developed and that they were involved in the whole process.

The intention was to develop W3C standard, free, open source widgets that can run in any web browser, do not require installation and are platform independent. Apache Wookie (Incubating) is an application that provides a W3C-compliant widget server where you can deploy widgets and serve W3C widgets from the Wookie server in third party applications. Although the original intention was to develop Wookie (2010) widgets, in some instances this was not feasible, particularly if the widget required access to the desktop or local device.

As a result, three types of widgets were developed:

- Wookie widgets: standard W3C widget running from a Wookie web server.
- Opera widgets: standard W3C widget but benefitting from installation on a desktop or devices hosting the Opera web browser
- Mobile, desktop or windows app: designed primarily to install and run on a specific mobile phone or device, laptop or as a windows app and therefore usually not W3C-widget compliant

In practice, the majority of designs (23) were implemented as Wookie widgets, while some (8) required facilities that weren't available to the widgets standard APIs so needed to be Opera (6) only or Windows applications (2).

WIDE Evaluation (Phase 3)

In accordance with the principles of participatory design, the CoP was involved in every stage of the evaluation:

- Analysis and design stage: Accessibility experts and technical experts evaluate and advise on proposed designs.
- Implementation stage: Evaluation of prototype widgets by designers
- Deployment: Widgets evaluated in practice by designers (post project)
- External evaluation: an evaluation of the widgets developed, the design approach and the potential for adaptation is being carried out by accessibility experts external to the project.

A full evaluation of the widgets in use is necessarily a longitudinal process and is ongoing.

Evaluation at Analysis and Design Stage

Although the primary stakeholders of this study are the students, the teachers and supporters of students with disabilities and accessibility experts were also considered as stakeholders. For this reason, it was important to seek informal feedback on the workshops from the participants and partners at Portland and York. Some comments include:

> *'In terms of the workshops themselves, I thought that they were superb. It was great to have the morning to contextualise the aims and objectives and then the afternoon for the participants to be creative and work on specific (and therefore highly relevant) widgets'*

The workshop facilitator at Portland College gave this view of the experience:

> *'The dynamics of the three workshops were all very different, with pros and cons to each. The mix of the audience in York was superb, with ideas being adapted and changed from ISC to FE to HE and vice versa. In complement to this though, specific groups also formed on occasion to produce a level or user-specific app.'*

Feedback from staff at the specialist college also indicated that they enjoyed the control of being authors, especially when there was no need to have the technical expertise to worry about how to produce the widgets themselves.

Evaluation at Implementation Stage

A preliminary evaluation of the widgets has been carried out and initial results confirm that the designers are enthusiastic about their widgets, generally the learning designs have been translated successfully into widgets and they have met the expectations of the designers.

A total of 13 participants took part in the evaluation and evaluated the widgets they have designed. A selection of the feedback and suggestions for further development (some of which has already been implemented) is given below:

Touch Screen Timer widget:

> *'It's excellent! Well thought out. I like the digital display going red during the last 5 seconds'*

Visual Shopping List widget

> *'I like the idea of audio feed back on choice selection and selected items put into basket.'*

Digital Abacus widget:

> *'This is very impressive. Thank you for bringing my idea to creation. The widget works fine and is very close to how I imagined it to work. Could you make the background of the application transparent so the user can see the other 'open' window behind the abacus?'* (This was implemented).

Sentence Jumbler widget:

> *'First of all let me say that the Sentence jumbler is a really nice idea and I like how quickly it works - no waiting for too long. I think that if I was going to use this with a learner it would be useful to be able to generate more than one sentence at a time for the learner and click jumble and leave them to it for a few minutes'*
>
> *(Dyslexia Tutor)*

The widgets have been widely disseminated and we have already had a request for an adaptation to the Visual Shopping List widget:

> *'When I saw the Visual Shopping List in the JorumOpen listings I knew it was something I should show to the teachers. They like the widget very much and have asked me to try and find out if it can be adapted. Their particular idea is that the teacher would be able to type in weights and specify exact brands, where necessary, to allow the system to be used within*

cooking classes where students visit the catering store to collect their ingredients."

Evaluation at Deployment Stage

A preliminary evaluation of the widgets developed was also carried out, where selected widgets were evaluated by disabled students in practice. These students have not been involved in the workshops and they were give a list of widgets they could chose from to download and evaluate. The data collection method that was employed was a questionnaire that included both rating scale and open ended questions. The students were required to comment on the widgets' functionality, suggest how they would use them, and identify possible adaptations to their design, functionality or purpose. Overall, the feedback for the widgets was positive and the students identified a number of adaptations to the widgets. All of the students found the process of downloading the widget straightforward and easy and only one of the students had difficulties in understanding the purpose of widget.A selection from the comments from the open ended questions is given below:

Spell it widget:

> *'This is great for anyone with learning difficulties when it comes to spelling. As a dyslexic myself, this is a great tool. All you have to do is guess how to begin spelling the word and the widget does the rest for you!'*

Visual shopping list widget:

> *'The widget is quite simple to operate but I would have liked some kind of table with the items on to be generated after the done button is clicked'.*

One-Click timer widget:

> *'I expected a simple and easy to use widget with a basic but usable interface, but I was actually unable to get it working at the beginning. I would have liked the opting of adding multiple alarms'.*

The other student also commented on the interface of the widget:

> *'I would use this timer when working on small tasks –especially in a time critical environment. But I tried clicking and dragging the timer bar but instead it dragged the whole application and I would have liked a solid background to it so it won't conflict with my desktop'.*

External evaluation

In terms of the external evaluation, the intention was to receive feedback from accessibility experts external to the project on the validity of our overall process which is relevant in terms of the participatory method applied. For this reason, we engaged a number of accessibility experts to evaluate the overall process of the WIDE project, in terms of the wiki, widget learning design and implementation method and the widgets themselves. This evaluation covered an evaluation of a sample of three WIDE widgets, an evaluation of the process of developing a widget (from a non developer point of view and from a developer point of view) and an evaluation of the WIDE wiki as a means of supporting the participatory design process (WIDE Project Report, 2010).

In terms of the widgets, the evaluators found that the working versions of the widgets show significant potential in addressing accessibility issues, and matched the learning designs. Regarding the participatory process, the evaluators identified that the wiki-based approach adopted by WIDE offers a suitable basis for bringing together and supporting interested parties to design and develop widgets. Nevertheless they commented that it was limited to supporting the community of practice and the workshop participants, rather than the wider community.

CONCLUSIONS

Linked to the overarching aim of enhancing the e-learning experiences of disabled learners, the WIDE project aimed to apply user-centred methodologies to the design of accessible widgets and to disseminate these widely, in order to promote a participatory approach to designing and evaluating e-learning.

Web 2.0 technologies equip educators with a rich repertoire of services and applications to address this challenge by enabling learner choice and allowing creative decisions about how to best to set learning goals and create learning environments that support those goals. The findings of the WIDE case study demonstrate a need for personalised applications to enhance the learning experience of students with disabilities, they also recognise that although basic widgets are simple for those with some technical expertise to develop, the development of new widgets is likely to be beyond the means of most teachers or tutors. For this reason a set of authoring tools (incorporating libraries of templates, services and APIs and a repository) that would enable academics without technical skills to develop, modify, adapt and share widgets is required.Development of such a toolkit would require extension of the CoP to include developers, content providers, researchers and learning design experts as well as teachers, tutors and students. This represents a significant challenge but would provide a means for a much more extensive CoP to develop widgets tailored precisely to the needs of disabled students, and would make a considerable contribution to emerging models for supporting greater levels of personalisation and customisation of learning for all individuals.

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CHANGING DEMANDS, changing directions.
Wrest Point | Hobart Tasmania Australia | 4–7 December 2011

What's the big idea? Changing demands and effective use of technology – how do we capture and disseminate good ideas and how do we then facilitate effective change in learning and teaching practice?

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Abstract and Symposium Plan

The rate of new ideas and the multitude of pressures on time poor academics means we have to develop new ways of recognizing innovative ideas worth implementing and supporting, and to consider effective ways of building capacity which have real impact on student learning. This symposium will highlight and consider some approaches to determining the ideas that make a difference in a time of changing demands and changing directions, as well as offering ways of building academic capacity. Ideas and comments will be sought from the audience, and the group will determine the developing "big ideas" from the symposium and the conference more broadly.

This session aims to be interactive and audience led. In the style of ABC's Q and A, the panel members will provide comments and provocations, and then lead discussion facilitated by a chair. Audience members will be able to engage via their mobile devices; using OWL (Open Web Lecture), a new web-based student response system developed by QUT, which blends the physical space with a virtual learning environment to create a live collaborative experience. The format will be lively, provocative and responsive to emerging topics from the conference. The Chair and Panel will strive to create a blended learning environment by demonstrating an effective format and use of technology that engages the audience and stimulates thinking and discussion.

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Using log data to investigate the impact of (a)synchronous learning tools on LMS interaction

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This paper presents exploratory examination of LMS log data from ten undergraduate business courses that differ in terms of learning activity design. Data were derived from the Unit Statistics and User Activity functions on Blackboard versions 8 and 9.1, which report the number of student hits across the various LMS applications. The research identifies obstacles encountered when using log data. Findings suggest that the design of learning activities has substantial impact upon levels of student interaction with the LMS. Furthermore the greater the amount of asynchronous learning activities, versus synchronous ones, may generate increased student interaction not just with the interactive applications but with the LMS overall. This outcome is particularly relevant given the correlation between LMS interaction and student results reported in other studies. The research confirms the potential of log data to inform online teaching practice, highlights some of challenges involved and outlines avenues for future research.

Keywords: log data, LMS, synchronous, asynchronous, e-learning.

Introduction

The past five years have seen dramatic growth in online education in Australia, as well as the surrounding Asia Pacific (APAC) region. As illustration, Open Universities Australia (OUA) enrolments increased from 38,133 in 2005 to 130,976 in 2010 (OUA, 2011). Many other well known universities have also joined the e-learning bandwagon, delivering online and blended teaching not only in Australia but to other APAC countries as well. The international delivery mode frequently takes the form of collaborative ventures with locally based institutions such as Kaplan in Singapore.

With the growing use of learning management systems (LMS) in online education (Weaver, Spratt & Nair, 2008) an apparent correlation between level of LMS student interaction and the assessment grade achieved has been inferred by some researchers using log-in statistics (Beer et al., 2009; Macfadyen & Dawson, 2010). Log data provide an indicator of user interaction with the LMS and have the advantage of being non intrusive, readily available and free. However, the downsides include the time it takes to prepare the data into a format ready for appropriate analysis (Black et al., 2008), as well as the fact that log data never fully describe how users interact with the LMS, nor reveal insights into the users experience, both of which may influence the depth and quality of interaction with the learning site (Beer et al. 2008). Furthermore log data do not necessarily track frequency of reading / interacting with learning materials since some students, perhaps those with connection problems or those who prefer paper, may work with downloaded materials. While few institutions have used student access data obtained from the LMS system logs to inform decision making (Beer et al., 2009), the potential for extracting pedagogically meaningful data is becoming more widely recognised (Macfadyen & Dawson, 2010; Yang et al., 2010).

One potential avenue for log data research concerns the ongoing debate about the use of synchronous versus asynchronous approaches in online education (e.g., Cheung & Hew, 2010). Synchronous live online chats are structured by a moderator and may be text based discussion threads, as well as audio or video discussion using software such as Elluminate. Recordings of the live debate can be posted onto the LMS after the synchronous session to provide students unable to attend the opportunity to observe the interactions. Advantages of these live chats have been discussed widely (e.g., Luck & Whiteley-De Graaf, 2004). They are perhaps most popular since they provide instant responses and feedback between students and teachers.

Many researchers and educators view asynchronous online discussions as playing a crucial role in online learning. Asynchronous discussions are mainly text based. The key advantage over synchronous tools, is that they do not require a presence at a particular ‘time’ and ‘place’ and hence students may revisit this environment as often as they like at their own convenience. Kim and Shaw (2009) conclude that online discussion promotes collaborative problem solving and discovery-oriented activities. Another advantage is the ability to foster student-peer interaction (Rochester & Pradel, 2008). According to Lee (2005) use of discussion boards also helps students to learn to respect and appreciate the opinions of other participants. Birch and Volkov (2005) found that the use of discussion boards allowed students to achieve a range of cognitive and social learning outcomes, and to develop some important graduate skills.

Given the strengths of synchronous and asynchronous approaches supporters and detractors can be found for each; both among teaching staff and students. Some online educational researchers recommend utilising both delivery formats (e.g., Greenland & Ho, 2010; McDonald, 2006). This paper describes exploratory research examining LMS log data from business undergraduate units that employ varying degrees of synchronous and asynchronous learning activities. After presenting the methodology and results, the potential implications for pedagogy design, as well as LMS service providers are discussed.

Methodology

Data were derived from the Unit Statistics function on Blackboard 8 and the Summary of User Activity function on Blackboard 9.1, which report the number of user hits on the various LMS applications. Units examined in this exploratory research ran between 2009 and 2011. Those selected vary in terms of the degree of asynchronous and synchronous learning activities involved in weekly lesson activities. They are classified as being either synchronous (using text based live chat as the main learning activity), asynchronous (using text discussion threads as the main learning activity), or as combining a mixture of synchronous and asynchronous activities. To serve as a constant one unit was run in the three different learning activity modes across different study periods. For units using synchronous discussion recordings of the transcripts were posted to the LMS after each live chat session.

Challenges of using Blackboard log data

The log data downloaded from Blackboard enable the mean number of hits per student to be calculated for each of the selected units. While such data are fairly simplistic in nature a number of challenges were encountered in their retrieval and are outlined below:

With the Blackboard LMS, if user interaction and the number of hits are to be recorded, the track statistics option must be manually set for the various applications for each unit. While this was done for the units investigated in this paper, if a unit convenor does not do this when constructing the unit learning site, or simply forgets to set this option for just one of the applications, then the data are rendered unusable and cannot be compared against other units. Ideally an LMS should have tracking statistics enabled automatically for all applications; otherwise potentially valuable information is lost.

While log data remain available for the duration of the unit, the Blackboard LMS purges log entry data shortly after the unit is complete. Consequently if data are not downloaded immediately after the unit is finished then the information is lost.

Currently the unit statistics relating to interaction with the LMS are separate from the grade centre. If analysis of LMS student interaction against student performance is required then two separate data sets must be merged manually. This adds significantly to the time required and hinders investigation of this rich data resource.

Another limitation with the Blackboard log data reporting system is not being able to drill down into and separate the information. The user activity data include those for non student users such as tutors, administrative and IT staff, as well as students who enrolled but did not actually complete the unit. For this study the data therefore had to be manually cleaned or filtered in order to examine LMS activity specific to students who had completed each unit. While non student users can be deselected during the data download process, enrolled students who had not completed the unit had to be first identified by matching against the separate grade centre output and then manually deleted from the data file. This is time consuming, especially so for larger units with several hundred or more students.

The validity of Blackboard's log data is open to debate. Data presented in Table 1 in the results section are from Blackboard 8 only. With this version there are minor inconsistencies within the unit reports for the total number of hits recorded. Total hits vary depending upon which section of the unit statistics report is used. As illustration for unit F the total number of hits reported in the initial "Access / Application" section of the output is 21365. However a later section of the output report "Access / Day of Week" gives a total number of hits as 22488. For the Blackboard 8 unit statistics, examined in this research, variations of between 2% and 5% were observed in the total hits across all the units studied. Blackboard does insert the following caveat at the top of the unit statistics report "Due to the way statistics are collected, not all totals are consistent", but offers no further explanation. For the sake of consistency, in this research only the hits within the "Access / Application" section were examined for each unit. Nevertheless, any apparent inconsistencies in the statistics reporting function of Blackboard raises concern about the validity of using these LMS log data.

There are significant differences between Blackboard 8 and 9.1 and this year Swinburne University adopted the upgraded version, which offers greater functionality to users. This research had planned to include a greater number of courses using additional 2011 unit data. However, comparison of the output from the two Blackboard versions reveals that 9.1 reports a much higher levels of user interaction with the LMS. This is perhaps logical given its greater functionality and also explains the much greater time that it takes for the 9.1 LMS to perform the unit statistics analysis and produce the output; over 20 minutes for units with several hundred students. Given the apparent higher levels of LMS interaction we cannot yet make valid comparison between levels of unit use across the different versions Blackboard. However, this may be possible once data have been established across a larger number of units. A more significant reason for not reporting any Blackboard 9.1 log statistics in this paper is the much greater inconsistencies observed between the total number of hits reported in different sections of the user activity reports. As illustration across five 2011 Blackboard 9.1 units examined, the number of hits reported in the "Access / Application" varied by between 20% and 60% compared to the total hits in the "Access / Day of Week" section. While discrepancies of the order of a few percent may be more easily overlooked clearly differences of this magnitude cannot be. Furthermore, the unit activity reports from Blackboard 9.1 do not include the caveat regarding inconsistencies in the totals. At the time of writing feedback from Blackboard on this issue is still pending.

Results and discussion

Table 1 presents the log entry details for over 1200 students taking ten online business units. The average or mean number of hits per student has been calculated for different applications for each unit.

Online course or unit	Live chat main learning activity	Thread & live chat activities	Thread only learning activity	Total students	Total hits interactive application areas**	Mean hits interactive application areas**	Total hits all application areas	Mean hits all application areas
A - SP2	✓			53	2536	49	NA	NA
B	✓			15	751	50	2197	146
C	✓			31	803	26	4622	149
D	✓			19	1380	72	3705	195
A - SP3		✓		176	19988	114	32311	183
E		✓		77	11823	154	20195	262
F		✓		81	12547	154	21365	263
A - SP4			✓	85	17833	210	25589	301
G			✓	410	78016	190	193273	471
H			✓ *	343	161910	472	215377	628

* Assessment component linked to participation in thread discussions
** Collaboration & discussion board application hits combined for interactive application hits

Table 1: Log statistics for student hits by unit and learning activity delivery mode

The 'mean hits' columns in Table 1 suggest that the level of online unit interaction varies considerably depending on whether synchronous or asynchronous communication tools are used. Indeed the frequency of student visits to learning sites is much higher for asynchronous than synchronous tutorial discussion. This higher frequency of hits is also evident across most areas of the learning sites, and not just those in threaded discussions. As a constant, unit A was run using each of the three different learning activity modes across different study periods. This is perhaps therefore the strongest indicator that the (a)synchronicity of a unit's learning activities determines the level of student LMS interaction. Intuitively this outcome makes sense in that students would use asynchronous activities more often since this is a major affordance of this approach. Furthermore when students enter the LMS to check development in the thread discussions they are also likely to visit other applications.

Conclusion

While the total number of students studying the units examined in this exploratory research is large, the sample of different courses involved is narrow. Nevertheless, the log data analysis supports the hypothesis that course activity design in the virtual learning environment has a strong influence on how students interact with the learning management system. Furthermore, it appears that units with more asynchronous learning activities may correspond with greater levels of interaction. This increased access appears to occur not only with the interactive areas of the LMS but across all application areas. Given that others studies confirm links between level of LMS interaction and results, this finding could have important implications for teaching practitioners wishing to design courses that encourage maximum student interaction with the LMS, and thereby contributes to the ongoing debate on online education surrounding synchronous versus asynchronous delivery.

This study is specific to one LMS, but underlines the potential for, as well as some of the challenges of, using Blackboard log data to inform teaching practice. The study may therefore assist e-learning teachers, as well as LMS service providers in terms of prioritising the development of more effective log data reporting capabilities. Further research involving a larger sample of units, as well as using other LMS platforms such as Moodle, might seek to confirm or otherwise the tentative findings and patterns discussed in this exploratory study.

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How are Australian higher education institutions contributing to change through innovative teaching and learning in virtual worlds?

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Over the past decade, teaching and learning in virtual worlds has been at the forefront of many higher education institutions around the world. The DEHub Virtual Worlds Working Group (VWWG) consisting of Australian and New Zealand higher education academics was formed in 2009. These educators are investigating the role that virtual worlds play in the future of education and actively changing the direction of their own teaching practice and curricula. 47 academics reporting on 28 Australian higher education institutions present an overview of how they have changed directions through the effective use of virtual worlds for diverse teaching and learning activities such as business scenarios and virtual excursions, role-play simulations, experimentation and language development. The case studies offer insights into the ways in which institutions are continuing to change directions in their teaching to meet changing demands for innovative teaching, learning and research in virtual worlds. This paper highlights the ways in which the authors are using virtual worlds to create opportunities for rich, immersive and authentic activities that would be difficult or not possible to achieve through more traditional approaches.

Keywords: virtual worlds, VWs, Second Life, OpenSim, engagement, VWWG

Introduction and Background

The use of virtual worlds (VWs) for teaching and learning in higher education has gained increasing popularity over the last several years. As Salmon (2009) observes, it is not surprising that some early adopters of virtual world (VW) technology initially used these environments as replications of activities that could perhaps more easily and appropriately be undertaken using traditional teaching and learning technologies. However, VWs have the potential to extend traditional web based online curricula by providing an online space in which students, represented by their avatars, can learn, create, explore, gather information and collaborate in a safe environment that supports experiential learning activities (Wood, teaching and learning). These environments are increasingly being used for a range of activities including presentations, discussions, role-plays, simulations, historical re-enactments, laboratory experiments, games design, creative arts, machinima, virtual tours and career planning. Levine (2010, online) supports this view, noting findings that investigate how educators view VWs today, ‘Contrary to statements that virtual worlds are passé … among educators, interest continues to be strong or growing’.

In 2010, 21 members of the Virtual Worlds Working Group (VWWG) contributed to an ASCILITE paper titled ‘Australian higher education institutions transforming the future of teaching and learning through 3D virtual worlds’ (Gregory et al., 2010) in which they provided a snapshot of the ways in which they were using VWs to transform their teaching for an unknown future. Since that time there have been several important drivers that have influenced the ways in which institutions are responding to changes in the wider policy environment. The first of these drivers relates to the need for institutions to increase their capacity to offer flexible learning environments to meet the needs of an increasingly diverse student population in response to the Australian Government's widening participation agenda (Gillard, 2009). The second major driver arises from the opportunities afforded by the Australian Government's digital economy strategy, which seeks to ensure that by 2020 universities and higher education institutions will have the high speed connectivity and facilities to offer students and learners who cannot access courses via traditional means, the opportunity for online virtual learning (Australian Government, Department of Broadband, Communications and the Digital Economy, 2011). This paper provides an update on the ways in which Australian educators who are members of the VWWG are using VWs to contribute to the changes required to respond to these policy drivers through the innovative use of VWs to provide more flexible learning environments for an increasingly diverse student population. The contributions by the 47 authors of this paper reporting on 28 Australian higher education institutions provide further evidence that supports Levine's (2010) observation that the use of VWs in teaching and learning in higher education continues to increase in number and in scope.

Australian higher education institutions working with virtual worlds

The VWWG was constituted in November 2009 with 12 members from the institutions forming the DEHub research consortium: University of New England, Charles Sturt University, Central Queensland University, University of Southern Queensland and later in 2010, Massey University. In 2010 membership was expanded to all Australian higher education institutions and by mid 2010 the numbers had grown to 24. Due to growing interest, in late 2010, New Zealand educators were invited to join. The numbers currently stand at over 170 members from Australian and New Zealand higher education institutions (HEIs). The members of VWWG come from many different disciplines, specialties and expertise and use a variety of VW platforms. Second Life (SL) remains the most popular platform although the numbers using SL started to decline after the discontinuation of educational discounts to SL customers (Nelson, 2010). The work of the VWWG encompasses a variety of areas. Group members collaborate on research projects, papers, in-house seminars, presentations and also work with students across institutions. The VWWG epitomises what many higher education institutions are striving to achieve, collaboration that permits students to receive their education from the 'experts' in the field. Australian institutions represented here provide an overview of how they are using VWs for teaching, learning and research and changes that have occurred over the past 12 months since this snapshot was last reported.

Methods
A call was sent out to Australian members of the VWWG to contribute to the paper. Authors were provided with the proposed Abstract as to complete a survey, using Qualtrics, to provide consistency and gain insight into the way the authors, whose case studies are reported in the subsequent sections, are using VWs. The 47 authors represented in this paper responded to the call for submissions and this is their story. Analysis was undertaken by examining the type of virtual world each institution used, how long each institution had been using virtual worlds, the disciplines that were using virtual worlds, the number of students at each institution using virtual worlds and queries in relation to challenges and successes in using a virtual world in their teaching and learning. Themes from responses were identified and collated and are discussed in the Analysis and Discussion section.

Of the 28 VWWG Australian institutions reported in this paper, 25 are using SL, 14 Open Sim and 7 are using other platforms, such as Vastpark, iSee, Unity3D, Quest Atlantis and three customised VWs for their own needs. There are a variety of disciplines using VWs, with the most dominant in Education (22), Health (15), Business (12), Science (7) and a range of other disciplines (25), including history, art, sociology, law, engineering, architecture, visual and performing arts, tourism, hospitality, construction, languages, pharmacy, social and behavioural studies. There are approximately 200 students per HIE studying through a VW. The following snapshots represent recent experiences from Australian HEIs utilising various VWs for teaching, learning and research. This illustrates the diverse range of activities being conducted and collaborated by educators, students and researchers as well as their collective experiences. Following the snapshots is a cross-sectional analysis of the various institutions, providing ideas of what worked for various institutions and what the future may hold in relation to VWs. The snapshots are to provide potential users of virtual worlds with a reference guide.

University of New England (UNE)
UNE ventured into VWs in 2008 following the creation of the Education Online Headquarters in SL as a space for teaching and learning in the prior year (see http://www.virtualclassrooms.info). To date, over 500 education students from UNE have experienced SL for virtual tours and excursions, guest lectures, role-play, web quests, basic building and scripting, round table discussions and for fun (Gregory, 2009). Several research projects have

been conducted culminating in an Australian Learning and Teaching Council (ALTC) grant led by UNE and in conjunction with Charles Sturt University (CSU), Australian Catholic University (ACU), RMIT, Curtin University and the University of Hamburg to establish VirtualPREX, professional experience role-play for pre-service teachers with peers and bots. In other fields, students in Pharmacy and Social Work programs are using videos (machinima) and role-play scenarios created in Open Simulator (OpenSim) as part of the Social Work Pharmacy Interaction Contextualization Experience (SPICE). This DEHub funded collaboration between UNE, CSU and James Cook University is creating lifelike, immersive, communication experiences for students with input from industry and is researching their effectiveness to improve learning outcomes.

University of Western Australia (UWA)
The UWA SL presence was launched in 2009 focusing on teaching, research, art, architecture and machinima. Classes have been conducted in several degrees and with international lecturers (Canada, US, Denmark) through SL. Teaching through SL to offshore students in Singapore commenced in 2010. Partnerships have been signed with The University of Texas, San Antonio, for cooperation in Teaching and Art. In architecture, the building creators have created models for the Office of Facilities Management for long term campus planning. An international 3D Architecture Design challenge was held 2009-2010 to provide a design for the Cultural Precinct Flagship building. With Visualisation Research, initial tests have been conducted across many fields including nanotechnology, chemistry, physics, and mathematics, allowing for actively working on 3D data sets with collaborators around the world. Across arts and machinima, the art and machinima challenges have seen prizes up to L$1,000,000 (AU$3,777), some of the richest in SL, and have attracted some of the most inspirational creators in SL from around the world. Close to 1,000 entries from more than 40 nations are received over a year.

Curtin University (Curtin)
Since 2008 Curtin University academics have used SL across a range of disciplines and for different purposes. A key undertaking was the establishment of a representation of some iconic buildings and Student Central from the Bentley campus to be used as a virtual information portal for finding information about courses, faculties and services, as well as for contacting Student Services. The School of Nursing and Midwifery established a virtual wound clinic to allow students to engage in a series of activities relating to wound management and patient interaction (in partnership with Kings College London). The School of Science has been using Michael Bulwer's 'Life on an Island' in Quantitative Biology classes to create very authentic and engaging assessments. Staff and students in Curtin Business School have also conducted teaching and learning projects within SL. The School of Information Systems has used SL to facilitate a role-play assignment, involving buyers and vendors in an international collaboration with Molde University College in Norway. In 2009, an informal 3D MUVE (multi-user virtual environment) Special Interest Group was established for a more formalised and collaborative approach to teaching and learning activities in VWs.

Victoria University (VU)
Educators at VU have been deploying VWs since 2006. Initially working in SL and Teen Second Life. VU's VW activities have focused on increasing student engagement in the VET sector (construction, hairdressing, multimedia, building design) and piloting the use of VWs within the VicHealth-funded Avatar and Connected Lives projects. In 2009 VU's main project team moved to OpenSim and has since run projects using versions of OpenSim hosted externally, on local networks. In 2009 the team also began work on its flagship web-based learning management system called PushLMS. This system allows teachers to enter multiple choice or yes/no question sets that appear inworld when triggered by avatar actions. In 2010 the team used PushLMS to build a virtual unsafe construction site where students triggered questions by exploring and clicking on unsafe workplace practices. Monash University's Pharmatopia has adopted PushLMS, an open source system, trialing undergraduate students in the Bachelor of Pharmacy.

University of Queensland (UQ)
The Foundation Year Business Island in SL (moving to OpenSim) gives students access to a virtual trading environment. Operating as managers within eight businesses, students are able to implement strategic plans and compete with other businesses while receiving guidance from teachers and leaders within the business community. In Education, SL is used to demonstrate the features and possibilities of VWs to pre-service teachers. Mathematics and Statistics use a custom built web based 2D world, 'The Island' to simulate a virtual population consisting of towns, households and individuals. This supports teaching in experimental design, epidemiology and statistical reasoning. Religious studies use 'The Religion Bazaar' (Farley, 2010) that has buildings from a variety of religions to teach first year classes and for supervising distance postgraduate research students. In Pharmacy a virtual compounding dispensary has been built allowing students to practice pharmaceutical calculations. This is located on the Pharmatopia islands in SL (moving to OpenSim), a multi-institution collaboration using a shared practice model where each school develops and shares a simulation. The

Faculty of Health Sciences is planning a virtual medical facility for immersive scenario based learning where interdisciplinary teams collaborate on patient treatment plans from emergency care through to rehabilitation. It aims to develop clinical, communication, problem solving and teamwork skills.

University of Adelaide (UniAd)
'Getting a MUVE On' based in the History discipline aims to evaluate a re-creation of eighteenth-century London in SL. It was used to illustrate lectures, run inworld tutorials and for the design of learning tasks. Students in the pilot course completed inworld assessments which entailed constructing a display including a critique of historical research they had conducted and writing a reflective journal (Matthews, 2010; Lemmings et al., 2010). Meanwhile the 'Transforming Assessment' island in SL was created as a professional development resource targeted at academics with the aim of improving assessment practice within VWs and other online environments. The SL island and website (transformingassessment.com) showcases approaches to e-assessment across a range of disciplines. Examples in SL (Crisp, Hillier & Joarder, 2010a) include using the Sloodle Chair for quizzes integrating both inworld and web content, Sloodle Awards that provides instant and comparative feedback, a chat logger that links inworld and external participants, QuizHUD with 'touch to answer' exercises and using chat bots (scripted avatar robots) to provide interactive quizzes and simulated discussions (Crisp, Hillier & Joarder, 2010b).

TAFE NSW Western Institute (WIT)
WIT provides vocational training (VET) across 65% of western NSW, including many remote locations. In 2010, funded by the Australian Flexible Learning Framework, a project focused on developing virtual tourism learning experiences to engage young learners, specifically VET students and remotely located trainees. The WIT Virtual Campus is currently utilised by Tourism & Hospitality students for a range of web quests and role-play activities. WIT Virtual Campus was established in OpenSim enabling students aged from 15 to 60+ to access a common space. Learning materials are brought to the Virtual Campus via Sloodle through the Learning Management System (LMS). TAFENSW is part of the Department of Education & Communities (DEC) where policies relating to firewall management practices bar the use of innovative technologies such as teaching and learning in VWs using the DEC portal and intranet. Firewall barriers are the keystone to expansion in the delivery base and WIT are balancing the desire to explore technology use in teaching and learning while maintaining the integrity of the IT systems network.

Queensland University of Technology (QUT)
QUT has been utilising SL to facilitate teaching and learning in a variety of modes since 2007. SL machinima have been used to contextualise legal principles in a number of projects such as Air Gondwana (negotiation skills) (Butler, 2008), Entry into Valhalla (legal ethics) (Butler, 2010) and The Sapphire Vortex (criminal liability, responsibility and procedure). All utilise detailed sets created on QUT Island. These projects are testament to the ability of machinima to make real world connections to otherwise abstract principles and to create cost effective learning environments that are both engaging and challenging. QUT Island also provides synchronous learning in both architecture and interior design. Students have used SL to obtain an introduction to 3D modeling and as a simulation of the built environment in creating landscape architecture while others have been involved in the creation of the QUT Space Station, which requires the design and construct of a complex microgravity environment reflecting not only community, connection and inhabitation but also physical expression. Students of advertising, marketing and public relations have also used SL to experience VW immersion and to appreciate 3D implications for marketing including branding, public relations, advertising and sales perspectives (Mathews & Bianchi, 2010).

University of Ballarat (UB)
In 2009 UB created an online SL presence and purchased its own island, including the creation of an online campus which houses interactive lecture theatres, meeting rooms, University promotional literature and specifically built research orientated simulations for different schools and associated academics. Critical Life is a simulated emergency room (ER) to expose nursing students to possible real life scenarios. First created in 2008 Critical Life has since been expanded upon and refined to encapsulate six different scenarios focusing on common ER crises. Critical Life has found to be a valid and embraced environment in which student nurses found it to be a highly beneficial to simulated exposure and also team-based learning. In 2009 the Virtual Stuttering Support Centre (VSSC) created a multi-story building - a hub of self-support for people who stutter (PWS). The VSSC conducts PWS support groups, presentations and meet with other interested people. Members are encouraged to verbally communicate in a safe and supportive environment.

Monash University (Monash)
Monash University Behavioural Studies department first piloted a lecture in SL in 2007. Although technically challenging, the inherent potential of the platform encouraged the lecturers to expand their use of SL as a teaching environment. Since 2009, Digital Selves, a final year subject, has been offered, focusing on equipping students with theoretical and applied knowledge and experience of the implications for identity, privacy, communication, teamwork, commerce and community that are affected by digital mediation. In 2008, the Faculty of Pharmacy and Pharmaceutical Sciences developed a virtual laboratory in SL where students could learn how the pharmaceutical industry manufactures tablets and also the role of ingredients in shaping a tablet's physical properties. The virtual laboratory is a safe learning environment that students can access anytime. The development of the virtual laboratory led to an international collaboration of 12 schools of pharmacy in which each school develops a learning activity on the 'Pharmatopia' island. Chinese Island is designed to complement traditional classroom-based learning with task-based, contextualised learning in a high fidelity virtual environment of Chinese language and culture. Learning on Chinese Island encompasses a range of inworld learning activities, from realistic task-based scenarios, to role-play, quests, the making of television chat shows and news-desk reporting.

Charles Sturt University (CSU)
The School of Information Studies built the CSU-SIS Learning Centre on Jokaydia in SL in 2009, a customised facility to support the teaching of distance education (DE) courses (Hay & McGregor, 2010). Library and information management and teacher librarianship subjects use SL requiring students to complete a number of learning activities inworld. DE students are encouraged to attend inworld discussion sessions hosted by faculty, guest speakers or student presentations; join a range of professional and educator groups; attend professional development activities; visit a range of libraries, university campuses, professional and education spaces; and meet with their lecturers for individual consultation (Gregory et. al., 2010). An evaluation of academics' and students' experiences using SL was conducted in 2010 (Hay & Pymm, 2011) with general consensus from both students and staff that the provision of teaching and learning experiences in SL is very worthwhile. In 2011 staff are exploring new ways to support teaching, research and professional development activities in the CSU-SIS Learning Centre. In the design of energy efficient buildings, students from the School of Education have made good use of Google SketchUp's 'geo-location' feature to place virtual buildings onto a site where it is subjected to simulated sunlight at designated times of the day and year. Using this virtual environment, students walk through buildings and to assess according to their incorporation of passive solar design principles.

Deakin University (Deakin)
Deakin supports a cohesive digital simulations program that includes VWs to encourage flexible, student-centred and accessible teaching and learning. Ubiquitous etechnologies support augmented reality and virtual simulations (Grenfell and Warren 2010) to enhance work related learning (Devlin, Coates & Kinzie, 2007) enabling students to access learning content. In 2007, the building of the Arts Education Centre on Deakin Island in SL began. Later, Criminology, Nursing and Occupational Therapy precincts and an introductory skills development zone were established. To promote greater collaboration, three islands were merged to form a single integrated virtual campus. Currently, undergraduate students, undertaking an elective art subject, are immersed in elearning artifacts embedded within the Deakin LMS system and in virtual and real world art studios. Students move seamlessly from text based content, still and moving images, audio and movie clips, located in the LMS and inworld to real time studio activities using traditional media and techniques or digital image manipulation software. Collaborative learning is experienced and students conduct inworld presentations of their artworks, culminating with a virtual exhibition of artworks in the art gallery in SL.

University of South Australia (UniSA)
UniSA has been active in VWs since 2007. Trials in the use of VWs for health science role-play simulations, experiential learning, defence simulations, performing arts and games design have been widely disseminated (see Fewster, Chafer & Wood, 2010; Fewster & Wood, 2009; Gregory et al., in press; Gregory et al., 2010; Wood, 2010a, 2010b,). Findings suggest: a) students put effort into virtual learning experiences providing they can see the direct relevance between learning activities and their future career aspirations; and b) students studying externally are more positive about the potential of VWs than students studying on campus. The School of Communication, International Studies and Languages is extending its teaching and learning activities with a focus on enhancing and supporting the development of students' career skills in areas such as journalism and professional communication. UniSA is currently developing a virtual careers centre using OpenSim, which will provide students with access to a wide variety of written and multimedia based career learning and information

resources. UniSA is also developing a range of interactive scenarios to better assist students identify and articulate their employability skills.

MacICT Virtual Worlds Project – NSW DEC and Macquarie University (MacICT)
The MacICT project assists classroom teachers in primary and secondary schools to develop curriculum-specific units of work using OpenSim. The objective is to develop programs which maximise student learning outcomes and cyber-citizenship, through engaging students in design and construction activities in the VW. Programs involving sculpture, sustainability, learning spaces and architecture have been completed, covering Visual Arts, English, Mathematics and Human Society and Its Environment. Each program aims to engage students in design tasks with real-world implications, for example designing students' ideal learning spaces for a location at their school. Project evaluations have found that the design and construction activities in the VW can: facilitate students' understanding and application of concepts and design processes; support development of spatial awareness; be highly engaging; encourage collaboration and team work; and enable design resolutions that students are proud of by allowing rapid visualisation and refinement of design ideas.

University of Canberra (UC)
In 2008 the Faculty of Information Sciences and Engineering (ISE) acquired land in SL (Telework, Telework Space, UCISE and UCISE Project). The two Telework regions are largely used for research into virtual work environments and sustainable VW ecosystems and as a platform for scripting and demonstrating artificial intelligence applications (Campbell et al., 2007; Cox & Crowther, 2008; Cox, Crowther, & Campbell, 2009). The Telework regions are also used to support postgraduate research training and projects. It hosts examples of interactive art and artificial intelligence. The underwater environment located in Telework Space is rich in free-roaming artificially intelligent objects. ISE subjects utilise the UCISE and UCISE Project spaces in SL and focus on construction of objects, scripting, land management and practical applications of VWs to industry. Students have the opportunity to acquire high-level skills in building and scripting complex objects (see Ryan, 2009, for an example of student work). In 2011 ISE established a 16 sim OpenSim grid.

University of Tasmania (UTas)
At UTas post-graduate students are exploring the potential for VWs in their own teaching contexts. Students engage in ethnographic research of the textual, discursive and social literacy practices occurring across a range of new media spaces including VWs and other social networking sites. In particular, English teachers and their classes are exploring how complex, esoteric and poetic concepts of texts can be constructed and examined critically in VWs. The site of Virtual Macbeth is being used for research with several secondary English classes. Classroom management is being used with teachers in Australian schools who need to demonstrate a capacity to engage and manage the behaviour of pupils in order to be effective leaders of learning. These skills are not easily practised in the university setting and are often acquired by default during professional experience placements. Trials in SL with pre-service teachers taking the role of students have stimulated development of OpenSim, enabling social exchanges to be private, replacing volunteers with 'bots' to improve learning efficiency.

University of Southern Queensland (USQ)
USQ was an early entrant into VWs in the Australian context. In 2005, the Advanced Learning and Immersive Virtual Environment (ALIVE) project began at USQ, with the aim of providing easy to use, Web3D elearning content development tools for educators (de Byl, 2009). The difficulties and high cost associated with creating a bespoke 3D environment became obvious and given that environments such as SL were emerging, the project was discontinued. Given impetus by this earlier work in 3D environments, USQ hosted a virtual careers fair in SL in 2008. In 2009, the careers fair was held in Exit Reality (McIlveen at al, 2009). USQ has positioned itself at the vanguard of VW use in higher education. In 2007, the first sim in SL provided housing to a variety of immersive teaching activities relating to Law, German language learning, Australian literature and education. In 2011, a second sim was created to explore the restorative possibilities engendered in Indigenous and virtual environments. USQ's exploration of this space continues with the development of an in-house OpenSim grid. National and international projects are being formulated in Unity3D, Minecraft and Kitely.

Griffith University (Griffith)
Griffith School of Education has used a variety of VWs since 2007: the Appalachian Educational Technology (AET) Zone; their own SL island and Quest Atlantis (QA). The School is currently developing VWs in OpenSim, MineCraft and Cryengine. In SL pre-service teacher preparation experience different simulated classroom teaching environments, comparing spatial arrangements and availability of arrangeable space for individualised, collective and collaborative learning. They also explore how student and teacher stereotypes (via avatar role-play) can influence teaching practice (Zagami, 2010) and create collaborative constructions in virtual environments to improve understanding of peer communication that increase complexity and creativity. Arts

education concepts are taught via virtual excursions, performances and installations to prepare students to use VWs in primary and middle years to meet curriculum goals through QA and to participate in international multi-university online projects to develop understanding of the effectiveness and challenges of collaborative online projects. Postgraduate courses use VWs as examples of educational technologies in AET and SL, enhance online course discussions in SL and compare various VWs for achieving curriculum goals (Zagami, 2009).

Southern Cross University (SCU)
In 2009 SCU Interaction Island was purchased. In 2010 Commerce Town was developed to support teaching scenarios in programs in the School of Commerce and Management, Law and Justice, Hospitality and Tourism and Education. The buildings on this island represent a range of business premises and have been realistically constructed to facilitate role-playing and teaching scenarios (Phillips & Ellis 2011: Jacka & Ellis, 2011; and Jacka, Logan & Ellis, 2011). The School of Education has been active in its use of Commerce Town for pre-service teacher courses in visual art, science and technology and learning technologies. In 2011, DBA Island has been constructed to support the International Doctor of Business Administration Program. The students and staff come from throughout Australia and overseas so the SL platform provides an ideal way to bring them together. In 2012 a fourth island is under consideration to allow for facilities to be constructed to expand teaching and role-play scenarios in additional courses in the School of Education and the School of Nursing.

Royal Melbourne Institute of Technology (RMIT)
In 2009, researchers in the School of Electrical and Computer Engineering developed a virtual TV studio learning environment in SL (Neville, Burton, & Burnett, 2010) aimed for use in courses taught at both the Melbourne and Ho Chi Minh City campuses. A significant component of these courses is the practical experience. Students learn to design and create multimedia content, use advanced audio/video editing, mixing tools and the RMIT TV studio. The RMIT Vietnam campus does not have a TV studio facility, thus the SL virtual studio mirrors the City Campus TV studio aiming to help bridge the facility gap and enable student collaborations between the two campuses. The City Campus TV studio is a fully operational facility and with avatar interactivity in SL, the virtual studio mirrors the studio and control rooms (and communications/feeds), props, cameras, and DMX lighting rig with static and intelligent lights. Currently being integrated into LMS coursework repositories using Sloodle for alignment with course material, students can communicate with teachers and student peers, keep a record of their studio setups for class sessions and save the 'film' that they have created in the virtual studio for assessment. Trials using the virtual studio are ongoing with local students to obtain feedback on its effectiveness before deployment across both campuses.

University of Western Sydney (UWS)
UWS has both developed the technology of VWs and utilised that technology for education purposes. Research has been focused on technology for electronic trading, cultural studies, tourism and emulation of processes in hospitals. Core technology is based on the integration of formalized social norms, Artificial Intelligence and VWs. The Westopia Island in SL is used by the School of Computing and Mathematics for teaching, developing new methods of human-computer interaction, game technologies, social informatics and professional communication. A SL project, Uruk, recreates humanity's first city in ancient Mesopotamia and simulates daily life using Artificial Intelligence (Bogdanovych et al. 2010). Education uses it for experiments in creating immersive teaching materials, in particular, history. Students learn about the daily life in Uruk by 'living' there and interacting with virtual 'inhabitants' who are agents aware of where they 'live', hence the history learning happens through interacting with them. The team has developed technology for controlling avatars via a motion capture suite for applications in sports, health informatics and tele-health.

Swinburne University (Swinburne)
Swinburne's Koala Island in SL caters for two groups of students, on-campus students and Open University Australia (OUA) students. On-campus students have been exploring the VW of Exit Reality alongside SL. However, the lack of 'virtual life' within Exit Reality has been a constant issue for students and consequently they prefer SL to do their business model analysis. Over the last year there has been an increase in usage by distance and OUA. They have been made up of post-graduate students undertaking IT subjects. These students have been using the island for group discussions for subject related matters and exploring the island together in groups as part of their get to know routine and ice breaking. This has been a new development and is very encouraging given the difficulty surrounding group work involving distance of OUA students. To facilitate these, several cubicles have recently been built and usage of these spaces is readily noted. Despite the growth in usage and popularity of the island in SL there are discussions to move to OpenSim due to funding.

Central Queensland University (CQU)
In 2008, CQU Learning Island opened with a welcome area providing signposts for spaces and events enabling one to teleport directly. Interests were strong initially for usage of SL as the platform for micro-worlds, but there were concerns about the requirements for sufficient bandwidth and computational power for effective use of the environment. Organisational issues impeded the use of SL, with some campuses blocking access at the network level. Issues around cognitive load was also explored by the research team as it had been observed that as users spend most of their time trying to learn how to navigate through the unfamiliar environment, instead of planning, articulating and thinking about their ideas; it was hindering learning. The research interest then shifted to exploring the educational potential of SL machinima and CQU integrated the use of machinima in curriculum and instruction (Muldoon et al. 2008; Muldoon & Kofoed, 2009). In this longitudinal design-based research, machinima were used as an anchor for apprenticeship style learning in the classroom.

University of Sydney (Sydney)
Sydney's Faculty of Architecture is using SL for lectures, demonstrations, tutorials, exhibitions, interactions and discussions where students collaborate on designs, presentation and exhibition and are critiqued by teachers in SL in conjunction with Istanbul Technical University, Turkey and Yuanze University, Taiwan. Being together increased the awareness of others' activities and social presence, which mimics characteristics of face-to-face learning. The Estate USydney in SL facilitates teaching instrumentation, process dynamics and process control concepts in the Faculty of Engineering and IT. Equipment found in oil refineries was built in SL with simulated behaviour augmenting practical learning. A challenge facing this engineering application of SL is interfacing the environment with dynamic simulations that mimic real process behaviour. Students in SL engaged with instructor and peers. International students, with preliminary English skills, favoured SL over local students (Abbas, 2010). A Sydney and Macquarie University project explores the use of educational virtual worlds to develop scientific inquiry skills in secondary school science education. This project uses Unity 3D to design the Omosa Virtual World enabling students to engage in scientific inquiry in biology as they investigate the mystery of a plummeting population of megafauna in a scenario inspired by Australia's unique natural history. Students are encouraged to gather and analyse data to solve the mystery of ecological crisis on Omosa.

James Cook University (JCU)
When developing an on-call hospital ward simulation at JCU, it was considered that the limitations of third party platforms were too restrictive to capture the real world nuances that exist within the communications and interactions of patients and medical professionals in a hospital ward. The lack of control over the technical facilities of the underlying technology also limited the ability for customised data capture for formative feedback and automated elearning assessment. The imposition of available interface options starkly contrasted real world interactions. In response to these problems, the medical ward environment was created using Unity 3D with avatars and medical models created in AutoDesk Maya. Unity 3D offered high resolution 3D graphics with superior performance, networking support, ease of importing 3D objects, terrain builder, audio capabilities, light mapping for realism (reflections and shadows) plus avatar customisation and animation. In addition, Unity 3D provides the ability to read and write from files and to interact with a database. These features provide a basic infrastructure and make data capture for assessment and feedback more flexible. Using Unity 3D a prototype of the on-call hospital ward simulation was developed featuring virtual patients with intelligent conversation system, networked supervisor observation console and time-stamped log files of interactions.

La Trobe University (LaTrobe)
La Trobe's Faculty of Humanities and Social Sciences built an island in SL in 2007, providing a series of learning, teaching and meeting spaces based on LaTrobe's bush campus and the laneways of central Melbourne. An open-air lecture theatre modeled on LaTrobe's amphitheatre and a sandpit and campsite were also provided. Initial uptake from academic staff was slow and depended on individual enthusiasm. A virtual Art Gallery was added in 2008 and is used to showcase student work in photojournalism. The Faculty of Law and Management is about to use the space for mooting classes and projects have been conducted in Nursing and Education.

The University of Melbourne (UniMelb)
Researchers at UniMelb are studying the use of VWs and online games, researching: the impact of voice communication on user experiences in online communities (Wadley & Gibbs, 2010); problems of mutual awareness during collaboration around objects in SL; building and studying networked games that employ 'exertion over a distance'; and the ongoing negotiations of rules and conventions by users of VWs.

Australian Film Television and Radio School, (AFTRS)
In 2006 Esperance was established in SL and used for educational and pervasive game applications through the Laboratory of Advanced Media Production (LAMP) including ‘Thursday's Fictions’ combining art, poetry, real life performance and spiritual exploration. The Graduate Media curriculum uses SL for sound design for games, cinematography, machinima pre-visualization, script development through role-play, VW creation and 3D art as well as hosting mini conferences with international media schools.

Analysis and Discussion

In 2010, the VWWG presented a snapshot on institutions using virtual worlds in their institutions (Gregory, et. al., 2010). At this time, 21 authors from the 22 members of the VWWG contributed to the paper. There has been a rise in popularity with contributions for this paper increasing to 47 authors from 28 institutions. Members of the VVWG were asked a variety questions in a survey to provide current information on what is happening in the Australian VW sector. Table 1 indicates when each institution began using VWs at their institution.

Table 1: Opt in year of using virtual worlds of institutions represented in paper

Year			Institution
1998	UWS	2007	Griffith, LaTrobe, Monash, QUT, Swinburne, UNE, UniSA, UB
2005	USQ	2008	CQU, Curtin, Deakin, UC, UQ
2006	AFTRS, Sydney, VU	2009	CSU, RMIT, SCU, UWA
		2010	JCU, MacICT, UniAd, UTas, WIT

As can been seen in Table 1, UWS began using VWS in 1998, however, the uptake from other members of the VWWG has been since 2005 with the use of immersive VWs such as Second Life. Table 2 outlines key responses in the survey from the authors of these institutions on two questions; the key things that they are using VWs for and the unresolved challenges that VWs present.

Table 2: Institutional responses on experiences of teaching, learning and research in a virtual world

Question	Key responses
List three key things that you are doing in a virtual world	Research; providing students with virtual experiences unavailable to them; meetings; tutorials; social media; inter-professional education; ethical decision-making; experiential learning, collaboration; role-play; simulation; guest lectures’ web-quests; excursions; tours; scenario based training; building; scripting; authentic assessment; programming behaviour of avatars and objects; interfacing VWs with motion capture suits and cybergloves; design and implement distributed sports games
What are your current biggest unresolved challenges	Technical and financial support; bandwidth; acceptance; accessibility; lack of vision; preparation of materials; many people on the one sim at the one time; timetabling, learning curve

What do virtual worlds provide or enable?

The themes that emerged from content analysis of the snap-shots and survey responses were assessment, collaboration, communication, engagement, stepping stones and simulation and that the following discussion elaborates on the responses according to each of these identified themes. Virtual worlds provide ACCESS where ACCESS is an acronym for assessment, collaboration, communication, engagement, stepping-stones and simulation.

Assessment – While not necessarily its key strength, VWs provide a vehicle for assessment. An advantage of setting assessment tasks in a VW is that marking can be automated. They are also a useful venue for conducting assessment tasks when other barriers are in play. Typically this would involve physical barriers (for example a disability) or a geographic barrier. UniAd have established 'Transforming Assessment' island in SL as a resource for academics to improve VW assessment activities, as well as Curtin, using 'Australis 4 Learning'.

Collaboration – the VWWG itself is an exceptional example of collaboration. Members have produced over 300 articles on VWs. VWs play an important role in overcoming the tyranny of distance and as a result, members report increased collaboration and networking not only between students, but also between staff and especially with international collaborators. Phrases such as, 'the ability to develop and participate in cross-disciplinary, cross-institutional and cross-border research and collaboration' is one that most members of the VWWG relate to. Many institutions report international collaboration on research and teaching (expert international guest lecturers are invited to present at various institutions to students at little or no cost). Where else but a VW could a student be provided with interaction from these experts? To the authors' knowledge, to date there have not been any similar collaboration internationally with the exception of academics from New Zealand universities who are part of this group.

Communication – At one level communication is at the heart of what VWs do. Collaboration and simulations, for example, highlight the power of VWs as a synchronous communication tool. VWs have a special role in asynchronous communication. VWs have been used as a vehicle to demonstrate student work and machinima is often used for demonstrations or for students to submit assessment tasks. QUT and CQU have used machinima as a vehicle to make real world connections to otherwise abstract principles. Higher education institutions and institutions generally have, to some extent, used VWs to communicate something about who they are. For instance SCU have designed a virtual presences mirroring their physical presences, Deakin highlighted their strength in the visual arts by their appealing use of colour and light.

Engagement – While engagement is a multidimensional concept, the authors generally acknowledge that engagement exists when students have a sense of energetic and effective connection with the activities they are undertaking, for example, one author commented that there was a 'high level of engagement in virtual world-based activities by young male construction students'. Many members reported increased engagement of students. This may be reflected in increased participation, increased interaction and a greater willingness to share. VWs provide an increased sense of 'being there' that has resulted in increased student perception of their engagement and is correlated with increased student grades. VWs play an active role for engagement (or at least the student perception of engagement) effective (feelings) behavioural (observable actions or performance), cognitive perceptions and beliefs (Finger & Asun, 2001). Possibly the most significant venue for engagement is in simulations, and it is so important, that it has been allocated a category of its own.

Stepping-stones – Virtual worlds provide stepping-stones to overcome barriers. These barriers may be physical, cultural, geographic, psychological or even financial. For example VWs have a role in reducing performance anxiety, supporting international students and students with a disability to increase confidence and participation. VWs have been used to create a virtual support centre and this provides skill development opportunities as much as it provides solutions for the users. Several institutions reported that they used VWs to eliminate many of the social and cultural barriers to engagement in the classroom.

Simulations – Simulations provide a rich tapestry of opportunities for educators. VWs have been used as mock trials, a virtual pharmaceutical compounding dispensary (UQ) pharmaceutical virtual laboratory (Monash) and defence (UniSA, CSU, USQ). Even at a less complex level VWs enable educators to add lifelike contexts to learning and to contextualise otherwise abstract and dry education principles.

Challenges for Virtual Worlds

The learning/inconvenience curve and physical constraints (bandwidth and computer hardware) are two significant impediments to VWs. 'Lag' (slowing of the computer) is a common problem experienced when many (upward of 30) students share the one virtual space. Lag is a function of bandwidth and computer capabilities (especially RAM). Some VWs cope with lag better than others. The learning/inconvenience curve comes about because software needs to be downloaded on a computer and then a set of basic skills needs to be acquired (movement and communication). Often this whole process could be achieved within two hours with good guidance. Experienced 'gamers' would do it much quicker. However, this is just to function at a basic level. Often these impediments are overlaid with institutional constraints (e.g. firewalls) and financial constraints. Much VW work has been initiated on minimal budgets by motivated academics. This effort must be leveraged by budgets and institutional support to deliver the higher dividends offered by VWs (e.g. simulations).

How have these challenges been overcome?

Some members of the VWWG reported that they upgraded computer equipment in laboratories enabling better access for on-campus students. However, they were not able to provide this support for off-campus students. When students took on this expense themselves they found it improved their VW experience. When technical support was available during initial workshops many issues were overcome. Staff were provided with professional development immersive learning experiences and research and professional literature on VWs to give them a better understanding of the virtues of VWs. Members of the VWWG also worked with their staff to identify potential applications of VWs. Support from senior management assisted in overcoming many barriers as this support enabled academics with the financial and time required to provide VW experiences to their students and other staff. Staff also reported on the development of appropriate non-player characters to assist with teaching and designing of pedagogy, lessons and tasks. Collaboration with other institutions provided professional development, guest lecturers or join forces during lessons with students. Many members report that they used external assistance such as machinima and non-player characters to assist with their lessons. As VWs are currently undergoing dramatic change, many members of the VWWG are migrating to other VW platforms.

The above list of successes of using a VW in teaching, learning and research outline how a VW could be used as an educational tool. The HEI discussions demonstrate that virtual worlds have been used for various learning scenarios and across a variety of disciplines. VWWG members were asked to respond to how their teaching or use of a VW has changed. Grant Meredith, UB, encapsulates the many responses: 'Our teaching using SL has extended more towards multi-discipline awareness and education regarding the possibility of VWs being integrated into curriculum. We are continuing this education process at the moment to step up embracement and experimentation. We are continuing to experiment and evaluate group interactions and meetings within VWs'. These challenges and solutions can guide those planning to undertake teaching and learning activities in VWs.

Future and Conclusions

VWWG members see the future application of VWs, as outlined by Helen Farley, USQ, as: 'I think browser-based VWs will become more common and make OpenSim and SL more accessible by circumventing current ICT security issues associated with these platforms. Gesture-based computing will similarly become more commonplace. Gaming consoles such as Kinect and Nintendo Wii will push this trend. In turn, this will lead to activities supporting authentic learning and become a cost-effective way of providing authentic learning experiences at a distance.' There are many similar experiences outlined in this paper. Although some institutions may be a couple of years ahead of others, they have all learnt from each other and new users are able to learn from the more experienced users. Higher education teaching, learning and research are changing and educators need to embrace the opportunities that VWs provide to ensure their students receive the best possible immersive and engaging education that Australia can provide. 47 authors reporting on 28 institutions have demonstrated how the Australian higher education sector are addressing continuous changing demands by utilising VWs into their teaching, learning and research repertoire of resources. Not all Australian universities were represented in the paper and due to limited space, an in-depth analysis was not possible and content analysis was thus also limited by number of responses by members of the VWWG. The changes from the 2010 snapshot (Gregory, et. al., 2010) to this snapshot highlight the emergence and collaboration that has taken place in the VWWG. Further research should be undertaken to provide readers of a more in-depth analysis and cross-section of teaching, learning and research currently being undertaken by the HEI across Australia.

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Changing directions through VirtualPREX: engaging pre-service teachers in virtual professional experience

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Many pre-service teachers currently undertake their professional experience with insufficient knowledge and confidence to handle unexpected teaching situations. VirtualPREX explores the experiences of 72 pre-service teachers who undertook a teaching role-play in a virtual world. The researchers discuss this opportunity for pre-service teachers to utilise new methods and avenues in a virtual world to both supplement their learning and undertake preparation for practical experience. Participation by pre-service teachers in role-play enables them to test and develop a better range of professional skills and acquire confidence in, and more realistic awareness of, their skills before being placed in real-life classrooms. Presented in this paper are the findings from a pilot of this study and pre-service teacher reactions to the role-play activity including whether they felt that it was helpful in preparing them for their upcoming professional experience placement.

Keywords: virtual worlds, Second Life, professional experience, pre-service teachers

Introduction

The term VirtualPREX (virtual+professional+experience) has been developed as part of an Australian Learning and Teaching Council (ALTC) grant where pre-service teachers role-play professional experience in a virtual world. Researchers from six institutions, University of New England (UNE), Charles Sturt University (CSU), Curtin University (Curtin), Australian Catholic University (ACU), Royal Melbourne Institute of Technology

(RMIT) and University of Hamburg (UHH), are exploring assessment of virtual professional experience using peers and bots (virtual world robots or non-human characters). An overview of the results of a pilot study, where pre-service teachers experience teaching their peers in the virtual world of Second Life (SL), is presented in this paper.

Key literature, background and rationale for the study

A virtual world is an online presence that imitates real, or fantasy, life in the form of a personal presence through someone's avatar, their alter ego, a graphical representation of themself in the virtual world (Gregory, 2007). SL is one of over 200 virtual worlds (Gregory et al., 2010) and was chosen for the project as UNE, Curtin and ACU already owned a joint island in SL, Australis 4 Learning (C. Dreher, Reiners, H. Dreher, & N. Dreher, 2009), where five of the project members already taught. This was an ideal place for pre-service teachers to practise their teaching as a classroom and playground was already established on the island.

A strong professional experience component is acknowledged as essential to teacher preparation (Darling-Hammond, 2006; Hastings & Page, 2007; Keogh, Dole & Hudson, 2007; Smith & Lev-Ari, 2005) and school-based practice sessions to allow pre-service teachers to apply pedagogical theories in a realistic teaching situation are integral to all pre-service teacher education programs in Australia. Nonetheless, research has shown that, in Australia, as elsewhere, pre-service teachers often enter the workforce ill equipped for their professional role (Ferry, et al., 2004). This unpreparedness no doubt contributes to the rise in attrition rates when pre-service teachers undertake professional experience (Sim, 2006) and the 45% of newly recruited in-service teachers who resign or burn out in their first five years of classroom teaching (Ingersoll, 2001). However, and increasingly, accessibility to meaningful professional learning experiences, located in the field, is becoming limited due to significant increases in enrolments in teacher education and no subsequent increase in field placements (Barbousas & Nicholson, 2009). Furthermore, pre-service teachers who are located in rural and regional centres, or are in a low socio-economic bracket, and therefore have difficulty funding significant travel, are further restricted in the access to quality professional experiences (Abbott-Chapman, 2011). Therefore, there exists a mismatch between the value of learning in professional settings and the opportunity to undertake such learning. By supplementing traditional professional experience placements with a model of professional learning in the virtual world, concerns about accessibility may be partially addressed. Through a virtual model, pre-service teachers are no longer restricted by travel times nor availability of schools to practise their teaching prior to undertaking professional experience.

In considering the learning that occurs in a professional placement there is the inevitable matter of inconsistency in experiences and thus concerns about ensuring a defined and expected level of quality in the pre-service teacher experience. As universities move further towards an accountability agenda (Massaro, 2010) there is a growing need to better manage the quality of learning, and hence professional experiences. Here quality is being distinguished from standardisation. The idea of a standard professional experience is an enigma, however, quality experiences should be aspired to for all pre-service teachers. Quality professional experiences provide a diversity of experience within a variety of learning settings and interaction in complex classroom environments. At times where a pre-service teacher is successful in being placed into a school, they are put into environments that are less than supportive, or limit their opportunities to take a leading teacher role, for example team teaching with other pre-service teachers. Whilst pre-service teachers do learn from such experiences there is no consistency on how this learning can then be related to the teaching skills that they have learned in their course, nor are they afforded the opportunities to develop the range of professional skills required of a professional teacher. SL provides a highly immersive environment (Dalgarno & Lee, 2010) where pre-service teachers can interact and become fully engaged in their experience as practice teachers.

Where issues of accessibility are not problematic, the experience of a virtual world can further supplement the development of professional skills necessary to ensure successful achievement in the real world professional experience. Formative assessment, explicitly designed to promote effective learning, has a powerful influence on educational outcomes, supporting both high-quality learning and empowering lifelong learners (Crisp, 2008). VirtualPREX is being designed and implemented to provide pre-service teachers with experiences that reflect the complex, diverse and multi-faceted nature of a teacher's role in classrooms, schools and the broader community. The virtual world learning experience provides the ability for an instructor to create spaces and experiences that permit pre-service teachers to engage in the variety of experiences needed to develop across all elements of teaching practice. Unlike real world professional experience, the virtual world is somewhat controllable by the instructor ensuring that a pre-service teacher's experience can test them in particular circumstances and environments better suited to their current learning position. For example, a pre-service teacher who has difficulty in managing the disruptive student could potentially be able to access a virtual world experience where the other variables of the classroom are managed to permit a focus on the acquisition of this skill. Over time, the other elements could be varied slowly approaching a more definite simulation of the real world environment. Through constant practise and feedback, and the variations possible, a pre-service teacher will potentially be able to assess and evaluate their skills, developing these further before eventually applying them to the real world.

Locating practice within a virtual world creates a space of safety for the testing of ideas and practices which would otherwise be socially difficult in the real world (Campbell, 2009). The anonymity afforded by a virtual world environment may permit pre-service teachers to engage freely in practice and test their strategies to deal with the situation without a fear of errors being attributed directly to them. Also the errors of judgement, whilst providing valuable feedback, have no long-term impact on actual students in the real world. For example, a beginning teacher often has difficulty in assessing the levels and types of responses that should be given to certain behaviours of students. An inexperienced teacher may therefore either over-react or under-react to particular circumstances, with each level creating a range of possible consequences, such as impacts on student self-esteem. What may be regarded as small incidents in the classroom can have a long-term impact on the learning of students. Therefore, there is a need for emerging teachers to have developed proper responses to a range of classroom behaviours, but this should occur in a safe environment both for the teacher as well as the students. The virtual world presents such a possibility. Inherent in a progressive introduction of emerging professionals to the world of practice is one of the complementary development of professional identities and therefore the empowering of pre-service teachers to make mistakes and learn from these. As the pre-service teacher interacts with the virtual world professional experience it is anticipated that they will come to better understand themselves as teachers and therefore be able to draw from these experiences in responding to challenges in the real world.

Although providing these positive outcomes, it is acknowledged that limitations continue to exist in the use of virtual worlds as teaching and learning tools. Primarily, these limitations come through the ‘opaqueness’ of the technology and therefore the limitation of the ability of pre-service teachers to fully engage in this space. This critique refers to the problems associated with access to high-speed Internet which permits ease of use of the virtual world, particularly from a distance, and limits on the experience of pre-service teachers working in these environments. Despite Prensky’s (2001) claims of the emergence of the digital native there still exists a substantial percentage of the current university student population who do not regularly interact with role-playing games (RPGs) or virtual worlds. Therefore pre-service teachers can make cynical responses about the use of these tools for meaningful learning (Gregory & Masters, 2010). VirtualPREX, as well as developing a useful professional experience for pre-service teachers to engage with, needs to also consider the usability of such tools for these purposes, as well as developing the capacities for pre-service teachers to competently and willingly engage with these.

Research design/methodology

Aims and objectives

The primary aims of the project are to:

- Assist pre-service teachers in acquiring a better range of professional skills and confidence before being placed in a real life classroom;
- Provide diverse professional experience options for pre-service teachers;
- Create awareness about virtual worlds as a pedagogical and social networking tool, and;
- Compare different methods of interaction to enhance pre-service teacher learning and teaching.

The primary outcome of this project will be the development, implementation and evaluation of VirtualPREX with structured learning experiences for formative assessment (Crisp, 2008). The project as a whole will consist of four phases as follows:

- During Phase 1 (which has been completed),
    - a focus group session was conducted with experienced teachers to identify the aspects of teaching practice to be included within VirtualPREX role-play scenarios, and;

- a pilot study of pre-service teachers undertaking a role-play activity using the initial version of the VirtualPREX environment was undertaken.
- During Phase 2, the VirtualPREX environment will be further developed, including the creation of bots (short for robots; being avatars completely controlled by the computer) representing school students exhibiting particular problematic behaviours;
- During Phase 3, the VirtualPREX environment will be trialed with cohorts from each of the partner institutions; and
- During Phase 4, data collected during Phase 3 will be analysed and the results reported in various formats.

The project has adopted an action research methodology involving action, analysis, reflection and re-action (Kemmis & McTaggart, 1988) and, in keeping with good evaluation practice, mixed methods will be used (Babbie, 2007) to ensure accuracy and alternative explanations (Stake, 1995). There is an ethical need to confirm validity of the process and this will be done through triangulation (Tellis, 1997), using multiple sources of data (Yin, 1994). Reported in this paper is Phase 1, which focused on developing a model of an effective, replicable approach to using and evaluating a virtual space for teaching and learning. Ethics clearance for Phase 1 was obtained from the University of New England Human Research Ethics Committee. Phase 1 consisted of two stages as follows:

Stage 1: A focus group of eight (8) experienced teachers was formed to gather the participants' experiences of key pedagogical issues and classroom management problems that they encountered during their careers. The focus group session was recorded and transcribed to provide material to be used to design the virtual world role-plays.

Stage 2: 72 pre-service teachers undertook role-play activities in an immersive virtual classroom environment, prior to undertaking a real professional experience placement. The pre-service teachers undertook teaching role-plays with their peers role-playing primary school students. After completion of the role-play activities students completed a survey. The interactions during the role-play were also captured as text, video and screen shots to allow for analysis as part of the project as well as for the purposes of reflection and evaluation by the pre-service teachers and their lecturers. The sequence of events for pre-service teachers in Stage 2 were:

- Undertake dispersed days in schools;
- Undertake VirtualPREX role-play in a computer laboratory, and;
- Complete a survey after the completion of the role-play focusing on the usability of the virtual environment and students' prior experience with virtual world technologies.

Environment and role-play design

SL was chosen as the platform for the research project as UNE, Curtin and ACU already owned a joint space for their students. Four new virtual classrooms were created on the Australis 4 Learning island in SL (see Figure 1). 40 primary school student avatars and 8 teacher avatars were created for the role-play. The primary school student avatars were small, looked younger and were dressed in school uniform. Four computers were set up to record the VirtualPREX classes (video, screen shots and text). These recordings will be used to create machinima (in-world video footage) to create tasks for self, peer, formative and summative assessment. They will also be used for reflective tasks.

Five 2-hour workshops were completed with 72 pre-service teachers, ranging in number from 9 to 19. The workshop groups were divided into smaller groups of between 6 and 8 pre-service teachers each, depending on the size of the group. Each workshop began with a reminder to students on how to control their avatar in the virtual world. Students had received a prior 2-hour workshop learning how to navigate and interact with the virtual world. The reminder presentation took approximately 15 minutes. The presentation put VirtualPREX in context. It was also to remind the pre-service teachers of a few tips and tricks on how to use SL. Pre-service teachers were then handed their avatar's name and their student role-play scenarios for the workshop and each person received the choice of a male or female teacher to role-play.

The intention was that all students would have the opportunity to play the role of the teacher as well as the role of a primary school student. Specifically, each pre-service teacher was to present a 7 minute teaching episode or idea focusing on their preferred Key Learning Area (KLA) to a virtual classroom of their peers, followed by an interactive peer feedback session. The pre-service teachers were expected to develop teaching strategies to control their class and to draw upon relevant resources such as readings, texts, web resources and study guides to inform their role as the teacher. Peers, role-playing primary school students, were given their role during the workshop. These roles were designed drawing on the description of student behaviours that emerged during the focus group discussions. The role-plays that the students received were colour coded – pink/orange were "good" and blue/green were "naughty" students (see Table 1). This assisted in keeping the pre-service teacher on task as to which role to play and to easily swap if needed.

Figure 1: Pre-service teachers undertaking VirtualPREX role-play activities

Results

Focus group sessions

Eight experienced teachers and principals attended a focus group discussion and the session was recorded and transcribed. From this discussion, role-play scenarios for the primary school students for VirtualPREX were developed. The focus group thought that the following were the most common types of students you would find in a typical classroom:

- Getting up and down, wandering around and never still
- Calling out all the time
- Know-it-all – beyond putting their hand up, they just want to get the answer out
- "Goody goody" – just want to please the teacher all the time – going beyond being helpful
- Behaviour Disorders – may not have taken medication
- Tattletale – dobs on fellow students
- Over-achiever – knows answers beyond capabilities of other students – potential of becoming bored
- Noisemaker – tapping the desk, whistling, humming
- Under-achiever – does not understand and is always asking questions
- Does not pay attention and is always asking what is going on or getting the teacher to repeat things
- Slow learner – always behind in their work and often off-task
- Language Disorders – these children may be a bit slower
- Dominator and defiant – takes the teacher on
- Non-responsive student – withdrawn, sulky, non-cooperative, disengaged
- Eye-roller
- Attention seeker

After the focus group meeting the researchers chose the most common behaviours of students in a typical classroom and these are outlined in Table 1. Students were to role-play either a "good student" or a "naughty student". It was decided that, as these were first year pre-service teachers, they would not be given any student role-plays that were beyond their capabilities to control as a teacher.

Table 1: VirtualPREX role-play characters

"Good Students"	"Naughty Students"
Good students – ideal students in a	Walk around the class a lot, stop and talk to other
Good students, but do not understand	"Dob" on peers and continuously interrupt
Teacher pleasers	Stay up too late and nod off
Know-it-alls	Withdrawn – will not say anything or do anything

	Other things on mind – looking out the window and Back chatters who are rude to the teacher

Initially there were meant to be more “good students” in each class than “naughty students” to provide the “teacher” with the opportunity to focus on strategies to involve the “naughty students” in their lesson. However, this did not always eventuate depending on the number of pre-service teachers in the workshop.

Role-play participants

All 72 students who participated in the role-play activity were first year on-campus pre-service teachers at the University of New England. 61 were female and 11 were male. They were all aged below 26 years of age and came from various locations around NSW when they were not living on campus (none indicated in the survey that they lived in a capital or non-regional city, 55% indicated that they lived a regional town or city, and 37% indicated that they lived in a rural town or on a rural property). Students were asked a variety of questions in relation to their ICT skills prior to commencing university studies, their use of ICT online tools and knowledge of virtual worlds prior to commencing studies. 70 of the 72 respondents indicated that they used the Internet daily and 70 indicated that they used social networking tools either daily or several times per week, with 68 of the 72 respondents naming Facebook as the social networking tool they used regularly. However, less than 10 of the respondents regularly played networked or 3D games or regularly used virtual worlds. In fact, 37 respondents indicated that they never used virtual worlds and 25 indicated that they did so infrequently. When asked about their skill level in relation to the use of virtual worlds 30 indicated that it was very low, 20 low, 18 average, 4 indicated that it was high and none indicated that it was very high. Clearly, the profile of the students suggested high usage of computers and the Internet, but very low levels of experience with virtual worlds and related technologies.

How the role-plays progressed

A number of technology problems were encountered in the first workshop. Firstly, people and surroundings in the virtual world did not ‘rezz’ (come into focus), and secondly, and most importantly, for two of the groups, group chat did not work properly. Even though the group chat failure only affected two groups, everyone was affected by the revised strategy, which had to be applied quickly to keep the momentum going. The revised strategy, which was kept for all future workshops, was that the workshop participants were divided into only two groups (instead of four) and used the virtual classrooms that were far enough away from each other so that local chat could be used. After they had completed their seven-minute lesson, the pre-service teacher had to log off and change roles back to a student and the next teacher had to log on and begin their lesson. At the same time the role-playing students had to switch their student persona from “good” to “naughty” and vice versa. This process was repeated until everyone had had a turn at role-playing the teacher. In the first workshop, some students did miss out on role-playing the teacher because of lost time working out a strategy to overcome the technological problems. In all workshop teachers were asked to type in capital letters in local chat to differentiate the teacher’s talking from that of the students.

Pre-service teacher views on the role-play activity

At the conclusion of the role-play activity, pre-service teachers were presented with a survey and were asked a series of questions about their experience of the role-play activity and their views about its value. Table 2 shows a summary of their responses to a question asking them to rate the degree to which they found the activity Confusing, Difficult, Irrelevant, Interesting, Easy to use, Useful, Boring, and Enjoyable. Only 40% of the students found the activity useful with 24% undecided, possibly indicating that the value may not have been clearly communicated or perhaps that students did not see practicing in a virtual world as a valuable way to develop their teaching skills. Interestingly, of the 10 students who did not play the role of the teacher, 9 indicated that they found the activity not useful, and of the remainder, only 28% indicated that they did not find the activity useful. This suggests that playing the role of the teacher is the most important part of the activity from the pre-service students’ perspective. Encouragingly 61% found it interesting, with 18% undecided. A sizable minority (31%) found the activity confusing with 28% undecided and 29% found it difficult with 15% undecided, indicating that additional support or preparatory training may be required. Another factor which was mentioned in a later question was the difficulty and confusion experienced by the role-playing teacher in keeping up with the typed conversation in the virtual world.

Table 2: Overall perspectives on the role-play activity

Response	Not at all ←					→	Extremely	Mean
	1	2	3	4	5	6	7	
Confusing	7%	15%	18%	28%	20%	8%	3%	3.75
Difficult	13%	20%	23%	15%	20%	8%	1%	3.41
Irrelevant	17%	29%	13%	14%	13%	9%	6%	3.26
Interesting	1%	7%	13%	18%	30%	14%	17%	4.77
Easy to use	0%	9%	16%	26%	23%	24%	3%	4.47
Useful	3%	13%	21%	24%	23%	10%	7%	4.08
Boring	13%	17%	19%	30%	7%	10%	4%	3.49
Enjoyable	1%	7%	24%	24%	11%	19%	13%	4.44

Pre-service teachers were asked to state the best and worst thing about the activity. In describing the best thing, a number of students noted that it was entertaining; a number highlighted the novelty of the experience, while a number commented on the value of role-playing a teacher or particular types of student.
In describing the worst thing, a number mentioned the problem of everybody talking at once. This could just indicate the challenges for novice teachers in managing student behaviour or it may suggest that there are problems in using text chat rather than audio in a simulated classroom role-play. Consistent with this, a number also indicated that having to type made things move slowly and that they found it boring at times. A number also mentioned the difficulties in obtaining control of the class as a teacher, which may in fact be a positive rather than a negative, if in fact the pre-service teachers who were role playing primary school students were doing so in a realistic way.

Pre-service teachers were also asked to name one thing about the activity that could be improved. A number commented on aspects of communication suggesting, for example, that the teacher should be able to use the audio talk function. Others suggested the need for stricter guidelines for the activity and restrictions on avatar actions (for example preventing unrealistic actions like walking on desks).

Using reactive bots to create an interactive classroom

In the Pilot, pre-service teachers engaged in different roles to interact with other human-controlled avatars. As a consequence of the Pilot study, a number of changes were recognised as being useful to ensure the role-play runs more smoothly and effectively in future sessions. First, the current turnaround time to change from one role to another (e.g. teacher to student) was too time consuming as pre-service teachers had to log off and back on. Second, the role-play was only possible if a certain number of human-controlled avatars were simultaneously online and knew how to play their role. The first concern can be solved easily by having *outfits* available that the avatars use to replace their current look (including items like glasses or hats to identify the avatar in the new role). The question of human-controlled avatars and consistency in the role-play can be resolved by the inclusion of bots, which are currently in the development stage. As is common in games, non-player characters or bots will be provided that can fill each role; see also Mahon et al. (2010), Jolie et al. (2011). Major advantages for this approach from a non-technological perspective are:

- Multiple roles for the simulation even if the classroom is used by an individual learner;
- Predefined (scripted) reaction on events occurring in the classroom;

- Re-playing the same scenario multiple times without variations, e.g. in the case of exams where each learner should get the same test and not depend on bad acting capabilities;
- Changeable behaviour of bots using script libraries, that is, the teacher can configure the bots in advance to define certain scenarios including required actions to react to, and observing the experiments, the teacher can interactively manipulate bots to change their behaviour;
- Monitoring is simplified: bot action can easily be recorded and consequently observer is focused on learner;
- Replay of sessions to provide formative feedback.

SL offers an ideal environment to implement an interactive environment that allows monitoring of all events as well as providing bots at a high level of sophistication by using the original avatar technology. Figure 2 shows a schematic of the anticipated framework consisting of in-world and external components. The design is related to performance issues, as a complete in-world control of avatars would be too slow (Ranathunga, Cranefield & Purvis, 2010; Kumar et al., 2008). An experiment involves the following activities:

1. All roles/characters are either assigned to a human-controlled avatar by wearing the corresponding outfit or a bot is initialised by requesting the external server to log in and take control.
2. Configuring the mood, behaviour, event and solution for each avatar. For human-controlled avatars, this is only a guideline, as the software cannot influence the behaviour. Bots, on the other hand, perform based on these settings; e.g. A2 is naughty (mood) and will throw paper-airplanes (behaviour) whenever the teacher's area of observation is not on the student (event) (see Figure 3). Asking the student to draw a picture or keep the area of observation on the student can prevent the behaviour. Note that we plan with single events and actions at this project stage. The configuration board can be in SL (e.g. hidden behind a flipchart that only the teacher can turn around) or on external clients.
3. During the experiment, all events (including chat, movements, actions) are observed by an *object* in SL and reported to the external server for storage and later analysis.
4. The results are exported in different formats (e.g. Excel, websites) and will allow the whole scenario to be replayed by having the server use the information to control all roles as bots.

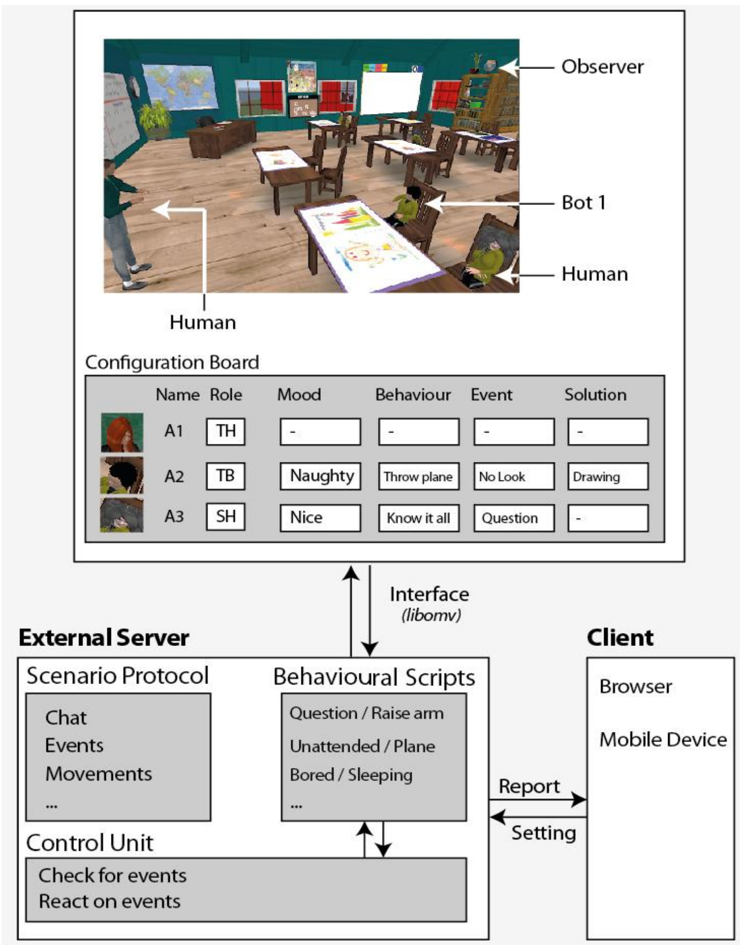

Figure 2: Schematic framework of in-world and external components of bot creation

The implementation uses the libomv-library (OpenMetaverse Foundation, 2011) for communication; thus allowing the usage of other virtual worlds in future projects; see Ranathunga, Cranefield and Purvis (2010), Prendinger, Ullrich, Nakasone and Ishizuka (2011); Gayle and Manocha (2008). The server applications are written in C# (due to the library being available for C# only), the in-world scripting uses the Linden Script Language (LSL). The whole system is kept modular such that scripts and server-client-technology can later be re-used as currently the development of virtual worlds is very fast paced. Over the last two years, several technologies to design and implement bots have disappeared and even though suggestions for standardisation exist e.g. MPML3D (Prendinger, Ullrich, Nakasone and Ishizuka, 2011), there is no final solution visible in the near future.

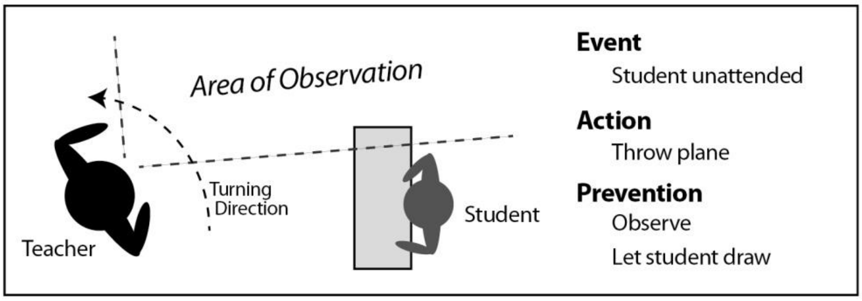

Figure 3: Example for event with teacher avatar and student bot

Conclusion and next steps

Each pre-service teacher was given two role-plays to act out as primary school students (one “good” and one “naughty”). When they had only two roles, after a while, they became bored and over-acted their part (or maybe this is just immersing themselves in their roles). Pre-service teacher feedback was that they wanted more in-depth criteria to act. Consequently, pre-service teachers will be given more roles to carry out. These will be created with the next iteration of the project.

In Phase 2 one component is the creation of machinima (in-world video) of online practice sessions that will be uploaded for viewing. The machinima will then be used as learning aids for self-assessment through reflection, as well as peer/educator formative assessment. Scripted machinima demonstrating best practice will also be produced and made available for pre-service teachers and other academics.

VirtualPREX on Australis 4 Learning will be accessible to members of the Second Life community of educators and all teachers, academics, pre-service teachers and postgraduate students across the higher education sector nationally, and potentially internationally, to use for practising and, researching professional skills. Results of the research will be shared and freely available to the higher education sector through the delivery of conference presentations, production of journal articles and via the virtual world of Second Life through online resources.

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Myth busting education in a virtual world – changing demands and directions

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Abstract and Symposium Plan

There has been much media reporting on the efficacy of virtual worlds for education over the last few years. Some of the claims made are unfounded and not based on empirical evidence. All panel members have been teaching and conducting research in virtual worlds for several years. They will address many of the myths about teaching and learning in a virtual world. The format will follow Jamie Hyneman and Adam Savage's television series, "Myth Busters" ("MythBusters," 2011) to find out whether the myths are "founded", "busted" or "plausible". To date there has been limited research and publications reporting on myths surrounding the teaching and learning in virtual worlds. However, Calani (2010) attempted to resolve the myths around immersion, James (2007) set about resolving the myths surrounding business in *Second Life* and, Hendrich & Mesch (2009), discussed 10,000 reasons why a virtual world will or won't work. This interactive session will seek audience participation in resolving these myths through evidence-based practice. In this symposium we will endeavour to address some of the following myths that have been perpetuated about teaching in learning over the last few years:

- Virtual worlds are not a platform in which one should do business.
- Virtual worlds offer no educational value.
- Anything you can do in a virtual world you can do somewhere else.
- Virtual worlds are too complicated for students.
- Virtual worlds take too long for academics, teachers and students to learn. *Second Life* is really expensive.

- Why not just use Skype instead of using a virtual world for conversations?
- *Second Life* is not scalable.
- You need to be a computer geek to be effective with using a virtual world.
- Virtual worlds won't survive; the 'hype' is over.
- *Second Life* is designed to be all things to all people; thus, it is not good for specialised activities such as teaching and learning.
- There are risks to students, as *Second Life* is all about sex, gambling and entertainment.
- There are too many distractions in *Second Life*.
- Young kids aren't allowed in *Second Life* then why use it with teachers when they can't use it for their own teaching?
- Students with disabilities cannot access virtual worlds.
- Virtual worlds contribute to the 'digital divide' by creating barriers to students from equity groups.

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Students’ engagement with technologies: Implications for university practice

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The inexorable pace of technological change demands frequent modernisation of learning technologies and services to ensure they support equitable and engaging learning environments. Because of the resources involved, costs incurred need to be carefully weighed up against the potential benefits that upgrades will bring to students and their learning. In order to provide an evidence-based approach to planning, three Australian universities have recently completed a multidimensional survey to gain a better understanding of students’ experiences and expectations of technologies in everyday life and for study purposes. More than 10,000 students responded. Technologies surveyed included established (email, learning management systems) and the more recent Web2.0 technologies (YouTube, Facebook). This paper presents the initial findings and implications they have for the development of technology-rich environments that are equitable, engaging and support quality outcomes.

Keywords: learning technologies, infrastructure planning, student experience

Introduction

Few can deny the pivotal role that technologies play in facilitating learning. Maintaining currency with the latest technologies however, incurs substantial costs to institutions, not only in developing robust technical infrastructure but also in the provision of educational development and support services. Hence, decisions about technologies need to be made with clarity of the potential benefits to students and their learning.

Kuh (2003), in his research on student engagement warns against universities making judgments about policies and practices in the absence of student engagement data or some comparable source of information. The danger of making decisions based on assumptions, rather than evidence, is borne out in research on the net generation, i.e. students 25 years and under. These students are claimed to have digital technologies central to their daily lives (Strauss & Hoew, 2006). However research by Kennedy et al. (2006) challenges assumptions of the digital literacy of net generation students as well as their interest in the use of digital technologies for study purposes. They found that the use of technologies was not as widespread in first-year students in Australian universities as expected. On the other hand, Oblinger & Oblinger (2006) in studies of American students, found that it is the mature-aged students balancing work, family and study who are more likely to be looking to use technologies to support their learning. Although this may have changed in the last five years, it does point to the value of understanding students and their academic and social practices; something that Gibbons (2007) maintains as necessary if students are to be placed at the centre of decisions about services and facilities.

The need to establish an evidence base to support future planning for learning technology infrastructure provided the impetus for three Australian universities – Macquarie University (Macquarie), the University of Western Sydney (UWS) and the University of Technology, Sydney (UTS) – to embark on a project to identify students' experiences and expectations of technologies. This paper reports on the preliminary findings from a survey, developed as part of the project, and also highlights the implications they have for future planning.

The survey

The survey was designed to provide insight into students' current and expected use of technologies for learning and also differences in academic use compared to use in everyday life. The development of the survey drew on several sources of information. The ECAR Survey, a United States based survey developed by Educause (ECAR, 2008), gave a perspective on how undergraduates think about and use information technology. The Great Expectations of IT Survey (JISC, 2008) from the United Kingdom, canvassed students aged 16 –18 considering going to university about their expectations of technology provision. To preserve commonalities with these surveys we used them as a reference point in relation to the scope of technologies and issues to be canvassed. The Horizon Project, a project of the New Media Consortium (http://www.nmc.org/horizon), produces annual reports describing emerging technologies likely to have an impact on teaching and learning in universities. These reports were used to ensure the survey was forward looking, capturing emerging trends. In addition, the work of Kennedy et al. (2008) served as a reminder that not all students have access to, or use the latest technologies, hence we were careful to include the familiar established technologies (email, SMS, mobile phones) as well as more recent Web2.0 technologies.

Overall, the Learning Management System (LMS) (i.e. Blackboard) and 25 other technologies were surveyed: instant messaging, text message (SMS), email, collaborative/conferencing technologies (e.g. Skype, Elluminate), mobile phones for voice calls, mobile phones with internet access, social networking sites (e.g. Facebook, Myspace, Twitter), virtual worlds (e.g. Second life, Active Worlds), blogs, wikis, online multi-user computer games, podcasts/webcasts (e.g. YouTube), social bookmarking/tagging (e.g. del.icio.us, Diigo), software used to create audio/video materials (e.g. Audacity, GarageBand, iMovie), presentation software (e.g. PowerPoint, KeyNote), data analysis software (e.g. spreadsheets and databases), Google docs, e-portfolios, GPS tagging (e.g. Flickr, Picasa, blog), library search engines, internet search engines (e.g. Google, Yahoo), RSS feeds, interactive whiteboards, web development software (e.g. Dreamweaver, Front Page), and tablet computers (e.g. iPad).

The survey comprised 127 questions covering demographics, access to technologies for learning, administration, communication and everyday social and work purposes. Included were four open-ended questions to provide qualitative data about the student experience.

Procedure and results

The survey, open to all students, was delivered online at each of the universities through Voice Project (http://www.voiceproject.com.au/). Invitations were extended through the LMS and the regular avenues for student announcements at each of the universities. The survey was administered during 2010: in April at Macquarie, May at UWS and October at UTS. The combined responses yielded a data set of 10,269 participants: 1104 from Macquarie, 7419 from UWS and 1754 from UTS. Only a portion of the findings that relate to technologies for everyday use and coursework purposes are reported here.

Technologies used in everyday life

Participants were asked to indicate on a five-point scale (Never or Rarely, A few times a semester, A few times a month, A few times a week, or One or more times a day) how often they currently used the technologies listed above in their everyday life, for social and work purposes. The top 10 technologies used a few times a week or more were: internet search engines (93% of respondents), text message (SMS) (92%), email (90%), mobile phones for voice calls (83%), social networking sites (77%), podcasts/webcasts (54%), instant messaging (51%), mobile phones with internet access (50%), library search engines (36%), and Google docs (28%).

Technologies for learning

To explore current and future use for learning, participants were asked, *How often do you, and how often would you, like to engage in the following learning activities that use technologies as part of your course?* The top 11 technologies currently used are shown in Figure 1. The most popular was internet search engines with 90% of participants using them at least a few times a week. This was followed by library search engines (46%), social networking sites for groupwork activities (24%), and podcasts/webcasts created by lecturers (23%).

When these technologies were matched with participants' preference for future use (shown in grey in Figure 1), it can be seen that comparatively more use would like to be made of all technologies, except internet search engines and social networking sites. Two other technologies, not shown in the figure, were also rated highly: tablet computers (e.g. iPads) for information access and contribution (42%) and interactive whiteboards (33%).

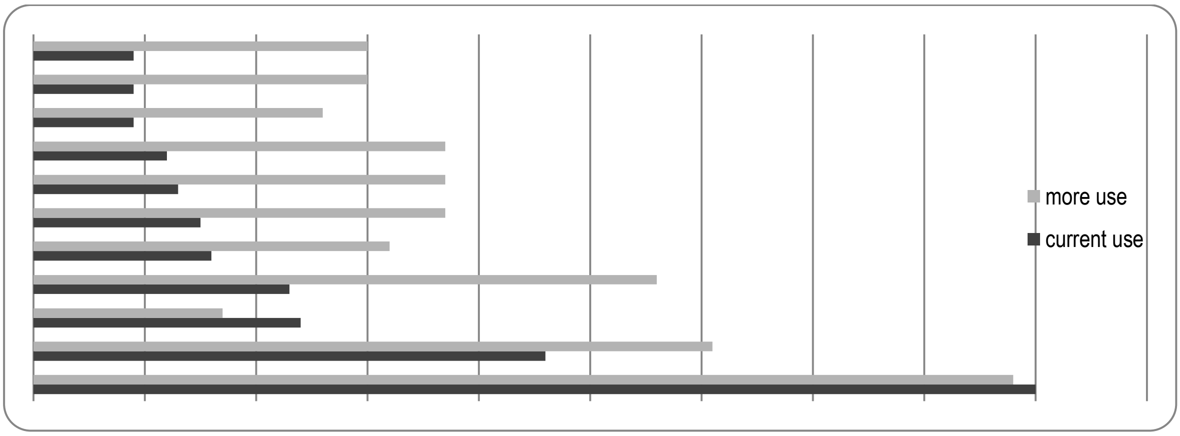

Figure 1. Students' current use of technologies compared with preferred use for learning

With regard to the LMS, participants were asked to indicate their use of 12 tools/functions. Their current use in rank order is: access to content (56% of participants doing so at least a few times a week), announcements appearing at login (56%), access to unit outline (40%), access to lecture recordings (37%), discussions (36%), quizzes for assessment (28%), tracking of progress and grades (26%), mail (22%), quizzes for feedback (19%), submission of assignments (17%), return of assignments (14%), and sharing work with other students (13%). In the future, students would like more use made of all tools and functions, with the strongest demand for lecture recordings with a 27% increase, followed by increases for assignment submission (23%), quizzes for feedback (21%), tracking grades and progress (21%), return of assignments (19%) and discussions (18%).

Web 2.0 technologies

There is quite a lot of speculation about the use of Web 2.0 technologies for learning, particularly applications that are popular in everyday life. Figure 2 shows the current use for social and work purposes (black) and preferred use for learning (grey).

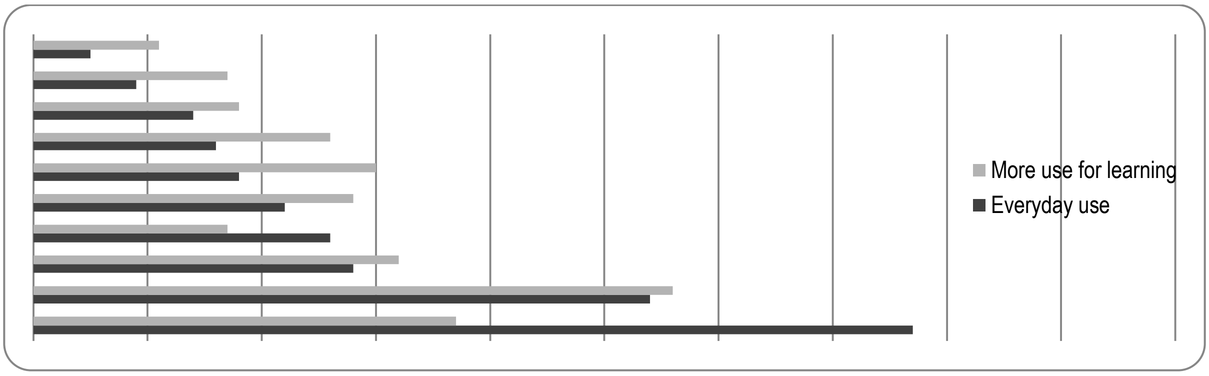

Figure 2. Students' current everyday use of Web 2.0 compared with their preferred use of learning

In can be seen that in everyday life the most frequently used Web 2.0 technology is social networking with 77% of respondents using it at least a few times a week. However, most students clearly do not want more use made for educational purposes, with preferred future use for learning falling to 37%. A similar but weaker pattern was evident for wikis. This was not the case for the other technologies shown. In everyday life, little use is made of virtual worlds (5%), tagging (9%), e-portfolios (14%), blogs (16%) and RSS feeds (18%) with somewhat more use being made of Skype/Elluminate (22%), Google docs (26%) and podcasts (54%). Nevertheless, these technologies are seen to have some educational value and students would like more use made of them.

Implications and concluding comments

The findings presented provide a snapshot of emerging trends. Overall, there is a clear message that students would like more use made of almost all technologies to support their learning. An exception to this is social networking, which is clearly seen as a technology for everyday use. The technologies that are currently used most often for learning are search engines, library databases and e-materials, and the functions in the LMS related to accessing information and resources. For future use, a similar pattern emerges with the strongest preferences being for search engines, access to online content through the LMS, announcements (LMS), lecture recordings (LMS), and podcasts/webcasts created by lecturers, followed by the LMS tools (discussions, access to unit outline, tracking progress, quizzes for feedback and assessment purposes). This suggests a continued focus on the development of the core, mainstream technologies in the university is warranted.

Looking at the comparative differences between current and future use, as opposed to outright rankings, gives an indication of the technologies associated with the strongest demand for increased use. Appearing in this group are mainstream technologies; podcasts, lecture recordings, and LMS tools for assignment submission, tracking progress, quizzes for feedback and assessment. Other technologies in the group reflect an increasing demand for mobility, flexibility in access and synchronous interaction and these are: tablet computers, e.g, iPads, to access and contribute to activities; mobile phones to access and contribute study-related information on the internet; interactive whiteboards to participate in tutorial-based learning activities; and web conferencing, e.g. Skype/Elluminate, to join in remotely to lectures or tutorials.

A cautionary note when interpreting the findings is that students' ratings could be influenced by their current experiences of learning and teaching with technologies; if courses are not designed to encourage new learning experiences and use of emerging technologies, their future potential may not be evident. If the full potential of these technologies is to be exploited, then academics must have the understandings, skills, support and time to enable their effective integration into the curriculum. Students' current experiences of campus infrastructure and support facilities also need to be taken into consideration. Although not shown here, satisfaction levels with these were quite low at all three universities. The reliability of technologies on campus, availability of wireless networks and power points to charge devices, and spaces to use mobile devices, attracted satisfaction levels of between 45% and 49%. Not only could this impact future use, it has serious implications for the present.

Overall, the findings suggest the need for continued investment in core technologies and services to promote more reliable access and effective use. However this should not exclude investment in more recent and emerging technologies, as there is a growing demand and awareness of their potential. Further analysis is taking place exploring the use of the LMS, differences between cohorts (e.g. disciplinary groups, low SES students, international, distance and on-campus students) as well as individual differences (e.g. age, gender). There is also the potential for repeated use of the survey to increase the database and provide a profile of changing usage patterns over time.

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Sustaining elearning innovations

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The challenges of turning funded projects from elearning innovations into sustainable products and services have featured in the higher education literature for more than forty years. Various guidelines and strategies designed to facilitate the process have been developed and tested. Key challenges are identified and critical success factors proposed. Yet the problem persists in more or less original form, suggesting that most of the advice has been lacking in some respect. This paper examines the current raft of ideas and proposed solutions to the problem of sustaining elearning innovations. Preliminary findings from sixteen case studies are presented to see how experience aligns with the guidelines. While the evidence from these cases is not universal, it is does support comment on the usefulness of existing guidelines and a proposal for an alternative approach to sustainable innovation based on this research.

Keywords: elearning innovation, sustainability models, organizational change, project processes

Introduction

Since as early as the 1960s, institutions and governments have promoted the use of educational technology through various strategic initiatives and a funded project model. This model typically offers support for two or three years, and in recent times, the expectation has been that new elearning systems or products will be widely disseminated and self-sustaining by the end of the funded phase. In some cases, second round funding has been offered to projects that can demonstrate initial success, however, this is an exception rather than a rule. Since many funded projects involve research and development for innovative systems, it often proves difficult to meet all the funding body expectations within an externally imposed timeframe. Furthermore, project teams with strengths in research informed design and development may lack the skills for dissemination and to build a business case for ongoing support. As a result, many projects with strong educational potential fail to find the means to continue beyond the funded phase, and a low return on investment is achieved. Apart from some research publications describing the experience, which many teams have limited time to produce, there is no efficient mechanism for sharing the experience gained in the research and development phase. The research described in this paper acknowledges that this problem has existed for many years, and presents a representative sample of literature to track other researchers' analyses and proposed solutions. Case studies were used to explore the practicalities of these solutions, and to identify emergent approaches to sustainable innovation.

The problem with funded projects

In a seminal work on the topic, White (2006) presents a summary of national strategic initiatives that were significant in driving the development of educational technology in higher education in the UK from the middle of the 20th century. As one of the pioneering regions in this field, the UK experience is something others can learn from. The predominant focus on funded projects within major initiatives is noted; along with the Teaching and Learning Technology Program (TLTP) evaluation report observation that 'management support and related investment' are important determinants of elearning project survival beyond the funded stage (HEFCE 1996).

On the matter of management support, White (2006) questions whether national strategic objectives that drive significant investment are well aligned with institutional ones, because with hindsight, local support has been slow, and in many cases, failed to materialize. While the funding council identified its own strategic objectives, it offered no direct help or direction for institutions to develop their own strategies. It acknowledged some of the challenges that might arise, and tried to anticipate the help and support requirements this would generate. In the circumstances, it may be reasonable to conclude that the vague nature of what 'management support' actually means and assumptions about senior management's ability to provide it may be part of the problem. In another study, Duke & Jordan (2008) found 'significant shortcomings in the capability of senior management teams in HEIs to identify and exploit the full strategic potential of technology.'

While funding rounds achieved significant gains in building elearning capacity across the UK higher education sector, from a single institution perspective, the project-based approach showed little success. For example, in six institutions involved in the *Scholar Project*, White (2006) reports that the observed effects may have been a result of changing external circumstances, i.e. the advent of the WWW, falling hardware costs and a general increase in the use of technology, rather than project activities. Little activity continued after the funded phase, and it was difficult to see how this could be maintained in the face of competing priorities such as research and the normal demands of teaching. Some initiatives report higher levels of success, (e.g. Anderson et al 2009). However, low uptake is common, and experience shows the opinion expressed by one participant that 'if it works the faculty will find a way to pay for it' doesn't hold true in many cases; certainly not when locally developed elearning systems and tools are made available beyond the host institution. There were cases where local developments had been adopted for institutional use, but frequency and processes through which this was achieved were not described. White's study also explored alignment of individual and institutional objectives, and concluded that improvement was needed, not just locally, but also for governments and their agencies. A distinction between teaching and research-intensive institutions was noted, as drivers of behavior, structure and management are different. Other researchers make a similar distinction (e.g. Czerniewicz & Brown 2009)

A final point of note in White's (2006) paper is that different capacity building strategies are required for early and late adopters of technology. While it is relatively easy for decision makers to identify early adopters, the challenge is to harness their energy and achievements as sources of systemic change. Both the need for this, and proposed processes to achieve it have featured in the literature for many years, but the success of such attempts has been variable. The question that remains is, what factors contribute to the situation where a seemingly simple process involving creative effort picked up by structure, strategy, policy, procedure and tactics has failed to achieve this objective? The parting comment from White (2006) is that institutions might usefully establish long-term strategic alliances to identify local barriers to change and critical success factors. While this kind of collaboration has run against the grain in a typically competitive institutional environment in the past, the case studies conducted for the current research suggest it is emerging as a practical rather than policy driven strategy.

Why initiatives fail

A high level perspective is offered by Demirkan et al (2010), who note that many elearning initiatives fail where substantial economic investment is required upfront, and the ability to adapt systems and services is limited. The case is based on an industry/university consortia reference model, which is validated through experiences of the Teradata University Network. The reference model addresses basic and advanced sustainability capabilities that integrate partner, application, faculty, student, and elearning service system issues. Validation of the model is by mapping to the literature on advances in elearning service system capabilities. One generally useful product of this validation step is a comprehensive set of capability assessment questions for use by national or institutional elearning initiatives. Broadly speaking, success depends on the ability to sense the environment and reconfigure systems to meet changing requirements; to assimilate or transform them to generate new ones; to manage interdependencies; and to integrate or adapt system elements to suit specific purposes. This high level view of systems and services is clearly important in a rapidly changing higher education environment, yet it is absent from most national and institutional elearning initiatives.

Further support for this perspective comes from a conference of researchers, policymakers, and practitioners focused on ‘scaling up success in technology-based educational improvement’ (Harvard University, 2003). The event synthesized insights from lead researchers working on challenges of transfer, generalization, scaling up, and adaptation of successful educational interventions. Participants included researchers and educators from case study sites, as well as national and state policymakers. The conference provided the opportunity to share insights, and to explore the missing links between theory and practice that undermine promising innovations. In brief, these links related to the need to adapt innovations to local contexts, and contextual factors that are often overlooked in research studies. The importance of a shared vision was noted, along with the increased chance of sustainable change where stakeholders have a practical problem to solve, and an innovation is the solution.

The lack of focus on adaptability and responsiveness to changing conditions is implicated in the failure of major initiatives such as the ‘learning object economy’ (Gunn, Woodgate & O’Grady 2003). Yet these attributes are uncommon in planning and implementation of most elearning projects. The open source community is a notable exception, with a model of adaptability that shows signs of making further inroads into national tertiary sectors.

Conditions for success

To address the barriers identified in various contexts, lead researchers have published frameworks they believe will support general capacity development in elearning, for example:

> If higher education is to meet the forecast challenges of this century, initiatives in elearning will need to encompass more than the current focus on teaching strategies… This article describes a framework for developing the capacity to deliver elearning courses. (Alexander 2001, p247).

Alexander’s framework is representative of initiatives with similar aims, and includes:

- A vision for e-learning at the institution
- A technology development plan
- Development of faculty workload policies which relate to e-learning
- Maintenance of a reliable technology network
- Facility for providing technology support to staff and students
- Market research support
- Faculty development opportunities in student learning, good practice in course design, development and implementation, project management, team- work, evaluation and time management
- Provision of time release for faculty engaged in e-learning developments

There can be little doubt that attention to these factors would help to achieve the benefits identified in an earlier study by Alexander, McKenzie & Geissinger (1998), i.e. improved quality and productivity of learning, improved access to learning, and improved student attitudes to learning through technology. In an article on ‘institutional readiness’ Czerniewicz & Brown (2009) examine the track record of different types of institution in supporting elearning innovation and achieving engagement by a critical mass, and find the two achievements tend to be supported by different types of institutional culture. Another author describes the dynamics of institutional change around elearning based on a series of discussions about elearning diffusion with institutional representatives from across the globe. The author notes that ‘in some institutions elearning was an accepted part of everyday activity, while in others it struggled to gain traction’ (Nichols 2008, p598). There were common factors in institutions that had successfully engaged with elearning across teaching and learning functions, i.e. elearning was approached proactively, was scalable, and self- perpetuating even if not all staff were currently making use of it. There was a sense of flow for elearning, and more confidence in future plans. Unless this sense of ‘business as usual’ is achieved, it is likely that elearning will remain the focus of enthusiasts.

Uys (2007) is another author who describes ideal conditions for elearning to flourish. He proposes the LASO (Leadership, Academic and Student Ownership and Readiness) model to ensure enterprise-wide technological transformation through a strategically developed framework, based on a clear and unified vision and a central educational rationale. LASO emphasizes the need for ‘integrated and orchestrated top-down, bottom-up and inside-out strategies’. Sustainability requires the model to be complemented by a ‘distributed implementation and support approach that advocates true partnerships between academic and support staff' thus providing the capacity for students or staff to initiate and participate in the technological transformation of an institution.

While many authors propose a formula for success, there are few practical examples where all factors are lined up and evidence shows that success has been achieved at a uniform level. It is more common for published articles on the topic to present ideas and works in progress than retrospective reports with evidence of successful diffusion and sustainable innovation. For example, Wiles & Littlejohn (2003) outline the progress of a national Supporting Sustainable eLearning Forum, funded by the UK Learning and Teaching Support Network Generic Centre. The aim of the forum was to move elearning from project-based innovation to embedded practice, and address questions around the scalable nature of elearning. Assimilated views of a wide range of support staff are presented, including ideas on how to devise strategies to support lecturers in the design, development and implementation of online courses; disseminate good practice in sustainable approaches to elearning; and contribute to the ongoing debate in the sharing and reuse of elearning resources. At the time of writing however, this was presented in the form of more great ideas with little evidence to show the outcomes of implementation.

Common challenges

Cox (2008) presents research to highlight common problems and contentions around elearning innovation. She quotes Salmon (2005) on two stages that elearning has gone through as, a) a new way of doing something familiar, and b) doing things that were not previously possible. The second stage is complex, requiring change at both practice and institutional levels, and a solution to the problem of fostering institutional learning about thousands of isolated examples of innovation where no support for systematic change is in place. To address this, she proposes identifying and promoting excellent sustainable, transferable practice and models of change.

Cox's study tests the first four of seven stages of the soft systems methodology described by Checkland (1990 and 2006a & b, cited in Cox 2008), and works with a definition of innovation derived from interview data, i.e:

> Innovation can be defined as a new and useful way of solving existing educational problems, for example, improving student understanding of content. The innovation does not have to be a new tool it could be changing the way an existing tool is used. Importantly any innovation needs to be understood in terms of its context, (Cox 2008, p204).

After an initial data collection phase, Cox aggregated a root definition in the following statement:

> Despite a lack of institutional support and encouragement lecturers find the time to innovate using educational technology in order to enhance their students learning experience as well as their teaching practice. However there is a concern here about who owns the innovation which needs to be investigated further, (Cox 2008, p205).

The next stage in her research was to take these definitions to the people interviewed and find strategies to address the challenging aspects of elearning innovation they had experienced.

Breslin et al (2007) identify many of the same issues as Cox (2008) and others seeking to integrate and sustain elearning systems and practices. Broadly, the issues are pedagogical, cultural and technological. A key point is that senior managers need to reflect on a range of related issues at a departmental or institutional level prior to implementation of new elearning systems. However, experience elsewhere shows that, although such reflection may prepare for many eventualities, there are almost always unexpected outcomes that require the flexible and agile organization identified above by Demirkan et al (2010) to generate an appropriate, timely response. It is unfortunate that these two adjectives – agile and flexible - are not commonly used to describe the organizational structure or processes for responding to innovations in universities.

Reuse of student-generated resources, which are added to a digital repository following review and addition of meta-data by specialist staff, is an example of pedagogical innovation cited by Breslin et al (2007). While this is becoming an increasingly popular concept among elearning enthusiasts, it seriously challenges tradition, and even professional identify for later adopters. Putting these cultural challenges aside for now, a question that remains unanswered is how the proof of concept stage for innovations is managed to ensure elearning systems are the best they can be in terms of educational potential and ease of use by different target groups. Breslin et al (2007) note that proof of concept was achieved, and designs refined through ongoing evaluation involving staff, students and objective data, which suggests good process but would benefit from fuller description. However, the kind of 'special attention' afforded by project resources is not present in normal circumstances, so the fitness for purpose of most elearning tools may be less well refined than it was in the cases involved in the study. Other success factors that receive less attention without the boost of institutional or national funding include strong project management to overcome cross-disciplinary and cross-functional differences. Pedagogical integration is identified as the most problematic issue, and could be expected to present significant barriers to wider use where dedicated support is not available. Another major question unanswered by Breslin et al (2007) as well as other published works, is what happens after the (often substantial) project funding runs out? Support from central university services is proposed, and a business case anticipated, but not actually presented. The authors also note that usability issues would need to be addressed for wider use to become feasible. Integration with enterprise systems has been achieved, although any changes such as new versions or upgrades would need to be addressed. What is not clear is where the mandate or resources to address these and other significant issues will come from.

Dede (2003) reinforces the point about the positive effects of dedicated resources on the success of elearning projects. He describes an initiative where investment in digital infrastructure was a key enabler of general improvement in the educational and professional development prospects in an American school district. In a study of ways the initiative can be scaled up, the author also identifies key questions that need to be answered to claim general applicability. Two significant points are that common purpose and shared vision brought various stakeholders together to solve a practical problem, so barriers to understanding, perceived relevance or the project gaining traction were likely to be absent. The other point is that a high profile researcher with external funding was instrumental in leading the initiative. This created an ideal set of circumstances that are unlikely to exist in institutions pursuing local elearning initiatives, however great the available technology resources are.

Dede (2003) also notes how organizational 'climate' and 'politics' influence progress, and that momentum was lost when school board members changed and a new agenda required refocusing of objectives. Stability and continuity were thus identified as additional success factors. A key strength of the initiative described was that data driven decision-making became instrumental in achieving the goals of improved student learning outcomes and increased organizational effectiveness. However, further research was needed to identify the types of data that would provide reliable evidence to support scalable, sustainable strategies for improvement for practitioners and policymakers. Further research is also needed to identify the conditions that contributed to success with generalizing improvements to other districts. So while this is an interesting successful case, it offers insufficient evidence to support general application, and corroborating evidence from further cases is required.

It's business – but not as usual

In a study of an initiative to embed blended learning in a university's teaching culture, Davis & Fill (2007) also endorse the benefits of the 'special attention' factor of project funding and dedicated staff. They describe the challenges that results when ' champions' retire or move on, and are replaced by staff with less knowledge or enthusiasm for the initiative. Faced with many demands on their time and not fully briefed about why and how particular approaches have been adopted, incoming staff may drop or reduce elearning components. They may be unable to defend the approach to colleagues or students. For those who continue on, there may be issues with maintaining and updating digital resources, especially if the information technology infrastructure changes, or the development and technical support initially provided through project resources is no longer available.

Those who subscribe to the promise of the 'learning object economy' promoted by authors such as Duncan (2004) and Campbell (2003), might respond to concerns about continuity by advocating reuse and repurposing of digital learning resources created by others and made available via centrally managed repositories. However, Davis and Fill (2007) noted that this approach to elearning was far from mature in the UK higher education sector, and in their experience, did not address the real needs of teachers for simple ways to adapt resources created by others without support from technical specialists. Gunn et al (2005) present a case study to illustrate the point, which Johnson (2003) endorses in a paper reporting the outcome of a meeting of thought leaders and practitioners from North America and Australia to discuss the state of play with reusable learning objects. In the latter case, a group came together to identify the systemic challenges inhibiting the realization of a functional economy in learning objects. The purpose was to explore the components of such an economy, and to identify obstacles impeding a reality where learning objects are created and shared, not only within sectors, but also across education, government, business, and national borders. The following quote sums up the discussion.

> No one at the meeting described the current level of activity as pervasive. Discussions over the two days focused rather on how to make the effort reach a tipping point… The issues with the

> learning object economy are content, content, and content. Unless we create an economy of content in which individuals and organizations can acquire, adapt, and repurpose content, the industry won't be successful, Johnson (2003, p7).

With hindsight, it is fair to conclude that the potential of the learning object economy has faded from view because its champions did not prioritize this pragmatic approach, and therefore, failed to reach a tipping point.

Fostering sustainable change

It is clear that sustainable change is a very different proposition to the special attention and resource richness of a funded project environment, and there is valuable experience within the sector to show how it can be achieved. However, it is also evident that this experience is not currently reflected in the policies and practices of funding bodies or recipient institutions. This mismatch is reasonably widely acknowledged, and there are cases that show how it can be addressed. For example, JISC, the UK-based sponsor of a Digital Libraries initiative aimed to ensure that changes made as a result of the project were embedded in the culture of participant institutions by requiring projects to continue for a further 2 years after 3 years of funding. The paper by Davis & Fill (2007) cited in the previous section was written during the two-year extension phase, and it would be interesting to revisit to see how it has survived five years on. The experience of the project revealed a number of factors that were considered critical to success in embedding the changes that the project funded. Active involvement of senior management is one such factor. While it may be easy to secure the letter of support that funding bodies require from senior management to indicate institutional commitment to projects, this often means little more than agreement to allow the project to go ahead without payment of overhead charges. As Lefoe & Parrish (2008) note in their report on an educational leadership capacity building initiative, senior managers need to be more actively and proactively engaged than this to make a difference. However, further challenges arise when the competing priorities and perspectives of senior managers come into the picture.

Challenges also arise from the recommended scale of change. The approach taken by Davis & Fill (2007) involved a complete curriculum review rather than changing a single module within a programme. The review supported identification of suitable places to include the elearning innovation that was the focus for the project. Selection was determined by the ability to serve specified learning outcomes and availability of suitable teaching staff as well as a range of other contextual factors. The challenge of bringing staff from an entire school or department on board is obviously greater, but so are the resulting benefits if the approach succeeds.

Funding is another critical success factor. Davis & Fill (2007) say their project would not have happened without external support. Although staff may be ready to change, they are not supported to take the risks involved in transformation. Support at the point of need is important, yet most universities offer support for elearning as a standardized central service. The limits on what is supported through this type of arrangement combined with the reluctance of central units to expand services and take on new systems is problematic. Staff need immediate support to allow them to continue their work uninterrupted. Many benefits accrue from funded projects, and a new service model that accommodates this type of innovative work is therefore required.

Collaboration is important for both obvious and unexpected reasons. In a collaborative project, it is reasonable to expect development effort to be shared and resources to be reused. Davis and Fill (2007) note that this happened to some extent, but that some benefits of collaboration were more subtle than anticipated, i.e. when working with staff from different departments across the institution helped project team members to gain confidence to deal with challenging times through a common sense of purpose. The authors also report on aspects of the project that didn't work so well, and these roughly reflect the absence of the various factors noted by different researchers as critical to success.

A holistic model for change

While describing a holistic approach to sustainable change, Buchan (2010) notes that only general references to the limitations of institutional support appear in the elearning literature, and explains this as a possible result of the historical separation of management and support from decision-making and use of ICTs. She introduces the concept of panarchy as a holistic approach to project management that offers a broad institutional perspective, while also centralizing the role of the individual. She defines panarchy as:

> …a systems analysis tool for describing and understanding the dynamics and complex inter - relationships of multi-scale institutional projects and the influences of a variety of factors on the learning environment, and on the potential success of elearning initiatives (Buchan 2010, p55).

Panarchy is presented as one of five heuristics in a social-ecological systems approach, which the author uses as the basis to develop a tool for para-analysis. The ‘para’ element of the analysis involves looking beyond the normal organizational perspective on project management to assess the potential impact of projects as well as physical and financial criteria to support decision- making around educational technology investment and support. The process is described in the context of an institutional case study, and involves mapping events and creating a visual representation of a system over time and space.

Four broad guidelines to sustain elearning initiatives include:

- Sustainable funding and IT services models
- A centralized project based approach to educational technology implementation
- A multi-stakeholder approach to managing the implementation of elearning
- Mainstreaming support after the project phase.

Buchan (2010, p73) concludes that this model also supports the decision that some technologies have to remain on the 'virtual horizon' until they can be properly resourced and implemented, and users can learn to use them effectively. There is, however, no description of the decision-making process or who would need to be involved.

The leadership challenge

All articles featured in the literature review for the current study either explicitly or implicitly point to the agency of strong and informed leadership for elearning innovations to become transformational, both across the higher education sector and within its institutions. While acknowledging that leadership and management are very different roles, the reality is that most universities are hierarchies where power and decision-making reside at the top level. It is therefore reasonable to assume that senior managers have a key role in decisions around elearning. In this context, the findings of a UK study commissioned by JISC (Duke, Jordan & Powell, 2008) give cause for concern. The study found that managers who combine a deep understanding of technology with senior management experience remain uncommon in the sector. The situation where management teams rely on collaboration between individuals with complementary skills to provide insight into the actual and potential contribution of technology to the strategic aims of the organization sounds fine on paper. However, in practice, these groups rarely include, or are influenced by front line teachers, despite them being the ones most deeply affected by decisions about technology, and having first hand experience for the organization to learn from. Gibbs & Gosper's (2006) article on the 'upside-down world of elearning' highlights the need for their voices to be heard and influence brought to bear. Otherwise, a worst possible scenario is that elearning will (continue to) be dominated by politics, power and the unrepresentative perspectives of people with limited experience of the workable nature of the elearning environments they are responsible for creating.

To paraphrase Gibbs & Gosper (2006, p51-52), unless educators play a more prominent role in the design of elearning systems and tools in the future, the sector will continue having to cope with the narrow view of education and pedagogically weak designs that are reflected by the capabilities of current systems. Technologies need to be able to accommodate the philosophical underpinnings, as well as the very broad range of activities that characterize teaching and learning environments. The authors equate the experience of using the currently common LMS as 'attempting to teach in a straightjacket', and quote an earlier study where the 'pedagogical awkwardness' of commercial systems led the author to develop his own simple system (Gibbs & Gosper 2006, p47). While the original statement was made some time ago (1999) many practitioners would relate to it today. Institutions should ignore the warning at their peril. Many academics are perfectly capable of pursuing independent courses of action, and in doing so, undermine the institutional objective to achieve standardization through the provision of secure and centrally supported enterprise elearning systems. This risk will exist as long as enterprise systems stifle innovation, as Kuriloff (2001) suggests they do.

Since Gibbs & Gosper’s article was published in 2006, an explosion of free software and social networking tools has increased the range of opportunities for teachers, and with it, the risks to institutions, which can neither stop nor control the tide of elearning innovation. To 'put the right side up', effective communication between software developers and educators is one necessary step, which they believe professional development for all parties may facilitate. In a few universities, people in these roles are co-located in an attempt to raise mutual awareness and increase collaboration, though this model is rare beyond specialist elearning units. Learning design is considered a key role for the future, as it can mediate between the technology and the pedagogy of different disciplines. However, until educators can articulate their teaching and learning needs more clearly, and software developers broaden their understanding of elearning environments and processes, the transformative potential of technology is unlikely to be fully realized. A major challenge is developing the strong and informed leadership capabilities that can steer institutions towards achievement of these objectives.

Working within the system

While innovation and user choice around elearning is definitely to be encouraged, there are clear benefits to framing these opportunities within existing systems. Gosper et al (2007) report on a project involving software selection in the context of curriculum redesign for a university program. The aims were common to those of many initiatives, i.e. to improve learning outcomes, and to increase flexibility of access and approaches to teaching and learning through the use of a variety of software packages and digital resources. It was important to ensure the solutions adopted were manageable within the existing infrastructure of the department and the university so support and maintenance issues did not become unmanageable. The selection process worked out for this case study led to the development of three instruments, which now offer a generally applicable CICTO (curriculum, ICT and organization) framework for selection and integration of software solutions. Key points to consider on the pedagogy dimension include support for an appropriate instructional methodology, integration, interaction, efficiency, effectiveness, value added and feasibility. The technical dimension focuses on process management, assessment, content creation and management, user management, usability and growth potential. Organizational factors are administration and interoperability, financial and asset management, policy compliance, support requirements, workload implications and risk management. These three instruments offer comprehensive support for faculty and academic support staff in selecting elearning tools and systems. They require discussion with technical and development staff, so may serve the additional purpose of raising mutual awareness among the different parties involved. Because they define key decision points that guide user choice, they can also be used as sustainability criteria for developers of elearning systems and tools, to ensure they would pass the selection test in institutions where similar processes may be in place. While the principle of working within the system could be interpreted as being limited by what it already offers, the instruments and processes devised by Gosper et al (2007) actually offer development potential and opportunities for organizational learning, which is a subtle but significant difference.

The future of elearning

Like all educational innovations, the future of elearning has frequently been questioned and remains contested in some quarters. At a time when major investment in online or e-universities was failing, Cronje (2006) rightly asked ‘who killed elearning?’ This marked the end of a period of intense, and with hindsight, totally unrealistic speculation about the potential profits from online education. Such aspirations are a common response to the introduction of any new technology. Early adopters and entrepreneurs rush in to explore the potential. When the period of speculation ends, practitioners with more realitically focused aims can explore the real educational value of various approaches and areas of application of elearning (or whatever educational technology is called). However, it is easy to see how senior management perceptions of the potential of elearning will be shaped by early experience, and endorsed by the limited success rate for funded projects that receive no support after an initial research and development phase.
Cronje (2006) points to misalignment of objectives and needs, contending that return on investment was the over-riding aim, when learning design, management and learning needs should have been equal or higher priorities. He also notes that target markets must be understood, and demand realistically forecast, and uses Khan's (2005) framework for elearning, which focuses on pedagogical, technical, interface design, evaluation, management and support, and ethical and institutional issues to elaborate the point.

When speculation dies down and more realistic expectations come into play, the management tendency to ignore, or even oppose elearning becomes problematic (Cronje 2006, p4). Failed expectations are one common cause of this, and limited understanding a driver. Coherent and concurrent elearning and change management strategies are required, although these can hinder or help, depending on how they are developed and implemented. The common practice of developing strategy at the centre without sufficiently broad consultation brings the problems of low practitioner involvement (Gibbs & Gosper 2006) and limited management knowledge (Duke, Jordan & Powell 2008) to mind. Further reference to McGraw (2001) highlights how poorly informed many approaches to the challenge of sustainable elearning are, and how easily management led strategies can overlook critical elements. In McGraw's paper, the omission is any significant focus on learning needs. For Broadbent (2001, cited in Cronje, 2006) the missing element is logic to a case that cites examples of failed technologies to justify the likely success of the latest innovation (the internet).

Cronje suggests taking the 'e' out of elearning, and returning to the core principles of learning'. For this, he proposes a blend of two approaches, i.e. the ADDIE model of instructional design with the balanced scorecard as a business model. He calls the result the learning scorecard; an integrated model for planning learning interventions that will be aligned with business objectives. However, the strength of his case, which is speculative rather than evidence based, is challenged, when he contradicts his own argument with this quote:

> A successful project is just 20% technique and 80% tactics… no matter how much we try to analyze factors that lead to successful implementation or sustained use of technology in education... it always comes down to human aspects that are simply impossible to quantify Romiszowski (2004, p24).

Cronje (2006, p6) ends with a comment that no one mourns the 'death' of elearning, and as far as the RoI driven movement is concerned this is probably true. For the educational community however, this 'death' marks the beginning of an era of opportunity to explore and exploit real educational potential without the shadow of profit motives and speculation distorting expectations, but with the legacy of failed expectations to overcome.

The problem with innovation

To conclude this overview of key concepts from the literature describing attempts to manage and sustain elearning innovations in universities, it is useful to follow Cronje's lead out of the discourse of education and into the business environment where innovation has been an integral feature for many years. In their seminal work *A Passion for Excellence*, Peters & Austin (1985) note that innovation has always been an uncertain and messy affair. Rather than attempting to control it, they propose designing organizations that take account, and even take advantage of the unpredictable and 'sloppy' nature of the process. Most organizations pursue tidier plans and better-organized teams to 'beat the sloppiness' out of the process, regardless of the fact that this approach has never proved successful in either business or elearning. A better approach would be for managers to learn to create organizations that can respond to, and support innovations. Peters & Austin (1985 p119-120) examine common myths about innovation that need to be dispelled for this to happen. While these were written in a different context, they apply equally to elearning, i.e:

- Substantial strategic / technological planning greatly increases the odds of a 'no surprises' outcome
- Complete technical specs and a thoroughly researched market plan are invariant first steps to success
- Time for reflection and thought built into the development process are essential to creative results
- Big teams are necessary to blitz a project rapidly, especially a complex one
- Customers only tell you about yesterday's needs

A quote that is frequently echoed and worth remembering is that:

> The initial use and vision for a new product or service is virtually never the one that is of the greatest importance commercially (Peters & Austin 1985, p123)

Innovations require very different types of organizational structure and process to that commonly found in universities. Returning to the problem of how funded elearning projects, as instances of innovation, can be transformed into sustainable products, there are some clear implications, but with apparently limited ability for institutions to act on them. To use an analogy from the business world, if projects were seen as the research and development phase of new products, which is essentially what they are, then sales, marketing and technical experts would step in to take them to the next level once proof of concept had been achieved (Gunn 2010, p98). Instead, when funding runs out, if the research and development team has not managed to devise a business model for a sustainable future, then valuable creative work and experience is left to founder.

Case studies and conclusions

This paper has outlined the first stage of a study of the 'state of the art' at the end of the first decade of the 21st century for ways to address the challenge of sustaining elearning innovations. Common problems with attempts to manage the innovation process are identified. One problem is a lack of knowledge among senior managers and decision-makers of what is actually involved in promoting the transformational change that elearning represents. Most of the literature cites management support as critical to success, so the problem is significant. Another challenge is the lack of mutual understanding among different players, i.e. technical staff and software developers, institutional leaders and managers, and teachers and learning support staff. A major barrier to progress is the failure of institutions to learn from the experience of their lead practitioners, or to respond to the needs of valuable educational innovations that exist outside the enterprise system suite of elearning tools. Where these innovations start as funded projects, the lack of ongoing funding and support, or ways to operationalize project outcomes results in low return on investment in both financial and knowledge building terms.

A range of proposed innovation management processes has been identified in a literature review. Analysis of a series of case studies is now in progress to see how these align with practitioner experience. Preliminary results show than initiatives that make a successful transition from funded start up to sustainable product are few, and typically involve exceptionally skilled leaders. Many of the attributes described by authors cited in this paper are present, i.e. adaptability, usability, fit for purpose and a sustainable business model. The most promising current approach combines open source and commercially hosted service, though some systems are purely open source, and a few purely commercial. While all the cases included in the study began as funded projects in some sense, the culture of the institution played a major role in subsequent development. There is, however, an emergent trend for collaboration across institutions that helps to transcend the limitations that arise from the local context of a single institution. Attempts to limit and control access to technical systems are thus being overcome.

The literature review provides the basis to draft guidelines to support sustainability prospects for innovations that prove to be educationally beneficial, technically feasible and practically possible. Development of the guidelines is progressing, using a collection of case studies of successful, stalled and struggling innovations to test usefulness in a range of practical situations. The higher education sectors and institutions in many countries have supported a project-based approach to elearning innovation for the last half a century. Many reports claim the model is flawed because inadequate provision is made for sustaining initiatives after funding has run out. Yet many excellent developments have resulted from the funded project model, and as yet, no viable alternative has emerged. The proposition emerging from the research described in this paper is that it is not the model that is flawed, but the institutional structures and responses that must change to accommodate successful outcomes.

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From funded project to sustainable product: elearning innovations in transition

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Abstract and Symposium Plan

The transition from funded project to sustainable elearning innovation has been problematic for many years. Most elearning innovations rely on seed funding for a research and development phase that is risky and resource intensive. Once proof of concept is achieved, different skills are needed for dissemination, integration and professional development, and a number of other factors are critical to long-term success, i.e. strong leadership, supportive institutional culture, senior management support, effective professional development and integration with existing technology systems.

In the current tertiary context, there is unresolved tension between the need to experiment with new educational concepts and tools, and the provision of standard, centralized and secure elearning environments. Valuable knowledge is lost when project experiences are not analyzed to inform parallel or future developments. This applies equally to small-scale, developments and broad concepts such as learning objects and open educational resources.

The discussion in this interactive symposium will begin with a working definition of ‘sustainable’ and a brief presentation of the strategies and success ratings from 22 Australasian case studies of funded projects that have achieved varying degrees of sustainability. Delegates will be invited to share their opinions and experience, and to debate the findings from an ACODE sponsored study that concludes:

- The concept of sustainability is problematic in a context of shared, adaptable and transitory ‘products’;
- Confidence in open source systems is limited, as leadership and resources are still required;
- Committed and capable individuals remain the single most important success factor for sustainable innovations;
- Institutional structures and process are at odds with the management and governance needs of innovations, resulting in some great elearning products with owners that don’t care;
- Project funding for two or three years is enough to produce a good working prototype but not a complete and self-sustaining product.

These findings challenge the relevance and expectations of the funded project model. With participants' consent, the outcomes of the discussion will be disseminated with case study findings.

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Teachers' Beliefs and Use of ICTs in Malaysian Smart Schools: a case study

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This preliminary study investigated Malaysian secondary *Smart School* teachers' beliefs about ICTs and how they are used in their classrooms. Using a case study design, data were collected from focus group interviews with 31 Science, Mathematics and English teachers from three Malaysian secondary schools, and from journals of three students. Results showed that although these teachers held positive beliefs about ICTs in education, these beliefs were not fully translated into their classroom practices. Most of them believed that ICT was just a tool to use in teaching and learning, particularly if it eased knowledge dissemination, and helped students to understand the content. The analysis revealed early career teachers were using ICTs in more varied ways than the more experienced teachers. Many of these early career teachers communicated with their students through blogs and online groups; practices that were rare among the more experienced teachers.

Keywords: ICTs, teacher beliefs, teacher practices

Introduction

Despite the increasing availability of infrastructure and equipment, teachers' use of ICTs, as reported in numerous recent studies, has been limited (Eteokleous, 2008; Lim & Chai; 2008; Nichol & Watson, 2003; Reynolds, Treharne, & Tripp, 2003; Sandholtz & Reilly, 2004; Smeets, 2005). In some studies of the extent of successful ICT use in classrooms, teachers were not fully using ICT in teaching and learning (Eteokleous, 2008; Nichol & Watson, 2003; Reynolds, et al., 2003; Sandholtz & Reilly, 2004), even when their schools were fully equipped with technology (ChanLin, Hong, Horng, Chang, & Chu, 2006; Zhao, Pugh, Sheldon, & Byers, 2002).

Teachers have often cited the inadequacy of ICT equipment and resources (Bauer & Kenton, 2005; ChanLin et al., 2006; Zhao et al., 2002), and the lack of adequate knowledge and skills (Brummelhuis & Kuiper, 2008; ChanLin et al., 2006; Eteokleous, 2008; Yang & Huang, 2008) as significant factors contributing to their limited use of ICTs in the classroom. However, Hokanson and Hooper (2004) suggested that the real challenges to teachers' uses of ICTs are pedagogical, curricular, and methodological. And to advance into higher levels of ICTs integration in teaching and learning, changes in teachers' beliefs are required (Hixon & Buckenmeyer, 2009).

Previous research has indicated that teachers' beliefs about ICT play a significant role in determining teachers' ICTs use (Ertmer, 2005; Ravitz, Becker, & Wong, 2000;Windschitl & Sahl, 2002), affecting their intentions to use ICTs in the classroom (Goos, Galbraith, Renshaw, & Geiger, 2003; Jimoyiannis and Komis, 2007), and the ways teachers choose to use ICTs in the classroom (Ruthven, Hennessy & Brindley, 2004). This study aims to build on this knowledge by examining teachers' beliefs and how they affect ICTs use in the classroom in the Malaysian context. The following research questions guided the study:

1. How are ICTs being used for teaching and learning of Science, Mathematics and English in the Malaysian secondary *Smart Schools*?
2. How do teachers' beliefs affect their use of ICTs for teaching and learning of Science, Mathematics and English in the Malaysian secondary *Smart Schools*?

Method

Participants

This study recruited teachers from three subject areas as participants. They were 31 teachers of Science, Mathematics, and English from three secondary *Smart Schools* in Kuala Lumpur and Putrajaya, Malaysia. Two Form Five students and one Form Four student were recruited (one from each school). These 31 teachers were divided into nine focus groups. Each school had a separate focus group for English teachers, Science teachers, and Mathematics teachers respectively. The number of teachers per group varied from three to five, depending on the availability of teachers at interview time. Only three teachers were male, while the rest were female. Their teaching experience varied from 4 months to 25 years. The majority of the participants held a bachelor's degree. Three held a master's degree and one held a diploma in education.

Data sources

This study adopted a case-study approach to explore the interaction between Malaysian secondary *Smart School* teachers' beliefs about ICTs and how ICTs are used in their classroom. It involved the use of focus groups and document reviews as main sources of data. Focus groups were used to understand the underlying beliefs that influenced those teachers' uses of ICTs for teaching and learning in specific subjects. A focus group protocol was developed and used to guide the discussions, and all focus groups were recorded and transcribed.

To provide an alternative perspective of how ICTs were used on a daily basis in the classrooms three students' daily journals were also used as a data source. These journals provided daily snapshots of how ICTs were used for the teaching and learning of Science, Mathematics and English in these schools. The students were provided with a bound set of journal entries templates which served as a guide to structure their responses.

Analysis

The data were first coded according to their sources and the research questions. Data analysis consisted of within-case analysis and cross-case analysis (Merriam, 2009). The within-case analysis took place first. For each school, the associated focus group discussions and student daily journal entries were analyzed to develop a rich description of the case. In order to understand the different uses of ICT observed in this study, the classifying scheme by Means (1994) was adopted. Means classified technologies according to how they are used for teaching and learning namely Tutorial, Exploratory, Tool, and Communication. The categories were applied to highlight differences in the instructional purposes of various technology applications. Following the within-case analysis, the cross-case analysis was carried out, exploring the similarities and differences among the three schools with regards to the research questions.

Findings

A significant finding of the preliminary study was that the teachers in the study generally held positive beliefs about the use of ICTs in education. Despite that, their focus on preparing their students for national examinations resulted in them viewing ICTs as tools that could help speed up or simplify the delivery of their teaching content. This led to the significant use of ICTs as presentation tools. However, further analysis showed that the early career teachers of the three subjects used ICTs in much more varied ways compared to their more experienced colleagues. These younger teachers used blogs, e-mails, online groups, online teaching, YouTube, Skype and movies, while the more experienced teachers preferred to employ the traditional, lecture-style teaching and learning method by utilizing mainly PowerPoint presentations and the teaching courseware.

Discussion

The findings from the preliminary study suggest that the teachers' different beliefs and practices regarding the use of ICTs in the teaching and learning of their subject should be further investigated. This may provide a deeper understanding about how teachers can share and learn from each others' differences to promote greater uses of ICTs for teaching and learning. These findings led to a more in-depth study which aims to investigate how early career and more experienced teachers can co-mentor each other to influence beliefs, ICTs practices and pedagogical practices.

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Appropriating Online Social Networking (OSN) Activities for Higher Education: Two Malaysian Cases

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Online social networking (OSN) activities are becoming more prevalent in higher education. The phenomenon can be observed in many higher learning institutions around the world. There are many ways of appropriating OSN for teaching and learning. OSN enables lecturers and students to publish and share knowledge quickly and easily. However there are also several challenges which include the limited skills in using social technologies among lecturers and students. This paper discusses the findings from two case studies conducted using an exploratory approach employing semi-structured interviews to gather lecturers' perspectives on their appropriation and use of OSN. The findings demonstrate a range of approaches used as well as the benefits and challenges faced by the lecturers in appropriating social technologies for teaching and learning. The finding can be used as a guide for other lecturers and educational designers to improve the use of OSN activities in higher education.

Keywords: Online Social Networking, Appropriating, Teaching and Learning, Higher Education.

1.0 Introduction

Online social networking (OSN) activities are becoming more prevalent in higher education around the world (Mason & Rennie, 2008; Hughes, 2009; Kear et al, 2010). OSN is defined as a range of activities enabled by social technologies and operationalised by a group of people (Hamid et al, 2009). In the context of this paper, the social technologies of interest include blogs, microblogs, wikis, social networking sites, video sharing sites and online discussion boards or forums.

The driving factors for adoption of OSN include the increasingly ubiquitous access, ease of use, functionality, and flexibility of social technologies (Brown, 2010; Schroeder, Minocha & Schneider, 2010). It has been argued that, in the context of higher education, social technologies can support social constructivist approaches to learning; they have the potential to extend students' construction of knowledge and promote student interaction (Ferdig, 2007; Schroeder et al, 2010; McLoughlin & Lee, 2008). A further benefit of social technologies provided on the Web is that they are often free or require marginal investment, removing a potential barrier to adoption (Brown, 2010).

While research into the use of OSN in higher education is gaining more momentum, there remains a dearth of research that aims to understand the different ways lecturers are appropriating these social technologies for educational purposes. Anecdotal evidence is rather inconclusive with regards to the benefits and challenges faced by the lecturers and students when OSN technologies are introduced for classroom activities. This research aims to conduct an in-depth analysis of two case studies examining how two different lecturers in two Malaysian universities have appropriated social technologies for educational purposes. The research also aims to identify the benefits and challenges the lecturers encountered in their use of OSN for their teaching and learning. The two case studies provide preliminary insights into the appropriation of social technologies, and the benefits and challenges of OSN use for higher education. This paper is expected to contribute and enrich current understanding of how lecturers appropriate OSN and the actual benefits, challenges as well as the outcomes as experienced by them.

In the next section we provide more detail about the concept of appropriation of OSN for education, and discuss the benefits and challenges of OSN in higher education as synthesized from the extant literature. This will be followed by an overview of the methodology and data analysis techniques used for this paper and a discussion of the findings from the two case studies. Lastly, the contributions, limitations and future research will be discussed.

2.0 Literature Review

Conceptually and practically, OSN enables its users to socialise and create networks or communities online. In the higher education sector, publicly available social technologies for OSN are being appropriated for educational activities. That is, technologies originally designed for social, or non-educational, purposes are being used and repurposed to support pedagogical approaches in higher education (Hemmi, Bayne & Land, 2009). There are several views on what appropriation means in the context of using new technologies. Degele (1997) argued that the concept of appropriation comes from creativity, with users creating new ways of using tools, distinct from what the developers and managers originally designed and developed the software or application for. Orlikowski (2000) viewed appropriation as 'technologies-in-practice' in the context of IT use in organisations. Waycott (2004) examined appropriation as the integration of new tools into user's activities, while Hemmi et al (2009) used the term appropriation to describe the use of social technologies in the educational realm. According to Jones and Twidale (2005), there are two types of appropriation: (1) serendipitous appropriation which includes the uses that arise out of spontaneous creativity, and (2) goal-oriented appropriation, where a user finds a technology that can help him or her satisfy a need or aid in attaining a specific, defined goal. Additionally, Fill et al (2006) argued that pedagogically appropriating certain technologies is part of a teacher's expertise. Hence, academics need to equip themselves with the knowledge and skills to appropriate social technologies for their teaching purposes.

Previous works, especially by Kennedy et al (2009) who studied the general use of information technologies by young students, and Hemmi et al (2009) and Jones et al (2005), who studied the use of social technologies, suggest that the appropriation of social technologies is not an easy and straightforward process. As higher education deals with a new generation of students who are perceived to be familiar with OSN and social technologies, the literature has shown evidence of some efforts made to use these technologies to support educational activities with a certain degree of success. However, the process of appropriation of the social technologies is not well researched and can be considered a big gap in this research space.

Researchers have also argued that the pedagogical and social affordances of OSN should be leveraged for enhancing educational outcomes of students (Lee & McLoughlin, 2008; Tay & Allen, 2011). Tay and Allen (2011) argued that students should be given the choice to use the tools that they feel comfortable and familiar with and that they believe are viable for completing the tasks at hand. In this regard, the social affordances of OSN might not be provided in one particular social technology but rather in the combination of several social technologies. Therefore, lecturers could be advised to avoid specifying social technologies but rather specify the processes for the students to discover what will work for them. However, this approach may not be practical for lecturers teaching large classes. Furthermore, it may be difficult for lecturers to translate the potential of social technologies into actual usage (Bowers et al, 2010). Bowers et al proposed a Web 2.0 learning design underpinned by the Taxonomy of Learning, Teaching and Assessing. They focused on technology as a mediator of interaction and at the same time emphasised the importance of considering the content and pedagogical aspects of the task when designing a Web 2.0 learning activity.

We situate our study within the framework of learning, teaching and assessing as discussed in Bower et al (2010) and also within the context of understanding the pedagogical and social affordances of social technologies described by Lee and McLoughlin (2008) and Tay and Allen (2011). Based on a comprehensive literature review, we identified four categories of OSN educational activities, namely content generating, interacting, sharing, and collaboratively socialising (Hamid et al, 2010). Most social technologies allow users to easily create their own content and also to actively share information, opinions and support across networks of users. Students can write entries in blogs or wikis or record an audio file for a podcast lecture series (Kaplan & Haenlein, 2010; Hemmi et al., 2009; Kane & Fichman, 2009; Ras & Rech, 2009). Generating content can also involve creatively producing multimedia content for posting on file sharing sites such as YouTube (Anderson, 2007; Sandars & Schroter, 2007). Using social technologies, students are easily able to publish their work and ideas in a public space for others to view and download. For example, multimedia files can be shared on file sharing websites such as Flickr, YouTube or Slideshare, and social bookmarking sites allow users to bookmark certain websites or tag keywords for users with similar interests to peruse (Andreas et al, 2010; Murray, 2008; Ras & Rech, 2009). Sharing content and information using social technologies can mean much more than just publishing them online. It may involve further improvement and enrichment to the content and information being shared. For instance, someone else might expand the contents by putting more facts and figures or correcting erroneous data such as on Wikipedia.

Social technologies support interactions among students by allowing them to actively participate in a discussion. They can leave comments on a blog or discussion board and ask for more detailed explanations, adding someone as a friend and initiating communication by leaving a message (Kaplan & Haenlein, 2010; Hemmi et al., 2009; Munoz & Towner, 2009). In addition, interaction can involve responding to others' blog postings, co-writing wiki entries to enrich content on a selected topic, and joining a group on social networking sites (Andreas et al, 2010; Kane & Fichman, 2009). Students can work collaboratively in an online social environment to solve certain issues or problems with their peers, or to organise social events (Andreas et al, 2010, Hemmi et al., 2009; Kane & Fichman, 2009; Munoz & Towner, 2009). By collaboratively socialising also, students can establish and actively communicate with the contacts made online, with the aim of working towards particular outcomes or producing deliverables, in both online and offline modes (Lockyer & Patterson, 2008).

Based on a review of the extant literature we have identified four major benefits of OSN use in higher education, namely improving engagement, enhancing learning motivation, offering personalised course material, and developing collaborative skills (Wheeler et al, 2008; Rifkin et al, 2009). OSN activities have the potential to improve student engagement and increase their participation in classroom, in particular among quieter students. Students can work collaboratively online, without the anxiety of having to raise questions in front of peers in class – or by enabling expression through less traditional media such as video (Wheeler et al, 2008). Quieter students may feel reluctant and hesitant to participate and interact actively in class. However, with the use of online technologies (be it blogs, wikis, Facebook, and etc), the students are more likely to participate online compared to face-to-face interaction as some students may have a personal trait of being shy to speak up in public. Students may also create a sense of belonging and ownership when they are given the freedom to publish their work online (for instance in the personal blog related to the course) or contribute to the class blog. Learning to use social technologies can further boost students' motivation and may, in fact, improve the overall quality of students' work. A study by Rifkin et al (2009) indicates that when students publish their work online for multiple audiences, the external audience motivates them to create original, interesting and engaging work. This in turn can lead to a more positive assessment from the peers and lecturer.

In addition, lecturers have reported that the use of online technologies can encourage online discussion amongst students outside school, beyond the traditional classroom setting (Gray, Chang & Kennedy, 2010). In the case of social networking sites or blogs, when students update their user profiles and personalise their respective pages, they can provide comprehensive information about themselves (e.g., full name, date of birth, address, educational background, hobbies, social, and even political or religious affiliations). The academics who are using such technologies in their classroom will then be able to learn more about the students they teach simply by viewing the students' profiles (Griffith & Liyanage, 2008). In response to this, lecturers can personalise the course material based on the students' profiles (Oradini & Saunders, 2008). Some social technologies such as wikis and to some extent blogs, encourage inquiry-based and collaboration activities among students. This opens room for active participation and can therefore create opportunities for effective learning. Linked with this principle of collaborative production, social technologies enable learners and teachers to share and publish artefacts produced as a result of the learning activity (e.g., course materials such as course syllabus, course notes, assignments, test cases, etc) and invite feedback from peers. By publishing and presenting their work to a wide audience through blogs, wikis, or podcasts, learners benefit from the opportunity to appropriate new ideas, and transform their own understanding through reflection (Dale & Pymm, 2009).

Previous research has also identified challenges associated with using social technologies in higher education. Jones et al (2010) conducted an empirical investigation of OSN use in four universities in the UK involving 76 questionnaire participants and 14 interviews with students. They found five challenges of social software for learning such as the separation of life and studying; originality and copyright issues; sense of information flooded; time constraint, and lecturers are not up-to-date and may not know how to integrate and make use of social software. Their findings confirmed in general the earlier issues highlighted by Kennedy et al (2009) based on their Net Generation research in three Australian universities. In their report, Kennedy et al (2009) listed six policy issues which teaching and learning with technology should address: student learning; diversity, equity and access to technology; curriculum and assessment; academic integrity; staff development and capacity building, and lastly, ICT infrastructure. Despite the benefits and challenges identified, Kennedy et al (2008) also cautioned educators that not all young generation students are attuned to OSN. Therefore, lecturers are advised to be mindful in their appropriation and use of OSN as to cater to the various students' learning preference. The literature discussed above has been used to establish deeper understanding of the topic and to guide the empirical data collection and data analysis for the research reported in this paper.

3.0 Methodology and Data Analysis

This section explains the process we used to collect, code, and analyse the data from two case studies examining the appropriation of OSN in higher education by two lecturers in Malaysia. We chose to use a case study approach because it is appropriate for exploring contemporary phenomena (Yin, 2003) and focuses on understanding the dynamics present in a situation being investigated (Eisenhardt, 1989). Using the case study approach, researchers gather rich depictions of the social context of the studied phenomena, resulting in rich and insightful information (Yin, 1994).

Research Setting

This research took place in two Malaysian universities. There are two main motivations for conducting this research in the localised context of Malaysia. Firstly, the principal researcher, who is Malaysian, has a better understanding of the context. Thus, understanding the culture, social values and language enabled the researcher to be fully engaged with the research context and develop a deeper association with the research participants. Secondly, Malaysian higher education has started to adopt OSN on a wider scale and young Malaysians are very active users of OSN (Zakaria, Watson, & Edwards, 2010). Therefore, the Malaysian context offers a good opportunity to explore the phenomenon investigated in this study.

The two case studies described in this paper are drawn from a larger ongoing study involving interviews with Malaysian and Australian lecturers. For the purpose of this paper, two cases considered revelatory cases were investigated in detail. In the first case, the lecturer applied a systematic and detailed appropriation process that has not been identified or reported in other studies. Further, in this case the lecturer no longer needs to allocate a certain percentage of marks in her assessment to encourage students to interact and participate. This is not typical and suggests that the appropriation of social technologies in this example has been successful. In the second case, the lecturer appropriated four social technologies seamlessly in his teaching. This, again, is an unusual practice: other cases generally only employed one or two social technologies. In both cases studied here, the students were pre-service teachers pursuing education degrees.

Data Collection and Analysis

The data collection involved interviews with two lecturers in two Malaysian public universities in July 2010 and August 2010. Potential participants were identified based on personal contacts and through their university's websites. The final selection of the participants to be involved was then based on their use of social technologies after they responded to an initial invitation. Interviewing was chosen as the data collection method because it provided the researcher with the opportunity to collect rich data that revealed lecturers' perceptions of the benefits and challenges they faced when appropriating OSN in their teaching practices. Bryman and Bell (2007, p. 474) argued that the use of semi-structured interviews offers flexibility where the interviewer "picks up on things said by interviewees" and "the interviewee has a great deal of leeway in how to reply". This approach also allows person-to-person interaction where the researcher is able to alter the line of questioning depending on the answers and discussion. Specifically, the participants were asked about the process they used to identify and appropriate OSN, the advantages they perceived of using OSN for their students and for themselves, and lastly the obstacles they and their students encountered while using OSN. The duration of interviews was between 40 minutes to 1 hour. The interviews were audio taped and transcribed.

The data were analysed manually using thematic analysis (Boyatzis, 1998). All interview transcripts were printed, read multiple times, and notes were recorded in the margins to identify potential themes. These were then collated, reviewed, and examined for connections and redundancies. Over time, the themes were expanded, contrasted and changed. For this current work, our focus is mainly on the appropriation process as well as the benefits and challenges of OSN use from the two lecturers' perspectives. To mitigate potential subjectivity bias and provide triangulation, the data analysis was reviewed by multiple researchers involved in this study.

4.0 Findings and Discussion

Table 1 below summarises the context of both case studies in terms of what and how social technologies were used. Below, we provide a detailed discussion of the findings based on the data analysis. First we discuss how the two lecturers were using social technologies to support OSN activities, then we describe the OSN activities in more detail, followed by a discussion of the processes lecturers followed when appropriating social technologies for educational purposes, and an outline of lecturers' reflections on the benefits and challenges of using OSN in higher education.

Table 1. Summary of OSN activities for the two case studies

Attributes	Case Study 1 (Lecturer A)	Case Study 2 (Lecturer B)
Social Technologies used by the lecturers	Blog and Facebook	Wiki, Twitter, Facebook, SlideShare.net

OSN Activities (used by both lecturers and students)	**Content generating:** lecturer notes, related link and examples. **Sharing:** related questions to test students' understanding and students can share draft assignment for feedback. **Interacting:** students interact and discuss topic assigned**,** give their reflection and for other students' to comment. **Collaboratively socialising:** Facebook used more for small group discussion	**Content generating:** Assignments prepared in Wiki, Slideshare.Net as substitute to LMS in publishing lecture notes **Sharing:** announcement, update and sharing interesting and relevant articles (post the link) using Twitter especially to unplanned updating **Interacting:** Informal interaction in Facebook to motivate and enhance students interaction **Collaborative socialising:** group work through Wiki
Assessment approach used by the lecturers	Assessment for interaction using OSN (in the past, lecturer allocated 5% to encourage and motivate students use of the social technologies. Currently, there is no need to provide such marks due to strong and positive support from the students)	60% of assessment marks for Wiki and it includes face-to-face and online interaction
Methodology used by the lecturers	OSN is used as a supplement to conventional teaching and learning approach.	
Issues faced by the lecturers	Time management Limited skills (students) Limited ICT infrastructure	Time management Limited skills (students) Limited ICT infrastructure

Social Technologies for OSN Activities

In Case Study 1, the lecturer interviewed is a female lecturer, aged more than 45 years old and has experience of teaching for more than 15 years. She holds a senior lecturer post at the Faculty of Education in an anonymous University A. Her passion in teaching supported by the use of technology is evident from her early career where she adopted Web 1.0 tools such as the Yahoo! Group and group email to support her teaching. In this particular study, the lecturer used blog on WordPress and Facebook.

> *"For teaching and learning, mostly I use blog (WordPress). I also use Facebook. However, I am not using Facebook for teaching, just for announcement purposes. It is very much like Twitter, we use it to let the students know what is going on."*

In the second case study, the lecturer interviewed used four social technologies seamlessly. The lecturer is a male, aged between 35 to 45 years old and has been teaching for 10 years. The course he is teaching is a core subject for final year undergraduate students in University B. Similar to the first case study, the students taught in this course are pre-service teachers who will graduate to become qualified secondary school teachers. The decision to use social technologies was influenced by the lecturer's own educational background; he also conducted academic research on the use of Wikis. In addition to the Wiki, the lecturer also used Twitter and Facebook to support communication with the students.

> *"There are four social technologies that I use. First* is *Wiki, second is Facebook and the third one is Twitter. While Facebook is really popular among my students, I used Twitter because it has the ability to send information very fast. Further, I don't have to use proper sentences to type in like in Wiki. Lastly, I uploaded my lecture notes on SlideShare.net. I asked my students to do the same."*

In the context of adopting social technologies, it is observed that the lecturers in both case studies have not resorted to using only one social technology. The use of supporting technologies in addition to the primary tools provides evidence of how social technologies have become arguably prevalent in today's classrooms. In both cases, social technologies are used to complement the traditional face-to-face teaching delivery. This also indicates that conventional teaching and learning is still relevant but made more relevant by introducing newer technologies to provide an enriched learning experience for students.

Online Social Networking Activities

Content generating: As can be seen in Table 1, in both cases social technologies were used for content generating. This included the publishing of lecture notes by the lecturers and sharing of the class resources. Further, the students also used the social technologies to generate content when they wrote up their reflections in blogs or prepared their group assignments in Wikis. In the first case study, students used blogs to write weekly reflections about the concepts they had learned that week. Because students published their reflections of what they had learned each week, the lecturer and students were able to easily chart the students' progress and understanding of the topic. The lecturer mentioned:

> *"I think I can now easily see how my students progress over the semester. I can gauge their understanding of the course by seeing how 'wiser' they have become (in relation to the course) at the end of the semester as compared to when they are in the beginning of the semester. Beyond assessing them in formal examination, at least this way also tells us whether we have achieved or not the learning objectives set early in the semester."*

In the second case study, the lecturer occasionally shared the links he found on the Internet with the students via Twitter instead of putting up the links on the course's LMS. The beauty of Twitter, according to the lecturer, is that it was fast and easy to use. Where necessary, the lecturer also sent notifications to his students if the class had to be postponed due to some unavoidable reasons.

Sharing: The lecturer in the first case study also shared related articles about the topic discussed and some of her past year exam questions she thought the students might benefit from. The lecturer expected that the students would in return use these past year questions to test their understanding of the topics and discuss among themselves for possible answers. Despite doing this, the lecturer acknowledged having no knowledge of whether the students were really using these past exam questions to prepare for their examinations. The lecturer in the second case study shared new contents uploaded to third party sharing websites such as Slideshare.net and later tweeted the information about the uploaded documents to the students via Twitter. The lecturer encouraged students to share the information with their friends who had no access to Twitter.

> *"Typically, every time I found new materials that I think my students would benefit from, I would share the links immediately on my Twitter. Sometimes I also share random thoughts that I have just to challenge my students' analytical skills."*

Interacting: In both case studies, the lecturers used the social technologies, particularly Facebook, to support informal interaction with their students. Similarly, students were encouraged to use the same medium to interact among themselves. In the first case study, besides the reflections made in blogs, the students were commonly seen continuing their reflections and discussions via informal interaction in Facebook. The second lecturer claimed that his students frequently asked him questions pertaining to the course on Facebook. This informal mode of interaction helped the students to tap more of the lecturers' expertise and this was beneficial to not only students who asked the questions but also other students who were just lurking on the class Facebook group. The use of Facebook was critical when it came to the group project. The students were divided into several groups in which they are assigned to develop a multimedia presentation related to the course's topic. The lecturer mentioned the active use of Facebook by the students to support their small group discussions (of 4-5 students per group) and this sometimes led to a face to face meeting among themselves.

Collaboratively socialising: The first lecturer (case study one) used Facebook as the chosen medium to support this OSN activity. She encouraged the students to virtually 'mingle around' with all the registered students in the class Facebook group. She claimed that some students preferred only to keep their socialisation among friends whom they were comfortable with. The lecturer also expected students to extend their socialisation into meaningful learning experiences (i.e., collaboratively socialising in common pursuit of amassing knowledge).

> *"I encouraged my students to collaborate among themselves in completing their group works. I frequently see the students interacting among themselves on Facebook and surprisingly, they are discussing about the assignments I gave them."*

The second lecturer widely adopted a Wiki for supporting collaborative socialisation among his students. The lecturer claimed that the Wiki was an 'e-whiteboard' where students could put up their work. This analogy described the ability of Wiki to hold an amount of students' work in the repository and where other students could edit (add, remove, change) the content easily. The collaborative work supported by the Wiki made co-creation of content easier, and the published final outputs could also be easily shared.

Appropriation Process of Social Technologies for Educational Purposes

In the context of appropriating social technologies for teaching and learning purposes, the lecturer in the first case study described a systematic way of identifying and using social technologies for her class. Interestingly, the appropriation process was strongly influenced by her own research interests in understanding students' learning preferences. The lecturer mentioned four stages involved in her use of the OSN activities. These were (a) pre-implementation, (b) choosing the social technologies, (c) designing and using the social technologies, and (d) assessing the effectiveness.

In pre-implementation, the lecturer made use of Biggs' learning style (Biggs, 2003) to understand students' preferences. Based on the lecturer's own research performed in 2001, the lecturer discovered that most of the students could be categorised as persons who prefer visual information rather than auditory information. She also discovered that the students who were introverts made up a small proportion of students and in comparison, most of the students saw themselves as extroverts. The lecturer conducted a simple SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis to choose the right social technology. Typically, the lecturer compared at least two social technologies side by side. In addition to paper-based SWOT analysis, the lecturer would test-drive the social technologies to assess their usability. This trial-and-error approach had seen the lecturer adopt Friendster, a social networking site, for a short period of time with her students. According to the lecturer the students liked Friendster and used it every day as for socialisation. However, the lecturer chose not to continue to use it because it could not be used to systematically upload content and useful class information.

In designing and using the social technologies, the lecturer looked at four critical considerations of her use of OSN; content, delivery, outcome and service. The lecturer developed the course content for both face-to-face lectures and the virtual interaction via blog based on the syllabus requirements. From the delivery angle, while the main approach was still face-to-face lecture, the use of a WordPress blog for course reflections was given strong emphasis. On the outcome side, the lecturer expected that the students' learning outcome would match the expected learning outcomes designed for the course. This was done through a set of assessments, discussed below. To address the service aspect of her use of OSN, the lecturer committed to posting something related to the course every week. She also ensured that she replied to the students' comments, however minimal (e.g., by saying something as simple as *"I noted your suggestions", "Thanks for your comment"* or more elaborate feedback such as by *"I totally agree with your view. Further, if I may offer an alternative view to that initial thought of yours …."*). The lecturer claimed that the comments would indicate to the students that she actually read and appreciated their replies. The lecturer also added that, if the students sent her a link to visit, she would make an attempt to do so and provide her own views about the materials shared by the students. By doing so, she believed the level of student's motivation would increase and they would be more engaged with the course.

For assessment, the lecturer normally assessed the students' works once they had completed their assignments. While the students could submit their draft answers via their blogs, these preliminary write-ups could not be considered as their finalised job. Hence, only after the due date of submission would the lecturer fully obliged to assess the students' outputs.

The appropriation approach demonstrated by the case study one above fits the goal-oriented appropriation as suggested by Jones and Twidale (2005). On the other hand, the lecturer in case study two arguably used the serendipitous appropriation in which the use of social technologies arose out of spontaneous creativity (Jones & Twidale, 2005). In this case, the lecturer had no clear process or formal preparation for the OSN use. Instead, the implementation just grew 'organically'. Specifically in the second case study, the lecturer spent some time explaining the social technologies he intended to use to complement the face-to-face lectures. The lecturer gave an overview of the technologies, demonstrated how these technologies would be used for the course purposes. He also asked the students to experiment with the social technologies to give them a sense of familiarity with the tools. The lecturer explained:

> *"I will allow the students to play around with the Wiki to get familiar with the tool. For example, in Wiki, I ask groups to introduce members of their group. They put in their profile, names, their area of specialisation, as well as their interest in becoming teachers, why do they want to take my course, sort of personal reflections within the group."*

For the course assessment, the lecturer allocated sixty percent of the course marks on assessment alone. These marks were mostly for the group work project in the Wiki. The levels of interaction among group members in traditional classroom setting and in Wiki were given emphasis. Asked about how the lecturer allocated marks for interaction, the lecturer argued that the quality of work determined the interaction level. He claimed that there was a correlation (while not numerically justified) between a high degree of interaction among students and the quality of students' work.

It is interesting to note that no common method exists either in the literature or found in the field pertaining to the way social technologies are being used for teaching and learning. Despite that, the first case study provides an exemplary case on how lecturers could systematically leverage social technologies for OSN activities.

Lecturers' Reflections on the Benefits and Challenges of Using OSN

The following discussion describes lecturers' reflections about some of the benefits and challenges resulting from their appropriation of social technologies for use in higher education.

Engagement and interaction: In regards to engagement and interaction with students, both lecturers in the two case studies believed they engaged and interacted better with the students particularly those termed as introverts. Both of the lecturers observed that students who were introverts had many good ideas to share with the class. However, their natural dispositions limited them from being vocal like the extroverts. Using social technologies as the platform, this situation could be overcome and the two lecturers noted that introvert students were now more competitive with their peers. This created a synergistic relationship, beneficial for students' academic development. According to the lecturer in the first case study:

> *"For introverts at least they now have a platform to communicate although they become lurkers in the beginning ... but at the end, if they want to start speaking, this will be the first platform."*

Appropriation of social technologies helped the lecturers in both cases to come up with creative and innovative ways of teaching and learning. Using more than one social technology provided variety, offering more options to create an enjoyable learning experience for students. For example, the lecturer in the second case study noted his class had changed into a more 'lively' environment after using social technologies. The students were more open and talkative (in a good way) as a result of their online interaction, having made their revisions and work together in a significant amount of time on Wiki and on other tools especially Facebook. According to the lecturer, this phenomenon was totally opposed to what he had observed in his previous classes that used the traditional lecture-based and the lecturer-centric approach.

Time management: The lecturer in the first case study found the use of OSN was not really time consuming. She even considered the use of OSN as really easy and said it required less work than the traditional mode of teaching. Pedagogically, she claimed that she just 'extended' her previous use of Web 1.0 tools such as group email to the new stream of applications labelled as Web 2.0. The lecturer in the second case study mentioned the ability of the social technologies to make learning go far beyond the realm of the physical classroom. Specifically, the lecturer argued that social technologies extended the classroom experience beyond the classroom hour into what he termed 'virtual time'.

> *"I think it becomes the extended class from my face-to-face meeting with the students. So it extends the class activity beyond the class hour. I cannot be there to monitor all their activities so I use these tools to monitor what they are doing and learning and what's their discussion all about. In short, when my student and I used the social technologies, we are able to have what I can say as the 'virtual time'."*

Challenge of limited skills: The lecturer in the first case study argued that the challenges of using OSN in higher education could be lecturer-specific. This is because she had not faced any major problems in using the social technologies. This observation might be true especially in the case of proactive lecturers who are appropriating and using these technologies without being asked to do so by the faculty.

The second lecturer, however, mentioned some challenges that had affected his students. For instance, he found it challenging to introduce the students to a new tool that was not familiar to them. While the use of Facebook appeared to be second nature to the students, a similar view could not be generalised to the use of Twitter and Wiki. The lecturer claimed that the students were not familiar with these two tools although they had some awareness of the tools. In general, the students had an awkward response when being told of the use of Twitter and Wiki for their classroom support. In order to overcome this situation, the lecturer had to encourage the students to experiment and acquire more skills through frequent use of the tools.

> *"Students are not familiar with the technology. I have to push them to acquire the skill. Generally, they have heard of it, seen it but never participate using it. I think it takes some time for the students to embrace and getting comfortable in using such technology (e.g Twitter) for classroom purposes."*

Challenge of limited access: The lecturer also faced another challenge in the form of students' limited access to the Internet. The class was conducted in the computer lab but beyond that, the students had to access the Internet via the university's campus-wide wireless infrastructure. Additionally, some students did not have the latest range of mobile phones that are capable of running mobile social technologies, particularly for Twitter and Facebook. Some students could not afford to own smart phones although all of them carried mobile phones. To respond to this problem, the lecturer and his students had to rely on the only communal access to the Internet, which was the computer lab where the class was conducted. Due to this reason also, the use of social technologies could only be considered as complementary due to limitation in its ubiquitous access.

5.0 Contributions, limitations and future research

The use of social technologies for educational purposes has changed the demands and direction of higher education. Lecturers are now being encouraged to use social technologies in their teaching in order to encourage social learning and to prepare students as graduates who will contribute to a society that now relies heavily on social technologies. From the evidence provided by the two lecturers in this paper, we found that OSN activities were used to complement current teaching and learning practices. The combination of one or more social technologies in enabling one or more OSN activities also demonstrates the confidence of the lecturers as well as the relevance of social technologies to support teaching and learning.

This paper enriches the current literature on the use of social technologies for teaching and learning which is still emerging. It also contributes to practice by providing empirical evidence of how social technologies can be appropriated successfully for harnessing teaching and learning in the higher education context as well as highlighting the benefits and challenges faced by lecturers in their use of OSN for teaching and learning. We have demonstrated that the selection of social technologies and the appropriation process are very much based on the preference of the lecturers. Thus, the wide range of social tools that are available as well as the flexibility offered by the tools to support various uses and applications may require creativity and innovation from the lecturers to appropriate the preferred technologies to support their specific needs.

There are some implications of this study findings for other lecturers and potentially, educational designers in planning, designing and using social technologies for their purposes. In particular, lecturers could consider taking up the systematic process of using OSN by meticulously planning and conducting for (a) pre-implementation analysis of students preference and learning styles, (b) conducting a formal evaluation of social technologies such as via SWOT analysis, (c) designing how OSN could be used for classroom environment, and (d) assessing the effectiveness of OSN use to ensure the teaching and learning practice achieves the intended learning objectives. For educational designers, the lessons learnt from the benefits and challenges of lecturers in using OSN activities to enhance teaching and learning should become the key pointers for them in enhancing and improving OSN for educational purposes. While many social technologies were not designed for educational purposes, this paper demonstrates they can be appropriated for teaching and learning with support of educational designers. To address the challenges such as the low level of familiarity in using certain social technologies for teaching and learning, educational designers could engage lecturers and their students in training sessions to give them the opportunity to familiarise themselves with the system design, features and usability of the social technologies. The limitation of this paper is attributed to its localised context of Malaysian universities and the limited number of cases which may affect its applicability in other contexts. Thus, more cases of appropriating social technologies for teaching and learning in various universities and in different countries would be useful to complement the findings of this study. In particular, cases that demonstrate both successful and unsuccessful uses of social technologies for teaching and learning would be valuable to increase our understanding about the appropriate use of social technologies in higher education. Future works could be geared towards developing a 'toolkit' that could assist interested lecturers to easily and systematically use social technologies for their teaching and learning.

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Bridging the Gap between OER Initiative Objectives and OER User Needs in Higher Education

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The *Open educational resources* (OER) movement is a new phenomenon in the field of education. Increasing use of Web 2.0 technologies along with growing competition between educational institutions have accelerated interest in the potential of such '*open*' educational resources. Some educational institutions have made their learning resources available online for learners for the purpose of encouraging knowledge sharing and improving effectiveness of teaching and learning. Furthermore, some community organisations are also hosting and supporting OERs. However, at least some reports from educational institutions indicate that the motivation behind this move to OERs might be driven more by a desire to enhance their reputation and attract new students to their programs, rather than the promotion of OERs. This paper presents the findings of a content analysis of a sample of OER websites undertaken to identify whether 'Net Gen' learner needs are adequately addressed by current OER initiatives. The findings suggest that although many educational institutions state that their OERs allow learners to share knowledge and extend critical thinking and interactivity, the OER community organisation sites reviewed appear to be offering learners greater opportunities for online interaction, critical thinking, and reflective learning practices than the formal educational institutions reviewed. The findings of the content analysis also suggest that OER initiatives do not necessarily meet learners/users' needs. The findings from this analysis are discussed and the implications for future uptake of OERs as a strategy for supporting widening access to education in response to the changing needs of learners are explored.

Keywords: Open Educational Resources, Initiatives, Web 2.0, Open Content, Qualitative Analysis, Electronic Learning, Interactive Learning, Learner Needs.

Web 2.0 technologies have opened up new opportunities for users to generate content and engage in collaborative efforts involving content sharing. Such Web 2.0 technologies are also gaining increasing acceptance in learning and teaching because they facilitate activities that 'enable learners to take control of their own education' (Franklin & van Harmelen, 2007, p. 21). 'Net Gen' learners, those born in the 1980s and after, are said to display certain learning characteristics such as preferring non-linear access and processing of information, multi-modal learning and learning activities that are active rather than passive (Oblinger & Oblinger, 2005). However, the literature suggests that there may be a 'mismatch' between 'Net Gen' learner and teacher expectations, and that new approaches are required to bridge this gap between the needs of learners and teaching practice (Kennedy et al., 2009). One of the emergent trends in response to such changing demands has been increasing interest in the potential of open educational resources for learning and teaching activities.

Open educational resources (OERs) have gained increasing attention because of their promise and potential for promoting individualised/personalised learning practices and facilitating lifelong learning. OERs, and more specifically wikis, are regarded as potential solutions for increasing access to education for learners from different cultural and/or socially disadvantaged backgrounds. This is because wikis support multiculturalism, do not require high technological specifications, and satisfy different user needs (Hanna & Metzer, 2011a, 2011b). Furthermore, more advanced Web 2.0 technologies and 3D Virtual Worlds can support the widening participation agenda for people in remote areas, and also learners with disabilities who may find it difficult to participate in on-campus learning activities (Wood, in press).

This paper provides an overview of the nature of open access and open content educational resources, the premises on which OERs are based, and the challenges facing the OER movement in a period of transition. The finding of a comparative review of OER initiatives, which considers OER objectives, target users, the nature of materials, and learners' FAQs, are presented. The assessment of OER users' needs and OER objectives provides insights that offer greater insight into whether there is consistency in the stated aims and achievement of objectives. Addressing these differences can help bridge the gap between the needs of learners and the OER services provided by educational institutions.

What are Open Educational Resources (OER)?

Open educational resources are electronic materials that are offered freely online for users. These materials include learning modules and content management systems (Hylén, 2006), which may be either open access (OAER) or open content (OCER). Open access educational resources allow learners to access and use educational content without (or with limited) restrictions. Open content educational resources allow users (including self-learners, students, and educators) to participate in the production of content, while also using and re-distributing the content. Figure 1 shows the process of production of OERS and illustrates the differences between open access educational resources and open content educational resources.

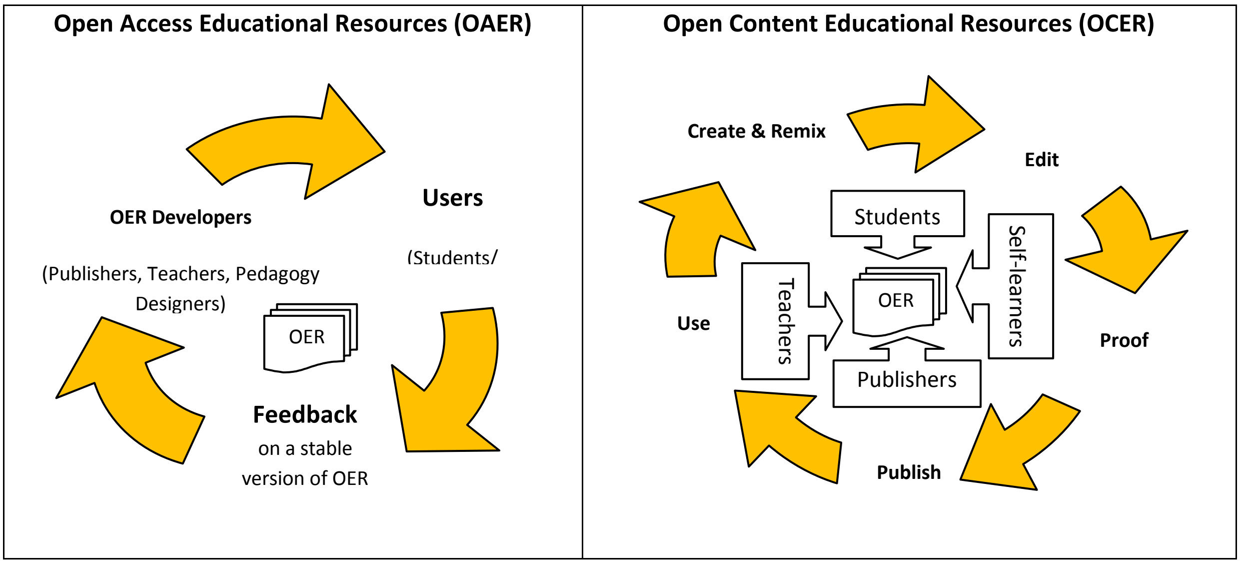

Figure 1: Production process of open educational resources

While OAER initiatives have contributed to the founding of OER repositories and have provided ongoing maintenance for host servers and content management systems, OCER initiatives also play a significant role in facilitating interaction, supporting production, and encouraging collaboration. Assessment of and discussion about the activities of some of the players in the OER market, as demonstrated in this paper, supports this view.

The goals of OERs

The primary goal of making educational resources 'open' through the use of Web 2.0 technologies is to disseminate and share knowledge for free (Yuan, MacNeill, & Kraan, 2008). Thus, OERs provide users with freedom from financial commitments and freedom from restriction of access (following Stallman, 1999). One of the fundamental basic rights articulated in the United Nation Declaration on Human Rights is that education should be (or shall be) free for all individuals (United Nations, 1948). OER initiatives, therefore, have the potential to provide the medium through which such democratisation of education can be achieved by providing 'a strategic opportunity to improve the quality of education as well as facilitate policy dialogue, knowledge sharing and capacity building' (UNESCO, 2011).

Grosseck (2009, p. 482) points to the growing uptake of the use of Web 2.0 technologies to enhance teaching and learning activities. He argues that the benefits of Web 2.0 facilitated activities include reduction in the cost of education, increased flexibility, ease of access to information, and the promotion of innovation. The 'knowledge-in-action' movement (Richards, 2009) supported by different applications of Web 2.0 has also contributed to the drive to 'reflective learning'. For example, Ras & Rech (2009) have found that the use of Web 2.0 technologies in education can significantly increase knowledge acquisition. The 'positive transfer' of learning *experience* instead of the 'negative transfer' of *knowledge* learning (Elgort, 2007) is one of the major reasons cited for incorporating Web 2.0 technologies in learning and teaching activities. As Bruns (2007, 2008) suggests, such technologies enable users to actively contribute in their capacity as product users, or 'produsers'; a term Bruns uses to describe the move towards community-based production, fluid roles, unfinished artefacts, and common property.

Many argue that the quality of OERs is indeed increasing, driven by 'open' market competition (Vukovic, 2009). It is argued that teachers and learners who are involved in the production of OERs, are motivated by 'altruistic ambitions', such as assisting developing countries and providing outreach educational services to disadvantaged communities (see for example GTP, 2005), while financial reward has been argued to be the least important motivating factor (Hylén, 2006, p. 6). Research undertaken to date suggests that the motivations of teachers and learners for using OER vary. For example, the findings of a quantitative study published on the OERCommons website (OERCommons, 2010c) suggest that students are using OERs to complete their assignments (9%), while self-learners either want to learn a new topic or expand their knowledge (~59%) or to stay current (~36%). The findings further suggest that teachers are using OERs to gather ideas for their lessons (~35%), to supplement their lessons (~30%), or to improve their teaching methods (~28%). It is apparent from these studies that the reasons for using and interacting with OERs differ according to the varying needs of different users. These findings illustrate that while learners use OERs to complete their assignments and expand their knowledge, teachers use OERs to learn new ideas for their lessons and improve their teaching methods; but both learners and teachers appear to also want to stay current and have the opportunity to network with others (Metzer & Hanna, 2011).

Hylén (2006) suggests that competitive educational institutions embark on the use of OERs for differing reasons including: 1) learning from the community about what courses work and which do not; 2) providing rapid diffusion of their courses; and 3) seeking different revenue models. However, the question remains as to why community organisations also become involved in the OER movement? Moreover, one might question whether there any differences in the reasons for user interactions with OER between OER initiatives, and further, whether there are differences between the motivations of users and the ways in which OERs are used in educational institutions and community organisations. Do OER initiatives satisfy OER user needs? Are there any differences between the explicit OER objectives documented via OER websites from the underlying implicit objectives? Regardless of whether the providers of OERs are educational institutions or community organisations, the nature of content production is argued to be the key issue in assessing objectives of OER initiatives against OER users' needs. To answer such research questions, a content analysis of a sample of OER websites was undertaken.

Method: Content analysis of OER initiatives

The main focus in content analysis of websites is not only on the technical features of the website, but also on the message form and the content, with a 'diagnostic-eye' on such matters as links, spelling, browser compatibility, image optimisation and accessibility (Newendorf, 2002), assessment of company's policies (Polariski, 2007), security, visual appearance, convenience of order process, information quality, responsiveness (accessibility of service and contact information) and interactivity (Chiou, Lin, & Perng, 2010). In other words, website content analysis has to date largely been a matter of evaluation. Gibson *et al.* (2003), for instance, applied comparative content analysis to assess party political election websites. Schweitzer (2008) found that websites of minor parties were underutilising the standard functions of websites, while major parties ran e-campaigns through sophisticated and interactive functions. While such studies may be useful in their own right, this project demands a different orientation. If website content analysis is to collect evidence of information presented to its users, then it should also be possible to use website content analysis to collect data for analysis focusing on an examination of the stated explicit objectives of OER initiatives and whether these objectives are met.

This study involved firstly identifying OER websites via a web search. From the relevant sites identified, a semi-random sample (Bourgeron, Humphries, & Jensen, 2001; Sim & Wright, 2000) of websites was chosen for further analysis. The comparison of OER initiatives involved establishing the following research criteria:

1. **The OER site stated objectives:** Content analysis involved assessing the stated objectives taking into account target users and the nature of OER materials available from the website.
2. **Target users:** Each OER website, either implicitly or explicitly, has identified target users. Understanding which users the site targets help in the assessment of the rationale of the OER initiative.
3. **Technology:** An analysis of the technology employed and features of the OER websites was undertaken to determine whether the objectives of initiating the OER are achievable. For example, if an OER website aims are to enhance collaboration among learners, but the technology employed in the website does not facilitate collaboration, there is very little likelihood that the stated objectives can be met.
4. **The nature of resources:** The educational resources available from OER websites might include textbooks, audio/video materials, simulations, course guides, educational games and educational software. Furthermore, these resources might be *open access* or *open content*. Content analysis therefore involved both identifying the nature of resources available and determining whether these resources can be characterised as being either open access or open content.
5. **The FAQs:** Since there is no way to survey users and understand their needs, the content of their frequent asked question help in understanding these needs. The questions by themselves are meaningless, so answers are represented to show common themes of needs of learners.

Results and discussion

The comparison of the selected OER websites is presented in Table 1. The analysis was based primarily on examination of each website's home page, the about-us page and the FAQs page. Other pages within the website were reviewed when more information was required for the purpose of comparison.

Table 1: A comparison of OER websites

OER	**Open Content Educational Resources OCER**	**Open Access Educational Resources OAER**
Website	**Connexions**	**OpenCourseWare**
Objectives	Connexions aims to encourage collaboration and of information sharing among learners, scientists, and people who do not read and write English, to address the increasing cost of textbooks, to make educational texts available to learners to access, and to reduce the time between production and distribution of textbooks (Connexions, 2010e)	To unlock knowledge, empower minds and help people who are socially disadvantaged. MIT, by launching OpenCourseWare, sought to enhance its reputation. Users are able to reuse the content providing they acknowledge OpenCourseWare (OCW) authors (MIT OpenCourseWare, 2010g).
Users	Authors who collaborate and create content, instructors who build and mix collections, and learners who would like to explore content (Connexions, 2010b).	The courses are available for any self-learner who would like to know more about the subject. However, learners are not awarded academic credit by MIT (MIT OpenCourseWare, 2010d). Learners of these courses are global and include: North America 40%, Europe and Russia 20%, East Asia 20%, India 8%, North Africa 5%, and Sub-Saharan Africa 1% (MIT OpenCourseWare, 2010e).

Technology	CNXML & MathML in addition to MS Word Importer (Connexions, 2010c). Content is open to learners as open access, however, in order to create content, an account must be opened. Creation of content is open to anybody. It is preferred that content is created in small modules since small modules make it easier for users to remix (Connexions, 2010d).	Static webpages, files available for download in Microsoft Word, PDF and in compressed zip files by clicking on 'download course material' link on the left menu (visit this course for example MIT OpenCourseWare, 2010f).
Resources	Textbooks (scholarly content) on which users can collaborate, from children to college students to professionals (Connexions, 2010a).	High quality open access courses which users can access. Resources include: course description, syllabus, lecture notes, readings, and assignments (MIT OpenCourseWare, 2010a). This website consists of different courses at college (university) level. These courses are available for open access by self-learners.

FAQs	Once they have accounts, OER authors, who are mainly professors and teachers, can create educational materials. Only authors can edit their created modules. However, users can make a copy of existing module and edit it as needed and republish it. Teachers and lecturers can customise their learning materials by mixing modules together to create new books, courses, syllabuses, and lessons, and to meet different learning styles of their students. Teachers cannot, however, test their students using quizzes or exams. There are options for self-assessment available for students. Students and self-learners can read and use these created modules. Connexions provide open educational resources that are free to use and reuse around the world. It supports different languages and different educational levels across more than 190 countries. OER brings people back to education. OER also help potential authors to publish their work (especially k-12 teachers, scientists, engineers and people who do not read and write English). The recognition that authors receive for their published work 24/7/365 universally is a great incentive. OER also help solving the high cost of textbooks (average cost $120). It helps by bringing current knowledge to learners instead of out-of-date of printed materials. In order to help users to find quality materials they need, connexions is developing a system that help authors to setup their own review process, and directs users to the content that	The use of MIT OpenCourseWare is free and no registration is required. MIT OpenCourseWare does not provide quizzes and exams; MIT faculty publishes content only. Only a few video lectures are available because production of video materials is very costly. Non-MIT-Students cannot have access to course-pack materials because they are copyrighted. Only copyleft materials are openly available to MIT OpenCourseWare users. MIT OpenCourseWare is not distance learning, so no degree, credit, or certificate can be obtained. However, those who wish to be MIT students, they need to contact MIT Admissions Office. However, in case of that organisations or teachers use MIT OpenCourseWare materials, acknowledgment should be made. Any translation to other languages should be accompanied with a specific MIT OCW disclaimer. MIT OpenCourseWare does not offer users the opportunity to contact MIT OpenCourseWare authors, as it does not involve interactive experience. Materials in MIT OpenCourseWare are openly available to users for non-commercial educational purposes. Materials on MIT OpenCourseWare published by their MIT staff only since MIT take the final responsibility of their materials. No download, copy, modify, reuse, remix, and redistribute MIT OpenCourseWare materials should be made without permission from the

	judged to be 'high quality'. This is done through allowing users to tag and comment on modules. Connexions allow dynamic, interconnected and engaging environment since it helps learners, students, authors and instructors to communicate cross-institutions and worldwide. (Connexions, 2010e).	copyright owner. MIT also offers OCW Scholar courses which are designed specifically for independent learners, hoping that learners provide their feedback and suggest ways to reshape content. These OCW Scholar courses are elementary courses. There are some messages and announcements from other MIT programs on MIT OpenCourseWare pages. (MIT OpenCourseWare, 2010c).
Website	**Wikibooks**	**OLI**
Objectives	To provide open books for an open world. To create free content in terms of freedom and money. To give back to humanity and help others. Teachers can use customised textbooks for their students, and learners can challenge themselves by making contributions. Authors can publish their books (Wikibooks, 2010c).	To allow independent learners to access open and free resources (material and activities). To allow instructors to build and customise their courses (OpenLearning Initiative OLI, 2010e, 2010f).
Users	Self-learners, instructors, institutions, and authors (Wikibooks, 2010a, 2010c).	Students, instructors, and institutions wishing to actively engage their students in material in various ways (OpenLearning Initiative OLI, 2010g).
Technology	Wiki which supports multilingualism	HTML, Java applets for simulations (see for example OpenLearning Initiative OLI, 2010b; 2010h which involves a simulation). This website has two groups of courses. The academic courses are not visible to self-learners. Students who have invitations can enrol when they enter the course keys. The free courses are open for any learners.

Resources	Open content textbooks that anyone can edit. These resources include: textbooks, annotated text, instructional guide, and manuals which all are instructional material (Wikibooks, 2010d).	Courses available are classified into two types: 1) Academic courses that are designed by instructors to create customised courses for their students. Low per-student maintenance fee (student may pay these fees on enrolment in their institution). Students can access instructors. There are graded exams. Instructors can trace student learning (OpenLearning Initiative OLI, 2010a, 2010e); 2) Open and free courses, which are designed for self-learners who are not supervised by instructors. Users are free either to register or anonymously use the content. There are no fees, tests or quizzes (OpenLearning Initiative OLI, 2010c, 2010f). All courses include course materials, computer simulations, course schedules, computer-based tutors, virtual laboratories, and self-assessment modules.

FAQs	Wikibooks aims to create free educational resources. Anyone can contribute to Wikibooks. Users of Wikibooks can download any content they like, and printing any book is also welcome by clicking on 'Printable version'. Users can communicate with other users through email lists. They can leave messages on talk pages of other users. Registered users can communicate with other registered users who have registered their email addresses by clicking on 'Email this user'. Users can contribute without having accounts; however, signing up with an account gives a registered user many benefits such as positive reputation of quality work. IP addresses of registered users remain unknown. While users, who seek recognition for their contribution, can use their real names, registered users are not required to use their real names. Users can change their pseudonym to their real names by 'Request for renaming' if they want. There is no mechanism to ensure that information in Wikibooks is correct and current since any one can edit. However, because there are many contributors, incorrect information is usually edited quickly. Users can create their own textbooks, guides, and manuals in Wikibooks. Debates and discussions are welcome in discussion pages as they help to improve content. Users, by contribution to Wikibooks, make information resources free to access. Contributions are being updated on ongoing basis which means they receive built-in feedback on their contributions.	OLI offers two kinds of courses: 1) open and free courses which allow a) access to resources, b) simulation and self-assessment, c) formative feedback to students; 2) academic courses, which in addition to the above listed affordances, also allow d) access to instructors, e) graded exams, and f) credit for course completion. OLI courses are offered based on education research: choice of and content of the courses are determined on the basis of empirical studies or the findings of evaluations. These courses are continuously updated based on feedback from instructors and students obtained through formal evaluation studies. Users have the right to opt-out from such studies. OLI expresses interest in working with teachers who would like to be part of ongoing evaluation and would like to adapt OLI courses for better teaching experience. Although accessing open and free courses does not require that users have an account, it is recommended that users create accounts to allow them to track their progress. Academic courses require registration. OLI does not grant any credit of any course. However, those who undertake Arabic courses can receive credit from the institutions of their instructors. OLI users who undertake free courses can download grade book results as a proof of their completed courses, but this does not grant credit (OpenLearning Initiative OLI, 2010d).

	Wikibooks considers users who have dial-up connection, so there is a limit of 30 KB of page size. The site provides features that are aimed at preventing or limiting acts of vandalism (such as deleting paragraphs from a webpage) and also a facility enabling users to recover texts. Logged-in users can track certain pages if they add those pages to personal 'Watchlist' by clicking on 'Watch this page' link.(Wikibooks, 2010b).	

An increasing number of educational institutions have embraced the OER movement in response to the rapid evolution of information technologies, globalisation and its impact upon economy and social life, as well as the growing competition between educational institutions (Wiley & Gurrell, 2009). Such factors have encouraged educational institutions to be part of the 'open' movement. Although some educational institutions, such as Carnegie Mellon University and Massachusetts Institute of Technology (MIT OpenCourseWare, 2010b; OpenLearning Initiative OLI, 2010g) have made educational resources available online for self-learners and students around the world, these resources have largely remained open access, rather than open content.

The reasons, whether explicit or implicit, for providing educational resources online for students and self learners vary, but centre around the following: 1) To encourage collaboration and knowledge sharing; 2) To make positive use of technology and allow wider access to information; 3) To maximise the impact of individual research by allowing individuals to publish their research; 4) To extend research; 5) To improve teaching and learning effectiveness; and 6) To foster critical thinking.

Table 1 shows that while some of the institutions included in this study demonstrate altruistic motivations for participating in the OER movement (for example, the provision of educational resources for the public good), the findings from content analysis suggest that they are also seeking social and economic benefits (see also McAndrew et al., 2009). Such social and economic reasons for developing OERs include: 1) Developing the institution's reputation and enhancing recognition; 2) Other implicit motivations, which 'might' include advertising their fee-based courses and their methods of teaching and learning inside the university; 3) Increasing earning revenue by selling their open course materials to instructors if they wish to re-use the content; and 4) Developing course materials for the public to edit and speed up the development of courses, whether for internal purposes or for external re-use. Examples of those institutions that seek financial and social reward are MIT and OLI. Organisations such as Connexions and Wikibooks that freely make their resources open to edit and re-mix, also make revenue by selling printable versions of textbooks and from accepting donations. These forms of revenue are important to ensure their sustainability. The most important issue is freedom in terms of money and contribution. The findings also suggest that some of the OER initiatives that are hosting quality educational resources are publishing their OER materials with minimum editorial assistance at a fee to cover their operating costs.

The findings also suggest that the reasons for users accessing and editing educational resources include: 1) The desire to acquire knowledge for free; 2) They are inspired to share their knowledge with others; 3) They seek to publish their work to receive recognition; 4) Editing OERs increases their understanding through peer review; 5) OERs help users to develop their networks through emailing authors, and communication via discussion boards or discussion pages; 6) They want to help others, especially those who are economically disadvantaged, or giving back to their community. Teachers appear to be using OERs to: 1) Develop their customised course materials; 2) Re-use the available content with some minimal restructure and editorial effort, thus saving them time; 3) Engage their students in the production of knowledge as constructive teaching methods and gaining feedback on student progress; 4) Enable students' collaboration; and 5) Encourage students to translate, which may lead to localising knowledge according to society's needs, and enhancing the students' reflective learning.

The analysis of objectives for those who initiate OER and responses to FAQs show that they differ from those of OER '*produsers'.* Such analysis demonstrates that although some of these objectives are clearly stated, the content analysis suggests that OER educational institutional initiatives are not maximising the affordances of sites to meet the target users' needs (see Table 2).

Table 2: Objectives of OAER educational institutions and a critical assessment of achievement for OER *users*

OAER Education Institution Initiatives	Learners (mainly users ONLY)
Enhance the community	Learners are part of the community and their skills indirectly help to develop the community. However, users perceive that the attainment of certification/qualifications is still important. This is understood from questions, published in FAQs pages on institutional OERs, from learners about whether they will be able to receive certificates for courses they studied or not (MIT OpenCourseWare, 2010c; USQ OCW, 2010).
Unlock knowledge	Although learners are able to access information and learning materials, they are not able to share information and discuss issues and problems because most of institutional OER are only open access rather than open content.
Increase the university's reputation	Evidence suggests that by initiating OER activities, the university's reputation may be enhanced. However, do users really care about the university reputation? Furthermore, since users appear to be concerned about the need to attain formal recognition through their participation (MIT OpenCourseWare, 2010c; USQ OCW, 2010), the benefits for universities may not be fully realised.
Advertise their courses	Users who seek OERs look for free courses (or free sources of information). New comers to the for-fee courses, who visited the free courses, are willing to pay and the free courses they use are 'test-drive' offerings (MIT OpenCourseWare, 2010c; Open Michigan, 2010; Open Yale Courses OYC, 2010a, 2010b; USQ OCW, 2010).

Enhance research skills	Since the institutional hosted OERs reviewed are open access and do not allow contribution and collaboration between members of research groups (to identify problems and seek solutions), the potential for supporting the development of user research skills is limited.
Develop critical thinking	It depends on tasks provided in those courses. The development of these skills would be further enhanced if the OER websites provided opportunities for discussion and feedback.
Allow collaboration and networking	In most cases, courses are '*open*' in terms of open access, and the opportunities for collaboration are reduced in sites that do not provide communication tools such as wikis and discussion boards
Develop learning and teaching methods	Some institutions allow teachers to reuse material (with special acknowledgment).

Table 2 indicates that the potential of the sites in achieving some of their stated objectives are not fully realised because of the identified limitations. Educational institutions could benefit from incorporating some of the features of not-for-profit (NFP) OER initiatives. Table 3 illustrates the objectives of NFP OER initiatives and the corresponding achievement of users' needs.

Table 3: Objectives of NFP OCER initiatives and a critical assessment of achievements considering the OER *produsers*

Non-for-profit OCER initiatives	Learners (and they also can be *produsers*)
Unlock knowledge	This objective is likely to be achieved since users can be proactive in creating and sharing content and they can reflect on their understanding and share their experience in the content.
Foster openness	The sites reviewed maximise the affordances of the open content movement by enabling users to edit, share, use, reuse, remix, download the content without (or with minimum) restrictions.
Increase research skills	The openness, and the ability of collaborative writing and sharing information, as well as discussions, allow users to develop their research skills
Enhance collaboration	The sites reviewed employ features that maximise the affordances of collaborative learning environments by providing opportunities for collaboration through discussion pages, discussion boards, built-in messengers, visible email contact of users, and wikis (or any similar technologies).

Develop learning and teaching methods	This objective is facilitated by enabling teachers to use the content, reuse, and remix. Learners are also to edit content and share their experiences supported by the collaborative nature of the sites.

This paper identifies two kinds of OERs: OAER and OCER. The findings from comparative analysis of these different OERs suggest that education institutions which produce and host OERs, are offering OAER for learners, while community organisations that are responsible for maintaining and running content management systems for OERs are showing a greater trend towards supporting OCER. As discussed in this paper and shown in the preceding comparative analysis, the objectives for not-for-profit (community) OER initiatives differ from educational institution OER initiatives. Furthermore, the findings of the OERCommons survey (OERCommons, 2010a, 2010b, 2010c) suggest that teachers are using OERs in their teaching and learning activities for a variety of reasons. Teachers derive both direct and indirect rewards from such involvement. Such rewards might include career enhancement as future contributors in the 'open' movement. Moreover, since remixing and editing requires time and effort, '*produsers'* may undertake these activities to make their time more productive. It might be argued that those self-learners who want to learn without necessarily attending school, may be seeking more productive use of their free-time. Moreover, as with not-for-profit organisations, some OER websites publish photographs and information about socially disadvantaged areas of developing countries (GTP, 2005), and in this way motivate users to contribute to the OER movement to promote social justice.

Conclusion and areas for further research

This paper highlights the increasing interest in the use of OERs for teaching and learning activities. Since, as the literature suggests, 'Net Gen' learners have a preference for active and collaborative learning, it is reasonable to expect that OCER initiatives are more likely to meet their needs than OAER. Although OER initiatives aim to make educational knowledge available for free to learners, as outlined in the objectives of institutional OER and NFP OER initiatives, the findings from this study demonstrate that open content OERs potentially hold additional benefits for their users than open access OER alone. Since OER users are demanding more benefits for themselves, such as developing creative thinking skills, unrestricted access to knowledge sharing and collaboration, the future of OER will be for open content material, not for open access material alone. Universities, schools, and research institutions need to be prepared for such a transformation of learning materials to meet the changing demands of learners in a knowledge based society.

Although this research did not survey or interview contributors to the OER movement or users of OER sites themselves, the analysis undertaken of users' FAQs provides some insight and understanding of their needs. This study is also limited by the small sample of OER sites included in the analysis. Moreover, the study would be strengthened by incorporating inter-rater reliability reviews of the sites. Future research involving interviews and focus groups with OER users, both teachers and learners, would help to provide greater insight into the benefits of OERs in teaching and learning. Despite these acknowledged limitations, the study has highlighted areas for further consideration by educational institutions that are positioning themselves to respond to the changing demands of 'Net Gen' learners and the widening participation agenda.

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Implementing e-learning: A migration story

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The shift to an open source learning management system (LMS) raises questions for the integration of technology and pedagogy in an institutional approach to e-learning, and for strategies to build effective student learning through staff development. Implementation at La Trobe University involved the migration of over 1300 subjects to Moodle by the start of Semester 1, 2011. This paper describes this process as a migration story in which successful implementation is a necessary but not sufficient stage to achieving an effective e-learning strategy, in this case, one that meets particular pedagogical needs by embedding pedagogical choices that match the blended learning needs of a multicampus university. The risk is that implementation defaults to technology requirements, and is enacted in a way that pre-empts and sets the conditions for academic development in e-learning. This paper examines the ambiguity of "implementation" that arises from the separate goals of LMS configuration and pedagogical needs.

Keywords: e-learning, learning management system, Web 2.0, academic development,

Background

This paper describes the university-wide implementation of the open source learning management system (LMS), Moodle 2, at La Trobe University for the commencement of Semester 1, 2011. The e-learning environment at La Trobe University presents a complex, multicampus environment, with a student population of 29664 (in 2010) distributed over two city and four regional campuses (69.9% at one city campus), for which a primarily blended learning approach is adopted for undergraduate degrees. This learning environment includes large student cohorts (over 1000 students), and subjects that are taught simultaneously over several campuses.

The LMS implementation occurred as a response to external contingencies, and the consequent choice of LMS involved a level of institutional risk: support for the existing LMS was to cease at the end of 2010, and Moodle 2 was a first-time installation in an Australian university. In this context, implementation was structured as a content migration project, managed externally by Netspot, and modelled in part on the implementation of Moodle at the University of Canberra (Carter & Arnold, 2009). The project aimed to migrate or transfer all subjects from the previous LMS to Moodle for use at the start of Semester 1, 2011, and to train as many academic staff as possible to a level of minimal functionality of Moodle.

This paper aims to raise the questions about implementation that are directed towards establishing sustainable e-learning in the university: what does implementation entail when it is scoped beyond functionality? How should staff development and support be designed if it goes beyond a technology training program? Will an LMS migration project default to a transmissive pedagogy, or can migration embed pedagogy as well as content into e-learning?

It's not purely technical

The commitment to e-learning by universities is shaped to a large extent by economic imperatives and the potential of information technologies for massification and extending learning over distance (Goodyear & Ellis, 2008; Snyder, Marginson & Lewis, 2007). It is not surprising, therefore, that as LMS have become mainstream in universities over the last two decades, there has been a tendency towards the "management system" aspect of the LMS and a transmissive approach to learning (Lane, 2009; Bayne, 2008; Malikowski, 2008). This emphasis is currently under challenge with the advent of Web 2.0 and PLEs (personalised learning environments) (Downes, 2010; Mott, 2010; McLoughlin & Lee, 2010), nevertheless, the use of LMS broadly reflects what Goodyear and Jones (2003) identified as a "default pedagogy" (p. 40) based on "access" and a functional transmission of content. In this approach, the technological *how* may come to shape the pedagogical *what*. The persistence of the troublesome accommodation between technologies and practice in e-learning is captured by Blin and Munro (2008), who comment that despite the investment in LMS in universities:

> there is little evidence of significant impact on teaching practices and current implementations are accused of being focused on improving administration and replicating behaviourist, content-driven models (p. 475).

The issue with institutional learning technologies arises when their implementation is framed by technology system requirements that exist prior to a project and set conditions for e-learning. In this instance of implementation, there were technical and external imperatives for instigating a university-wide migration project, hence a critical goal was for the new LMS to be functional and usable for all subject university wide. A migration project implements a model of minimal, or "interoperable change" (Marshall, 2010, p. 180), rather than disruptive or transformative change. From the broader perspective of institutional teaching and learning strategies, however, LMS functionality and usability are really a means to student learning, hence the challenge remains for staff to be able to integrate the new LMS into their teaching practice, and incorporate academic goals into e-learning. Function is not enough to address this challenge.

The migration story

The strategy for implementation of Moodle at La Trobe University was framed as a content migration project which aimed to achieve widespread technological functionality with minimal staff disruption. A program of staff communication and training included these components:

- Preparing teaching staff by migrating their subjects in the new system without effort on their part. Staff were encouraged to postpone development of new or revised subjects.
- Staff support and training consisting of a program of workshops for staff from November 2010 until the week prior to Semester 1 in late February 2011. Attendance for these workshops indicated that 48% of academic staff completed the Moodle basics workshop (see Table 1).
- Staff support and training that included the production of 26 guides in PDF format, 15 two minute short videos, demonstrations, student "rovers", staff drop-in centres (La Trobe University, 2011)
- Student support via a Help desk, Student guides (PDF and HTML), and Video Guides.

Table 1: Moodle training workshops and participation

Training workshop session	Academic staff
Moodle basics:	1239 (48%)
More Moodle - Groups & Groupings	171 (6.7%)
More Moodle – Quizzes	142 (5.6%)
More Moodle - Gradebook	139 (5.4%)
More Moodle - Assignments & Turnitin	34 (1.3%)

Initial reports in early Semester 1 on the content migration project indicated success in functional terms: the system remained stable at times of critical use, for instance, in the first week and on the due date of the first assignment.

The content driven model: Implementing what?

Implementation of institutional e-learning necessarily involves trade-offs and negotiations between competing institutional and pedagogical goals (Marshall, 2010; Uys, 2010). This instance of implementation was determined by contingencies that required a fast-track process of content migration to the new LMS. With the selection of Moodle occurring in June 2010, the system becoming available to users for subject development in October 2010, leaving little time and few resources for familiarisation and subject development. These implementation demands – for full functionality of Moodle across the university by the start of Semester 1, for widespread but minimal training – overshadowed or postponed the opportunities for a more pedagogical approach to e-learning staff development, and for exploring the potential for an open source LMS such as Moodle for incorporating uses of Web 2.0 and social media. The goal of large-scale migration framed implementation as a "content-driven" model, conducted through an information technology (IT) project management process, raising questions concerning the type of e-learning that is produced or put in place on completion of the migration project, and how technology and pedagogical design can work together to build an environment for effective student learning.

Professional Development: A model of ownership, excitement and engagement

If the above outlines an information technology (IT) approach to LMS migration, including a tools training component, then the question remains: What kind of academic staff development should be pursued once the migration team has moved on?

What we propose as a follow-up to the migration training is a reaction against the dull, under resourced, IT-driven, passive service approach. It is more than just advocating a pedagogical stance. It is about academics taking ownership of what they do, carefully crafting a pedagogy adapted to a very flexible medium, and adding excitement, engagement and specificity to a bland institutional environment. To encourage ownership and unique pedagogical craftsmanship we outline the following important elements:

26. **Learn by doing**: rather than academics having things done for them, for example content upload or the creation of discussion forums, academics should design the learning themselves.
27. **Scaffolding professional development**: lecturers would 'do it themselves' but in consultation with staff such as academic developers, learning technologists, educational designers, and/or media production staff.
28. **Adopt a project approach**: Part of the mechanism that enables scaffolding and assistance is the means by which support staff can walk academics through the process of creating a learning design and implementing a constructively aligned learning environment. Adopting a project approach provides a formal methodology that facilitates professional development and learning environment creation. The project could be very small scale and not too onerous in its implementation. Process and product must be balanced.
29. **Provide a creative environment**: The first three points need to be packaged within a creative environment to encourage expansive thinking and novel solutions. The lecture-tutorial paradigm has a history that is centuries old in higher education, so its abandonment (or supplementation) requires creative use of the digital medium. The promotion of an open source-open course set of values also encourages an expansive mode of thinking (see below).

Sometimes criticised as a "cottage industry", implementations of this approach, such as the Courseware Design and Development Program at the University of Melbourne (Hirst et al, 2004), have demonstrated that enough academics participating in the program can produce a critical mass of people creating interesting and engaging learning environments. Models can then be promulgated and adapted, but with a specificity of creative expression that the institution has always allowed and encouraged of its individual academics in teaching.

Zooming out to a broader view than assisting the individual academic, there is a role to play for a central university unit and local faculty staff working in cooperation to scaffold the learning. A network of centre to faculty and faculty to faculty cooperation provides the broader framework for strategic developments to live alongside individual initiatives. Top-down and bottom-up can co-exist where values embrace the contribution each can make to the e-learning experience. Such a mutual compact is also dependent on each side acknowledging the contribution the other can make.

The OE Model: Open Source, Open Course

Alternative approaches to the adoption of e-learning via the content model described above have been enthusiastically adopted for some time now. MIT's Open Education (OE) is a celebrated demonstration of one such model, and extends the concept of open source software to educational resources in order to revolutionise the way that students, academics and institutions interact (Baraniuk, 2008, p 229). Since 2001, MIT has been sharing its courseware online through its OpenCourseware project, and at the time of writing has published more than two thousand courses, with a hundred million visits recorded (MIT OpenCourseWare, 2011).

Cambridge University is one institution to adopt this approach to the provision of e-learning resources. The Centre for Applied Research in Educational Technologies (CARET) provides Cambridge with its LMS, Sakai, and supports this through the active involvement in the Sakai developer community. CARET's e-learning strategy takes the view that technology changes rapidly, and is expensive, and that online learning is unlikely to be a major component of face-to-face learning. It therefore adopts an approach to "operate as an innovation unit" by identifying and developing innovations that make learning better or easier, and "support R&D with University learning and teaching innovators".

Australian universities have by and large been slow to adopt an OE model that goes as far as MIT's, and few have even gone as far as Cambridge in making innovation a truly central component of the support for their LMS. Indeed, OE as a philosophy is about more than choosing an open source LMS, just as there is no necessary connection between choosing an open source LMS and adopting OE values as an institution. However, the recent adoption of Moodle in a number of institutions such as La Trobe may signal a step towards the support for innovation, if (a necessary if) open source technologies are used to extend OE values to the educational experience.

Conclusion: Challenges for implementation

While academics are expected to be proactive and reflective in their teaching practice in face-to-face settings, why is it often acceptable for them to passively assign tools in an e-learning environment? Critical to the approaches outlined above, both learning by doing and the OE model, is the provision of an opportunity to explore potentialities of e-learning, by establishing a supported space of conversation and innovation around student learning goals. Where information technology goals frame implementation, the complexity of e-learning in a university is dramatically reduced, but at the cost that pedagogical choices are presented in packaged form, and innovation is pre-empted and foreclosed. The challenge for the OE model of e-learning starts *before* the technology arrives, to re-scope implementation to encompass the pedagogical effort and learning goals of its practitioners: teaching academics, academic developers, learning technologists, and educational designers.

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Should we teach an old game new tricks?

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The Middle East Politics Simulation (MEPS) is a simulation of diplomacy and political tension in the Middle East. This online role-play exercise is aimed at providing students with an improved level of understanding of the political dimensions of the region. Having been run since 1993, the MEPS has not had any major updates to its platform in all those years. However, as such a mature online entity there is the question of whether the MEPS will continue to engage students as their expectations of what constitutes an online role-playing environment became steadily raised by their familiarity with more graphically immersive platforms. The reliance on social media tools for students and political figures to use as conduits for communication is also unrepresented in the MEPS and the subject of some student dissatisfaction in previous years.

This research assesses student attitudes towards the MEPS with an eye to balancing the demands of technology, functionality, equity of experience, security and, most importantly, learning outcomes.

Keywords: Role-play, social media, simulation, student engagement, politics, Middle East

Background

In deepening student engagement the use of role playing simulations is well established and known to offer positive outcomes in the teaching of Politics and International Relations subjects (Asal, 2005; Boyer, Trumbore, & Frick, 2006; Chasek, 2005; Hintjens, 2008; Sasley, 2010; Simpson & Kaussler, 2009). The Middle East Politics Simulation (MEPS) is a successful example of such a role play. A simulation of diplomacy and political tension in the Middle East, the MEPS is an online role-play exercise aimed at providing students with an improved level of understanding of the political dimensions of the region. The students take the roles of various political actors concerned with the Middle East and their lecturers perform the function of "Controllers", generating initial story lines, adjudicating and facilitating the simulation.

The intended purpose of using this form of role-playing exercise in delivering Middle East Studies subjects is to demonstrate the complexity of political dialogue the practical challenges and compromises that face the actors in this part of the world. Throughout its history, the developers and convenors of the MEPS have believed that this large collaborative exercise offers a deeper and broader comprehension of these realities in comparison to the more theoretical understandings that may be gleaned from a traditional assessment task such as an essay (Vincent & Shepherd 1998). By using an online platform to deliver the MEPS, the exercise can run 24 hours, thus deepening the immersion level further, as well as allowing the participation of off-campus students and those from other universities.

The MEPS has been running since 1993 and is currently administered by Deakin University, although other universities regularly participate. A text-based environment, the MEPS is viewed on a web browser over the public Internet and the site is accessed by a login/password barrier. Still operating through a low-bandwidth, simple HTML interface, the current MEPS system has had no significant upgrades since its original roll-out, the platform having been built as part of an Honours project by a computer science student at UNSW.

With such longevity, the MEPS has survived many trends in technology, e-learning and distance education in Australian universities. Literature describing the MEPS has consistently indicated the high level of student engagement and learning outcomes (Dracup, 2009; Hardy & Totman, 2011 (forthcoming); Ramsden & Watson, 2003; Vincent & Shepherd, 1998). Moreover, it has served as an exemplar for a subsequent generation of role play tools utilised in Australian tertiary teaching (Wills & McDougall, 2009).

The utility of the MEPS as a learning tool therefore seems apparent and its continued use desirable. However, as such a mature online entity, the convenors wondered whether the challenge of engaging students might increase as their expectations of what constitutes an online role-playing environment became steadily raised by their experiences with more slick and graphically driven tools. Even the very term 'simulation' occasionally causes confusion because in the popular mind a simulation is something more visual, for example a flight or driving program. Likewise, the phrase 'online role play' also conjures impressions of more immersive visual environments along the lines of World of Warcraft or Second Life.

Another omission from the MEPS platform is the sort of micro-blogging or file sharing tools associated with social media or Web 2.0 trends. At the time the MEPS was created, such functionality was unknown to the majority of the population, as indeed was the World Wide Web itself. Today though these tools are ubiquitous and to some extent *de rigueur* for inclusion in any web-based environment, particularly one that is principally concerned with communication.

So given these real and supposed short-comings, is it time to update the MEPS or is it a case of not needing to fix something that isn't broken?

The Status quo

The MEPS site is extremely serviceable but lacks some of the visual polish and functionality that the current generation of university students might expect. It is fundamentally an email emulator with some extra functions attached, such as an area to view news, a section for posting role profiles of the different teams, a diary/sandbox for intra-team communication and a live chat tool.

The core function of email emulation is fully serviceable and does not tend to cause any major complaints or problems. There are some slight visual issues caused by students pasting material out of Word documents, causing 16-bit characters like curled apostrophes to display as strings of symbols, but this cannot be classified as a serious impediment to functionality. Nor are there any consistent problems with other text publishing functions of the site, such as the diary or role profile tools.

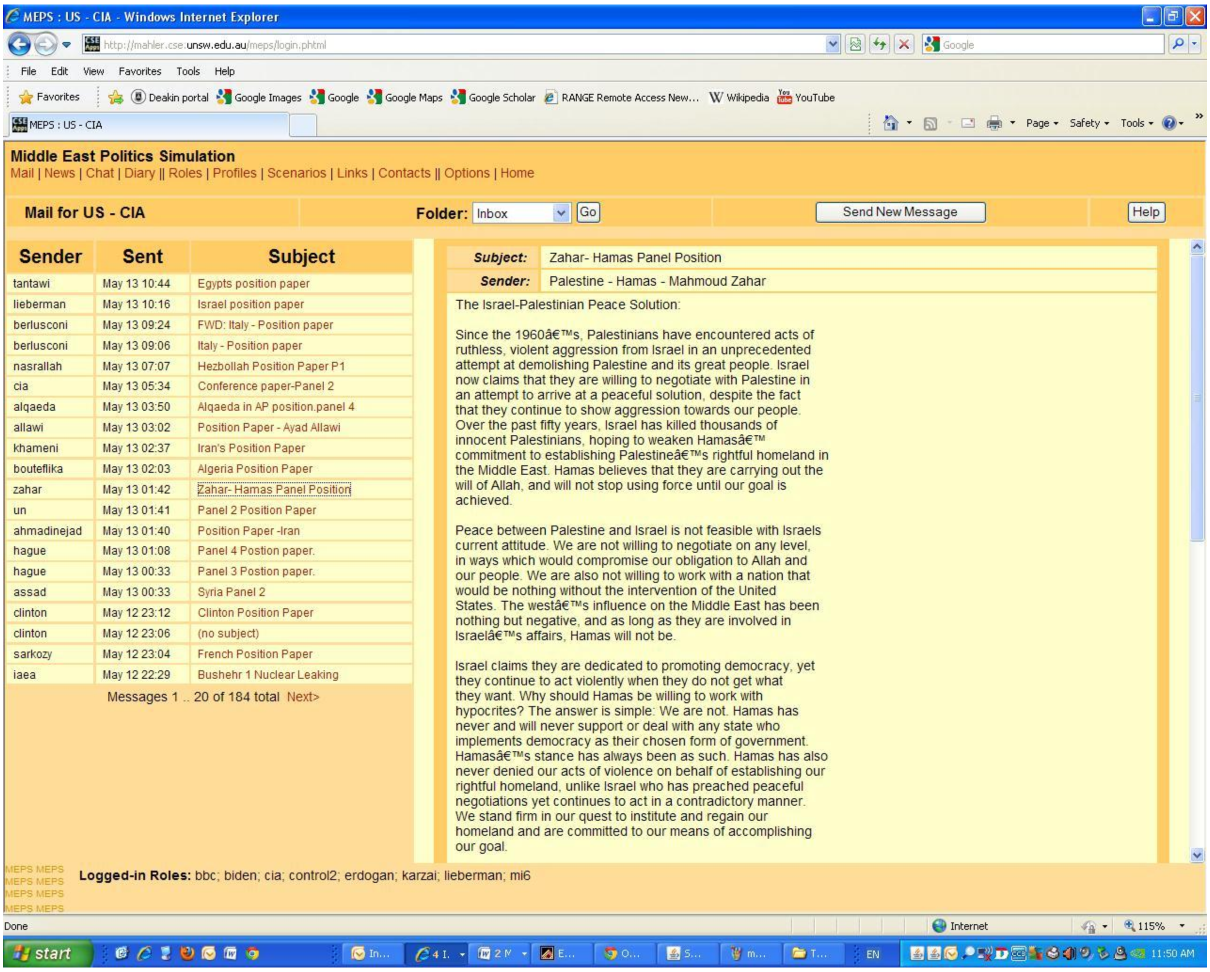

Figure 1: Screen view of a team Inbox in the MEPS

There are however two issues that do cause some annoyance each time the MEPS is run. The first of these is a steadily increasing incompatibility with each advancing version of Internet Explorer. This causes some areas of the site not to display properly, depending on the user's IE version and operating system. Naturally this can be completely avoided by encouraging the use of alternative browsers such as Firefox, but not all students have the skills for installing such software, nor is it necessarily an option for those using shared or public computers.

The second area of concern is the chat function. The chat tool pre-dates most commercially available instant messaging clients and therefore lacks many of the benefits of what would today be conventional wisdom. The three chief grievances with the MEPS chat tool are (a) that users must refresh the frame manually to see new messages/replies; (b) anyone in the MEPS can enter a chat session so there is no way of guaranteeing confidentiality between teams; and (c) navigating away from the chat window breaks one's session. Users who return to the chat window will then be re-logged as a new user identity, differentiated by a number. For example, obama1, obama2, obama3. Confusingly, the old user identity still remains visible in the session participant list, even though it is now inaccessible.

This is extremely problematic because participants in a chat do not have the option to check back to their emails or refer to other material without breaking their session. In a large chat session, the window quickly becomes full of notifications of duplicate user identities entering and leaving. Occasionally it can become so unstable that the entire session crashes.

Figure 2: MEPS chat window showing broken session

There have also been some regular expressions of yearning to add Web 2.0 functions such as micro-blogging or Facebook-style updates and file sharing to the MEPS. Partially this stems from an assumption that students use these things in their private lives and therefore might expect their inclusion or that the availability of these things will make the MEPS more enjoyable for them. However, it increasingly needs to be considered that in a world where senior politicians and even terror groups make full use of the Internet to post their opinions or Tweet, such social media tools are now actually a legitimate aspect of simulating political discourse.

On the other hand, increased functionality and its demands can alienate those students who are not as comfortable with using such tools or have no desire to use them in their studies. Given the growing weight of evidence disputing the Digital Native hypothesis (Cameron, 2005; G. Kennedy, et al., 2007; Kvavik & Caruso, 2005) the provision of extra functions within the MEPS may generate inequalities between users and raise levels of anxiety about what is already quite a daunting exercise.

The purpose of this research is to therefore to assess student attitudes towards the MEPS, both in terms of the experience they have with the current system and with what they believe should be added in future iterations. The core concerns of our research is the need to balance the demands of technology, functionality, equity of experience, security and, most importantly, learning outcomes.

Specific challenges

Any overhaul of the MEPS will face the generic challenges involved in the development of any online learning tool. These would include the pedagogical questions surrounding learning experience, scaffolding and instructional design, as well as the technological issues of platform, stability, access and of course, budget. Since these factors are so ubiquitous and applicable to any new implementation, it is not worthwhile dwelling on them within this paper. However, there are some specific obstacles that the MEPS gives rise to through the nature of its content and game mechanics. These do need to be considered since they are fundamental to both the long-running success of the simulation, as well as any future re-versioning.

The first difficulty that the MEPS faces with any design or upgrade is the nature of its content. The plotting of terrorist acts, violent responses to them and anti-Western (or anti-Semitic) rhetoric is an everyday occurrence within the simulation. Students are playing the roles of terror groups, intelligence agencies and state representatives and communication 'in character' is the whole point of the exercise.

Such content needs to be carefully quarantined from the outside world lest it be taken out of context. The Australian Security Intelligence Organisation (ASIO) is informed when a MEPS session is running so that if their electronic intelligence gathering is alerted by the simulation's traffic, an explanation is available. Participants are also asked to sign a pledge not to discuss the simulation's 'events' through any channel outside the MEPS site, except between their university domain email addresses. This legal proviso was instituted in 2009 after an incident where a student text messaged her team-mate regarding their plans for a bombing attack on a mosque. Regrettably she used the wrong number and the message was sent to a member of the public who then alerted anti-terror authorities. The matter was cleared up though not without the student and one of the convenors facing some unsympathetic interrogation from the police and the university's legal department.

This incident provides a salient lesson on the need for keeping the MEPS secluded from public channels. This includes being cautious about mixing the MEPS with the university's LMS and/or email system. At present it is impossible for a MEPS email to travel outside the interface, even accidentally, since with the bespoke email emulator there is no such connectivity for this data.

Secondly, the team assessment nature of the MEPS requires provision to be made for joint account access. At present team-mates share a username and password to access their account. This is another barrier to utilising the university's LMS, since it would require the creation and sharing of accounts not associated with real individuals. Moreover, because the MEPS regularly involves students from other institutions, this would require them having access in the same manner. Such obstacles are not insurmountable, though it can be imagined that organising this through the multiple stakeholders in a university IT system would generate some degree of extra administration. (Conversely, the fact that the MEPS has sat within an obscure UNSW domain server for all its life is perhaps responsible for its lack of evolution, in that it has not been necessary to adapt across the two or three different LMS versions that most universities have been through over the last 15 years.)

Thirdly, the mechanics and assessment of the MEPS require that the controllers be able to see all emails sent or received by the teams. This is for purposes of grading their role-playing. At present this privilege does not require extra log-ins for the controllers, but is achieved through a dropdown menu. Again this poses a technical challenge to using some off-the-rack solutions or an LMS.

Lastly, the size of the MEPS in terms of teams and participants is large and varies from session to session in terms of exact team numbers and team identities. Since the simulation is used across different units of the Middle East Studies major sequence at Deakin, there are different emphases in different sessions. For example, in the second trimester of every year, one of the units (The Politics of Terrorism) has a much greater stress on terrorist groups and this entails creating team roles that are not present in trimester 1. Moreover, the identities of the team roles can change as politicians and groups come and go in the real world. Lastly, the number of users, teams and members per team needs to adapt to cohort enrolments, students opting to undertake the MEPs as their main assessment task and other variables. In the last five years student numbers in any MEPS exercise have ranged from 120 to well over 200 in a trimester.

All of these potential variations mean that any MEPS platform has to be scalable and flexible enough to adapt to what is essentially a unique run for every session.

These four main concerns form the context in which any potential upgrade to the MEPS system needs to be examined within.

Question and methodology

Given that there are some known technical issues with the MEPS an upgrade does seem desirable. However some of the other reasons for considering an upgrade are based upon supposition, such as an assumed student desire for social media type tools. With this in mind, it was decided to survey students as to their experience with the MEPS and their thoughts about what features they thought would improve the simulation.

A questionnaire comprising open- and closed-ended responses was utilised for canvassing student opinion on the MEPS. This method was employed as it provided the best opportunity to sample large numbers of students.

Gathering a large number of responses was deemed desirable because the complexity of the role play (100+ students, 60+ teams) offers such a range of individual experiences that a smaller sample (such as a focus group type-approach) would have been much less representative and/or to complex to make representative. Additionally, given that the MEPS requires over two weeks of effort by the students, requesting more of their time to participate in follow-up research would seem unreasonable.

Deakin students who had completed the first trimester 2011 run of the MEPS (2 – 13 May 2011) were asked to complete a written questionnaire. This posed a variety of questions about the quality of their experience in a mixture of closed and open-ended questions. They were asked open-ended questions about what features they would like to see added to the MEPS and on their likes and dislikes about the simulation. There were 58 completed responses from 64 students who were given the survey.

By gathering this data, the researchers hoped to ensure that any decisions they made about changing the MEPS system had some supporting evidence behind them.

Limitations

The questionnaires were handed out during the final part of the MEPS exercise, which is a face-to-face role-playing conference. This sample therefore excluded some students who had participated in the longer online part of the exercise but could not attend the conference. Some of these were off-campus students or those who had other commitments. Around 30 students were excluded in this way.

As the final part of the assessment, this sample group also excludes anyone who had such a negative experience of the MEPS that they had abandoned their participation in it at an earlier point. This would include approximately five students.

The questionnaire was not given to the 16 or so students from Charles Sturt University (CSU) who had also participated in this iteration of the MEPS, filling the roles of newspaper journalists. The reason for excluding the CSU students was because their participation in the exercise was under fundamentally different assessment criteria, with different expected learning outcomes and under the direction of teaching staff not otherwise linked to the MEPS. For example, the CSU students participated in larger teams and were being assessed by their tutor on their journalistic and print production abilities. The central aim of their participation was to hone their skills as journalists rather than deepen their understanding of the Middle East.

Results and discussion

The results of the questionnaire illustrate three main trends:

1. Student experience with and attitude toward the MEPS is overwhelmingly positive.
2. The current interface is deemed simple and suitable, though a majority of users see room for improvement
3. Most users would like to see some social media (or Web 2.0) tools included in the interface, with an improvement in the chat function being the most common desire.

Student experience

Amongst the 58 respondents to the questionnaire 57 nominated their overall experience with the MEPS as being positive. (The single respondent not counted in this majority was one who did not answer the question.) Every respondent described their learning experience in this exercise as ‘Excellent’ or ‘Good’, with all but two (who did not answer) rating the MEPS as offering a ‘Much Better’ or ‘Better’ learning experience than traditional forms of assignments they had encountered. Over 90% felt that their understanding of the Middle East and their engagement with the subject had been increased by their participation in the MEPS.

Such results are consistent with previous research on student experience with the MEPS. Dracup (2009) found a similarly high level of student experience and satisfaction. Over 95% of respondents in that study expressed the opinion that they had “a better understanding of the facts of Middle East politics” as a result of undertaking the MEPS. That research also suggested that students felt they had seen an improvement in more generic academic skills such as creative thinking, communicating, team work and problem solving.

One contrary, though not necessarily negative viewpoint that was expressed in our questionnaire was the volume of time that the students felt they had put into the MEPS. Many noted the time demands of the MEPS as being considerably greater than they would normally devote to a university assignment. This has been noted in prior studies too, with a figure of about 3.5 hours per day being recorded as a typical student input whilst the MEPS runs. (Vincent & Shepherd, 1998)

It should be noted that the nature of the comments made in the questionnaire about time demands did not always indicate deep resentment or negativity, with many of them being along the lines of "I want my life back" or "My brain is dead!". Evidence that the time requirements were not begrudged is offered by the fact that 50 out of the 58 respondents indicated that they would participate in another MEPS if they had the chance.

The interface

Questionnaire responses were mixed regarding the need to change or upgrade the MEPS interface. Fifty-one respondents (88%) felt that the current interface was 'Suitable for its purpose'. However, this is contrasted with the lower rate of 67% in another question who felt that the current interface was 'adequate for the task', with several making informal notations in the margin in the vein of "Adequate, but could be better". This was also indicated in the response to the question regarding whether the interface needed to be improved, where 40 participants (69%) wanted to see improvements, with another 6 (10%) being undecided.

Visual appeal was not deemed important by the participants in the survey, with only 39% being in favour of making the interface 'more attractive'.

In terms of usability, the interface's simplicity was widely acknowledged by students. The majority (90%) agreed with the statement "The interface is simple". In free comment spaces of the questionnaire though, a few respondents noted specific functions or elements that they felt were complex or unintuitive. The email inbox and filing system was mentioned by nine respondents in this regard. The convenors would note however that some teams had a disorganised approach to their email inbox and failed to make any use of the folder creation functions that the emulator offers, which are very similar to those found on commercial mail clients.

Web 2.0 tools

One question in the survey asked students to agree, disagree or indicate indecision to the statement "Social media tools need to be added to the interface". The specific types of social media tools were not nominated by the questionnaire. To this question, 37 (64%) respondents indicated that they felt such tools did need to be included. Only 13 (22%) disagreed with the statement, with the rest being undecided or failing to answer the question. It is important to remark that amongst those stating a desire to see more social media incorporated, six respondents indicated in margin notes next to this question that it was solely the need for a better chat function that they were referring to. (See discussion below.)

The results from this question seem to indicate that a desire for greater social media presence is not automatic amongst students, even those sitting quite firmly in the demographic usually associated with such platforms. In the case of the MEPS, this may be because they recognised the unsuitability of social media elements to the task or perhaps because they thought it would add to the workload. Regardless of the reasoning, this question in our survey was the least clear cut in its response and would seem to accord with much of the research refuting the Digital Native hypothesis and the desire for social media presence in classroom activities. (G. Kennedy, et al., 2007; G. E. Kennedy, Judd, Churchward, Gray, & Krause, 2008; Kvavik & Caruso, 2005)

Criticism of the chat function of the MEPS was the most prevalent negative comment garnered by the questionnaire. This was expressed in various free form comment boxes as well as informal marginalia. Students were frustrated by the unreliability of the chat interface, its inability to be kept open when referring back to other site elements and the need to refresh the window in order to see replies. Some respondents also lamented the unavailability of an 'out-of-character' chat function, particularly so that team-mates could communicate synchronously.

This last wish may have been made more imperative in the last two years given the ban on students communicating via other channels, such as text message. Currently the only way team-mates can communicate with each other in anything approaching synchronicity is to arrange to be online simultaneously and then send emails to themselves or leave notes in the team's diary and constantly refresh the page. Both of these options seem rather awkward, especially given the ubiquity of chat functions in so many other online environments.

Another desire expressed by some students was an ability to attach files to emails within the simulation or at least some other ability to share files between team-mates or with other teams. This warrants consideration, but the question arises as to what sort of files might be exchanged and how this might be affected by institutional policies on appropriate ICT use and the need for security of material generated by the MEPS. For example, a seemingly benign use of such file attachments might be for a team to create their own letterhead for the issuing of press releases and thus send them as an attachment to teams playing media roles. However this gives rise to the issue of terror-related material ‘leaking’ from the MEPS as discrete files when created on one student’s computer and potentially downloaded onto another’s, where it could then be forwarded on outside the context of the MEPS. Likewise it would be possible (or even likely) that some students might send graphic or inappropriate image files to each other, particularly regarding terrorist actions. Whilst this can likely be covered by instituting rules or policies, the potential for mishap needs to be weighed carefully against the need for such file sharing functionality in the first place.

A further disincentive for instituting file sharing or enhancements beyond the text-based nature of the MEPS is in providing equality amongst participants. Currently the interface and entirely online nature of the task means that all students participate equally, regardless of their location, bandwidth, computer equipment or study mode.(Hardy & Totman, 2011 (forthcoming)) Allowing students to create and attach files might give a perceived advantage to those with the skills, equipment and inclination to do something beyond the scope of the average participant. Naturally this may be seen as a meritorious endeavour, but with the focus of the MEPS being on understanding the politics and diplomacy of the Middle East, the creation of additional media objects by students is not a target outcome.

Conclusion

It is obviously important to take notice of the expressed need for a workable chat function in the MEPS. The simulation cannot continue running with this element so badly broken, or at least not without it affecting levels of engagement. This will either entail a complete re-write of the chat function within the existing system or else a move to a new platform.

These results on the whole though suggest that a major upgrade of the MEPS interface is not imperative and that in any subsequent version care must be taken to preserve the simplicity of the system. Developers of online role play tools would do well to bear in mind this trade-off between simplicity and feature provision as it seems that students appreciate usability and ‘fitness for purpose’ over complex and ‘well-appointed’ interfaces. Naturally they would prefer to have both outcomes, though the nature of educational design and development rarely affords such unrestricted possibilities. The implication is that when designing something like an email system, it is not necessary to be concerned that the tool does not completely emulate the features and functions of a commercial email client. As long as the tool is adequate for the job, students understand that ‘bells and whistles’ are superfluous and their level of engagement is not affected.

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He ara hou ka tū mai: NZ institutions of higher learning unpacking demands and facilitating change

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The Virtual Worlds Working Group began with the DEHub research consortium in November 2009. In December 2010, New Zealand joined the VWWG. This paper highlights the current work of the NZ based members of the group and presents the work of 23 authors at 11 institutes of higher education in New Zealand. The scope of the work covered is diverse, and a number of platforms have been used. Virtual worlds enable educators to provide realistic simulations, engaging role-plays, immersive and genuine tasks, and social interaction that encourages group collaboration, and highlights the ability that virtual worlds have to transform both teaching and learning.

Keywords: virtual worlds, *Second Life, Reaction Grid, OpenSim*, immersion, engagement, VWWG

Introduction

He ara hou ka tū mai means "A new pathway before (us)". This Māori phrase succinctly summarises the position in which NZ educational institutions find themselves. As digital literacy continues to increase in importance as a key skill in every discipline and profession (New Media Consortium and EDUCAUSE Learning Initiative, 2011, p. 3), so the demands of our students and the demands of education precipitate us along this new pathway into virtual worlds.

"Virtual worlds are richly immersive and highly scalable 3D environments. People enter these worlds via an avatar which is their representation in that space". (New Media Consortium and EDUCAUSE Learning Initiative, 2007, p. 18) Virtual worlds offer educators a graphically rich, immersive and engaging environment where students can engage in role-plays, simulations, data visualization and modelling.

Salt, Atkins and Blackall (2008) described the sense of shared experience, immediacy, and the resulting social and emotional sharing, which facilitate group and collaborative learning in Second Life (SL), a virtual world used extensively by educators. In the EDUCAUSE Review, Marina Bers suggested that there is a change and shift in education from the idea that knowledge exists in an individual to a community of learning and this change can be seen in virtual world education. This spirit of educational collaboration led to the birth of the Virtual Worlds Working Group (VWWG).

In November 2009 the VWWG was formed from the initial institutions that comprised the DEHub research consortium: University of New England, Charles Sturt University, Central Queensland University, University of Southern Queensland and Massey University. Other Australian institutions were invited to join and by July 2010, the membership had increased to 22 members. On 7 December 2010, NZ joined the VWWG. Currently the total membership of the VWWG stands at over 150, with New Zealand having 31 members from 16 institutions. Membership is diverse, including lecturers, researchers, technicians, developers and administrators. Members contribute a wealth of expertise in various fields of endeavour, and assist each other in research initiatives, shared classroom experiences, presentations and publication.

This paper outlines the use of virtual worlds in many New Zealand institutions. The examples represent a diversity of research, experience, and perspectives. But the common element is the belief in the efficacy of virtual worlds for education and their potential for meeting the changing demands of a digitally challenging world. Virtual worlds have enabled the provision or resources, experiences, and learning that would have been difficult and sometimes even impossible to provide in the traditional classroom environment.

New Zealand Institution Vignettes

The following table summaries the current work being done in virtual world education by a number of New Zealand institutes of higher learning. Educational demands in New Zealand are changing rapidly and this table suggests ways that institutions are changing directions in response to these demands.

Institution -*Where*	**Project Intent**	**Process**	**Outcome**	**Future plans**
MIT *Purpose built sim: Kowhai on SL Movement into Jokaydia Grid & NZVWG*	Student interview skills for Foundation students Career pathways	Interview aspects, dress, simulated interviews in purpose built rooms (as shown in *Fig 1*)	Engaged students, retained students, more merit passes	Use by other departments Literacy game
University of Auckland – Health *Purpose built health clinic: SL*	Simulation for undergraduate nursing students	Simulation involving three active student nurses with patient and family member, plus other students observing	Thoroughly engaged students Debrief ensured learning of key points.	Have used the setting for other simulations Waiting for faster broadband before exploring extending further
University of Auckland – Architecture *Purpose built sim: Putahi on SL*	Give studio based experience to acquire digital skills in a virtual urban-like building site called the Living Sketchbook	Creative Digital Studio space for the first imaginative steps needed to design and build architecture	To 'get over the interface' and arrangement of the complex information flows of image and building design and construction	Ongoing survival and acceptance of virtual worlds/3d web rather than "SL" Continue development of the Living Sketchbook
Massey University *Customised Open Wonderland world hosted on university server*	Create a virtual workshop for teaching agile software development methods	Run workshops, observe and interview participants	Useful feedback for future design iterations	Benchmark performance and utility against other open source virtual worlds
Massey University – Auckland School of Design *Biofeedback augmentation, (Fig 2) Blender, Unity & Flash in lab & online*	Adapting interfaces for virtual world use (Champion & Decker, 2010)	1. Biofeedback sockets to augment gameplay 2. Combining mirror and code 3. Chinese character sketching 4. Unity run inside Moodle	1. Utilised in architecture 2. Projection of virtual environs 3. For learning Chinese 4. Running a virtual world inside an LMS	Extending work in creative interfaces
Waikato – School of Arts *Garry's Mod, a modding application for Half-Life 2 & its associated community and wiki*	Transferability of learning from creative practice, the role of machinima as a filmmaking tool, and mode of engagement with gaming technology	Workshops, utilising regularly updated user-generated content and solution based engagement to realise a film concept	Short film as a creative output (*Fig. 3* as an example) Further knowledge of game engines and modding practices	Consolidate and shift modding environments into purpose built open-source machinima applications
Waikato – Education Faculty *Intermediate schools in the Hamilton region – MARVIN (Fig. 4)*	Classroom-based research exploring using avatars to help develop student key competencies	Interviews, observation, screen capture software, video	Higher order thinking skill development. Increased collaboration. Enhanced awareness of local issues	Extend research to other school levels

University of Canterbury – Computer Science Education *On OpenSim portable server for use within schools*	Using virtual worlds to evaluate and deliver CS Unplugged activities (*Fig 5*)	School students participate in activities and their actions are captured for analysis	Experimental system still being developed for monitoring activity in SL	Complete experiments and see if evaluation in SL can inform evaluations in the physical world
University of Canterbury – Literacies & Arts in Education *OpenSim Server on campus – nominally part of NZVWG*	How to use MUVEs effectively in vocational education contexts	A MUVE for temporary traffic management instruction is being developed through design based research	This partially developed scenario is part of an on-going research project	On going research
Wellington Polytechnic *SL – Koru Kowhai Island* *OpenSim Server on campus – nominally part of NZVWG*	Authentic learning of technology & architecture Exploring dance, human senses and technology Using the virtual environment as a development tool	Computer Architecture course Dance - digital sensing of human data Designing prototype environments	On going achievement of learning outcomes Performance at Digital Resources for Humanities and Arts 2011, and on going collaboration	Continuing current projects Continuing collaboration on an international level
Auckland University of Technology– Languages *Purpose built sim: Kowhai on SL & exploration of cultural sims throughout SL*	Undergraduate: Experiential intercultural learning and language learning Postgraduate: virtual worlds for language learning, teaching and research	Undergraduate: ethnographic studies in a range of cultural sims Postgraduate: enquiry based learning; development of core knowledge	Undergraduate: critical awareness of own identity and culture; effective communication for relationships, Postgraduate: educational potential of virtual environments	Undergraduate: Develop exchanges with other universities Interdisciplinary studio model Postgraduate: possibly integrate into other courses
AUT - Computing & Mathematics *1) Prototype Java 3D CVE 'Teamlink'* *2) UpStage an open source web-based platform for cyberformance (http://upstage.org.nz/blog/)*	Aid learning and research into global virtual teams and collaborative technologies	1. Global virtual collaboration – ongoing development 2.Undergraduate projects working in partnership with the UPStage Virtual organization to extend UpStage software	1. Challenging learning experiences in CVE development, and collaborative technologies 2) Intriguing learning experiences, including open source development	1. Possible porting to a browser based technology stack - new global collaborations 2. Continuing developments and enhancements for annual performance festivals
Auckland University of Technology– VR Suite *AUT VRSuite, Colab http://vr.colab.org.nz/*	More effective VR research by sharing of resources and expertise An interface to aid industry in undertaking 'research of value' in interactive 3D	Exploration of varied 3D applications in a number of contexts such as rehab, advertising, interactive art, etc Complex data visualisations of natural disasters	Enjoyable learning experiences, clever algorithms and visualisations, useful research outcomes linking 3D technology and contexts	Industry linked research -human full-sensory perception and interrogation of complex information driving complex processing and modelling

University of Otago *Otago Virtual Hospital (OpenSim)*	Professional identity development of medical students	Medical students solve clinical cases while role-playing as junior doctors in virtual emergency department	To solve clinical case, students needed to notice clinically salient elements by themselves (Blyth, Loke, & Swan, 2010)	Assessment of dispositional behaviours as a measure of professional identity
Nelson Marlborough Polytechnic – IT *Koru and Kowhai in Second Life,* *Korako on JokaydiaGrid,* *NMIT sim on NZVWG,* *Sim on a stick* *Kitely*	1. How to build and script virtually, create communities of practice, and create machinima 2. Studying Systems Development Methodologies	1. Investigate viewers and grids, taught in SL how to build and script Final assignment built in chosen environment 2. Design & build a complex virtual word build	1. Understand the purpose and affordances of virtual worlds 2. Complex development process using established methodologies and adapting and innovating where necessary	More of the same. Keeping abreast of this technology and its implications (e.g. 3D web sites etc) is essential for future IT professionals
NMIT – Languages *As above*	Students learning English (at NMIT)	Early stages - using NZ themed immersive space for conversation	More comfortable role-playing and trying new skills as an avatar	Provide 'authentic' spaces for language learning

Table 1: Current work being done in virtual worlds by some VWWWG NZ institutions

30. **Figure 1: MIT interviewing**

31. **Figure 2: Massey biofeedback augmentation**

32. **Figure 3: Waikato machinima**

33. **Figure 4: Waikato - MARVIN**

34. **Figure 5: UoC – Unplugged activities**

Themes

Several themes emerge in the work of the institutions reported in Table 1. These include the following:

The students who are working in virtual worlds demonstrate a high level of immersion in the tasks they are challenged to complete. MIT report that students involved in the SLENZ (Second Life Education NZ) Project reported a sense of immersion which was supported by anecdotal evidence (Winter, 2010) and this immersion was reported in SL classes subsequently. Waikato Faculty of Education describe improvements in student social interaction, and the increased involvement of 'peripheral' students in general classroom activities.

A common theme in the majority of the vignettes in this report is that what is impossible for students in the real world, becomes possible in the virtual world. Making the impossible, possible, is often associated with simulation builds. The University of Auckland has simulations for maternal haemorrhage, paediatric bereavement, nursing and pharmacy and the University of Otago has a virtual hospital in which medical students play the role of junior doctors/housemen. Students are provided with safe and authentic learning experiences.

The ability to provide the previously impossible is also indicated in many Arts courses, eg. the architecture students from the University of Auckland, Computer Science students at Canterbury University, WelTec, and NMIT are all able to pursue projects made possible by virtual worlds. Language tutors report this same advantage of virtual worlds. Japanese students at AUT are able to go to the Japanese sim (virtual build) to interact with native Japanese speakers for an engaging and very real experience. It is possible for these students to not only engage in the previously impossible, but build networks and establish a sense of community at the same time.

The sense of community is another main theme indicated by the work of these NZ educators. There is group connectivity between educators and students in virtual worlds. This is seen in the VWWG itself where collaboration and community is seen in the huge growth of participating institutions. Links are reported between architecture students at Auckland University and Technology students at WelTec and between WelTec students and NMIT students. Several projects reported in Table 1 are part of international collaborations, eg, WelTec with dance instructors and students in Portugal and Japan, and AUT 'Teamlink', a global collaboration including NZ and Sweden. The sense of community is vital for students in the performing arts, with AUT students involved in UPStage relying on an online audience that participates via a browser, and the machinima (derived from machine and cinema) produced by arts students from Waikato Student is exhibited publicly online (e.g. www.selectparks.net, www.machinima.com).

Designing creative software solutions is another theme that is evident in the work reported in Table 1. Examples of this work include many of the IT courses, eg. Massey University examining techniques of agile software development in a game based activity, Massey's Auckland School of Design researching interfaces that can be adapted for virtual worlds, WelTec using virtual worlds as a development tool for creating prototype 3D interactive environments, the AUT Faculty of Design and Creative Technology's continuing investigation of 'Teamlink', a prototype Java 3D CVE, developed to aid research into global virtual teams and collaborative technologies, AUT's VRSuite, CoLab examining the use of interactive 3D technologies to aid industry, and NMIT where students are creating applications in complex immersive MUVEs as well as gaining an understanding and appreciation of the communities, the potential benefits and issues of working and operating in these environments.

Higher level critical thinking and reasoning skills can be developed within virtual worlds, as indicated by the work in creative software solutions. Real-time problem-solving is a common theme in virtual world education. Virtual environments that contain game elements frequently rely on real time problem solving. MIT's proposed literacy game will challenge students to solve grammatical problems. MARVIN, utilized by the Waikato University Faculty of Education, when used in small group settings, supports discussion, debate, critique, organisation and presentation of researched information through the exercise of higher order cognition (analysis, evaluation, creation) (Falloon, 2010). The prototype traffic management scenario being tested by the University of Canterbury requires surveyors to produce a traffic management plan for when they are working on a road.

It is also important to note that a number of tertiary institutions working in virtual worlds are working in conjunction with other sectors. Waikato University Faculty of Education has used MARVIN in trials with two Intermediate schools (Years 7/8) in Hamilton. The trials have concentrated on identifying any role the application might have for supporting the development of selected key competencies as outlined in the revised New Zealand Curriculum (2007). The Computer Science Education group at the University of Canterbury is interested in using virtual worlds to collect information about how learners interact with educational material. The main focus of the group is the CS Unplugged project (csunplugged.org) which exposes students to advanced concepts in Computer Science without using computers. Prototype Unplugged activities built in virtual worlds are on a local server as they are designed for the use of primary school children.

Conclusion

Virtual worlds are being used in New Zealand institutions of higher learning. Although Second Life still plays an important role in education, educators are looking into alternatives. The NZVWG is an OpenSim platform that is NZ based and has an academic focus. It operates on servers hosted by Auckland, Otago and Canterbury Universities, and Wellington Polytechnic. NZ educators are using a variety of other virtual worlds and challenging their students to use and create unique 3D interactive environments.

At ascilite2009, Scott Diener from The University of Auckland made the comment that everything in education would change with the use of virtual worlds. "They provide a real sense of self and the suspension of disbelief, a sense of place and sense of emotion." (Diener as cited by Waugh, 2009). These qualities of virtual worlds allow students to become immersed in active, problem-based learning. New Zealand has invested heavily in change with research and practice in virtual world teaching and learning. The evidence is seen in the work discussed in this paper.

The technology and the virtual worlds NZ educators use may change but the one thing that will not change is the commitment of these educators to provide their students with the best learning experiences possible.

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Is reflective writing an enigma? Can preparing evidence for an electronic portfolio develop skills for reflective practice?

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Documenting reflective practice would be easier if practitioners were in agreement about the meaning of reflection for practice. Even though evidence exists to support the links between reflection, professional learning and reflective practice, agreement about how to effectively facilitate the reflective process for deeper levels of reflection is not yet established. The reflective writing of postgraduate teacher education students was scaffolded using a Three-Step Reflective Framework. Written reflections were prepared for an electronic design portfolio and assessed by the subject lecturer. All participants demonstrated three levels of reflection in their writing, namely, Descriptive, Explanatory and Supported. There was a degree of critical reflection although this was not directly scaffolded by the framework. All participants found the Reflective Framework useful for assisting them to write reflectively, and the majority intended to carry on using it to assist in constructing a professional portfolio.

Keywords: reflection, professional learning, reflective practice, electronic portfolio, framework

Introduction

The meaning of reflection for practice is not easy to define and has long been debated by a number of scholars. The concept of reflection as a phased process of thinking was initially put forward by Dewey (1933), and later developed into three levels of reflectivity expressed as “ways of knowing with ways of being practical” (van Manen, 1977, p. 205). Generally, the process of reflection is claimed to occur over time so that practitioners can look back on their experiences in order to learn from them (Boud, Keogh & Walker, 1985; Boyd & Fayles, 1983), yet whether reflection occurs as a result of action, during action or for action is an area of disagreement precipitated by Schon (1983, 1987), and further discussed by Hatton and Smith (1995) in their work with teacher education students. This failure to find common ground has implications for practitioners who need to document their professional learning and demonstrate evidence of reflective practice. Even so, evidence demonstrates that clear links exist between reflection, professional learning and reflective practice (Boud et al., 1985; Fook, White & Gardner, 2006; Loughran & Corrigan, 1995; Mansvelder-Longayroux et al., 2007; Moon, 2007; Nsibande, 2007; Valli, 1997). Current thinking confirms that the preparation of written evidence can develop reflective practice, particularly when it is destined for inclusion in a professional portfolio (Doig, Illsley, McLuckie & Parsons, 2006; Levin & Camp, 2002; Mansvelder-Longayroux et al., 2007). However, research investigating the importance of reflective writing for a professional ePortfolio is rare (Hegarty, 2011).

For this research, existing definitions of reflection were explored (specifically, Boud & Walker, 1990; Boud et al., 1985; Rodgers, 2002; Tremmel, 1993) and a definition developed to inform the reflective framework used in the study. Reflection was defined as: deliberate and mindful thinking about one's experiences and the self-evaluation of feelings, decisions, understandings and actions, which may lead to development of professional learning for professional practice. Reflection which demonstrates these attributes is regarded, in this research, as 'effective reflection' and is associated with reflective practice, thus establishing a connection between reflection, professional learning and reflective practice. Also, definitions for professional learning and reflective practice were developed based on others' work (specifically, Hatton & Smith, 1995; Kwakman, 2003; Parsons & Stephenson, 2005). Professional learning is defined as any learning which has relevance to professional practice and occurs when new knowledge and understanding, skills and insights are gained and may lead to the achievement of professional goals. Reflective practice is defined as a process associated with professional learning, which includes effective reflection and the development of metacognition, and leads to decisions for action, learning, achievement of goals and changes to immediate and future practice.

Theoretical Background

According to Boud and Walker (1990) "retrospective noticing", can initiate the reflective process, but requires attention to inner thoughts and feelings if ingrained assumptions and potential learning are to be unlocked and other perspectives considered (p. 71). Similarly, Robert Tremmel's work demonstrates the importance of encouraging teacher education students to pay attention, and through noticing their thoughts and feelings, they can be guided to 'see' the detail of a situation (1993). Rodgers' Reflective Cycle contains a similar message, for example: "Presence in experience: Learning to see" (2002), and she claims that noticing initiates the reflective process leading to meaning being uncovered and an appropriate response. Boud and colleagues (1985) in their model of reflection, describe the first two stages of noticing as "Returning to the experience", and "Attending to feelings", and believe that this engagement prompts practitioners to act and change practice (p. 26). A third stage, called: "Re-evaluating experience", is transformative because actions and thoughts emerge as a result of working with new forms of knowledge in light of existing knowledge (Boud et al., 1985). Likewise, 'Learning to take intelligent action' is described in Rodger's (2002) reflective cycle. These theories provided guidance for developing the definition of reflection for this study. In turn, the definition of reflection provided a foundation for the framework used to scaffold the reflective writing process. The framework incorporates three steps: noticing, analysing and taking action.

Scaffolding reflection is commonly regarded as essential to success (Donaghy & Morss, 2000; Sparks-Langer et al., 1990). For example, according to Bean and Stevens (2002), "scaffolding helps to focus students' reflections and provides explicit support in modeling the role of reflection" (p. 216). From Maarof's (2007) perspective "explicit training or development of skills to assist … in reflecting upon their practice" is recommended (p. 215). Also, if practitioners are to extend their skills and examine their experiences using techniques beyond superficial description, support for reflective writing is regarded as essential (Hatton & Smith, 1995). In a study with 60 teacher education students, Hatton and Smith (1995) identified specific evidence of reflection in their writing about practice experiences, and this led to the development of a reflective framework for subsequent use, both for structuring reflective writing at a deeper level, and in the measurement of reflection for practice (see Table). Furthermore, five phases of cyclical reflection were used by Korthagen and Vasalos (2005) to assist student teachers to learn from their experiences, and they described this as the ALACT-model of reflection. (a) action, (b) looking back on the action, (c) awareness of essential aspects, (d) creating alternative methods of action, and (e) trial (Korthagen, 1985, p. 12). This cycle assisted the student teachers to develop their skills of reflection bringing them to a stage where they demonstrated “core reflection” with more awareness of themselves as practitioners, and able to critically analyse problem situations (Korthagen & Vasalos, 2005, p. 55). The structured approaches used by Korthagen and Vasalos (2005) and Hatton and Smith (1995) are intended to enhance both reflection and learning for professional practice as teachers can be taught how to reflect in preparation for reflective practice. This was also the intent of using a framework in this research study.

Rationale and context

An intervention was needed in a post-graduate teacher education subject where the lecturer found it challenging to get students to reflect at a level necessary for meaningful learning. She was interested in finding a solution for students in her post-graduate teacher education classes who generally wrote little more than superficial accounts when asked to reflect about their experiences. The students were required to prepare reflections about the process of designing multimedia learning objects for inclusion in an electronic Design portfolio. The subject lecturer believed it was necessary that professionals developed skills for reflective practice, yet in previous classes unstructured processes for reflective writing had not been successful. Therefore, an investigation into the use of a reflective framework to scaffold reflective writing was needed for students. Given their educational and discipline specific context an electronic portfolio was used to document their work and provided the context for this research.

Framework and research questions

When choosing models on which to base the framework for this research, specific attributes were sought, and included “their propensity for guiding reflective processes such as noticing, describing the experience, interpreting or analysing the experience, examining other perspectives, and learning from the experience in order to act or make changes to practice” (Hegarty, 2011). Specifically, a guided sequence of reflection within a hierarchal framework was required, thus “starting the beginner with the relatively simplistic or partial technical type [of reflection], then working through different forms of reflection-on-action [including critical reflection] to the desired endpoint of a professional able to undertake reflection-in-action” (Hatton & Smith, 1995, p. 45). The intention was to support practitioners to develop skills for critical reflection as this was regarded by a number of researchers as a desired indicator of reflective practice (Fook & Gardner, 2007). Therefore, a framework using three steps was developed to guide the sequence in which the participants reflected on their experiences. Being sufficiently skilled to recall and record the event effectively is claimed to deepen the reflective process (Boud & Walker, 1990). Use of the framework by the participants was expected to assist this, and also contribute to the development of a professional portfolio which contained evidence of learning and reflective practice.

Portfolios

Portfolios are claimed to give teachers the opportunity to document their “experiences, thoughts, actions and … learning…” (Kilbane & Milman, 2003, p. 565), and as such, assist teachers to reflect on their practice, and communicate their professional learning (Loughran & Corrigan, 1995). Although, reflection and professional learning are claimed manifest during portfolio development (Allan, Zylinski, Temple, Hislop & Gray, 2003; Doig, Illsley, McLuckie & Parsons, 2006; Falls, 2001; Wright, Stallworth & Ray, 2002), research is still unclear about how practitioners make connections between artefacts and evidence and reflect on them (McCoy, 2005). The reason that reflection is believed to be stimulated during the development of a portfolio is because experiences have to be analysed and interpreted in order to create the portfolio (Mansvelder-Longayroux et al.,2007, p. 49), and in this way practitioners are more likely to learn about themselves (Walker, 1985). In this research, the reflective content of written reflection assignments prepared for an ePortfolio and the way in which they used the reflective framework was of interest, not the process of developing the portfolio. The research question discussed in this article is: How do educational practitioners reflect when using a framework to write about their experiences?

Research Methodology

Case study, as a qualitative method using an intervention, was chosen to study how participants responded in a "real-life context", and is an approach based on work by Yin (2003, p. 15). The intervention, the Three-Step Reflective Framework (see Figure 1), was developed for the research study, specifically to scaffold the reflective writing of seven postgraduate teacher education students who were studying in a multimedia design subject. The participants were asked to use the framework when preparing written reflections about their experiences designing multimedia learning objects, all of which were destined for inclusion in an electronic portfolio, and were assessed. Therefore, the case was bounded by the enrolment and assessment requirements of the subject. This research was undertaken as part of a larger study in which diverse data was collected (survey, participant interviews and subject lecturer interview, and written feedback). The detailed findings of the study are not described in this paper (detail about this can be found in Hegarty, 2011). The findings presented in this paper focus solely on the reflective writing produced by participants as a result of using the Reflective Framework.

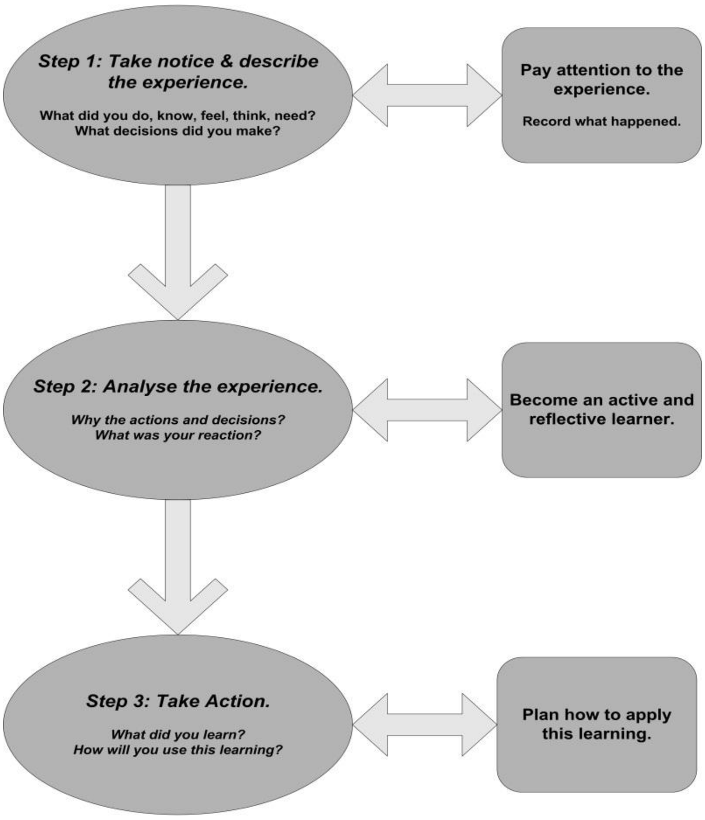

Figure 1: Three-Step Reflective Framework (Hegarty, 2011).

At each of the three steps of the framework, questions were used to guide participants to reflect, and some of these are shown in Figure 1. For example, at Step 1, participants were asked to notice their experiences and describe what happened. Additionally, further questions were used to prompt reflection at each of the three steps, and were available in the template used to structure participants' reflective writing. Use of the framework was optional. Nevertheless, participants were encouraged to use it by the subject lecturer, and introduced to the framework during an on-campus workshop at the start of the subject which was when the research began. At this time, the researcher explained the steps and provided participants with an opportunity to use the framework during exercises in reflective writing.

The participants

The seven participants originated from a variety of educational areas and included teachers, instructional designers, an IT specialist and a staff developer. The commonality amongst the group was their interest in multimedia design for learning, and enrolment in a Masters of Education programme. Participants' area of practice was multimedia design about which they wrote during this research. One participant had extensive previous experience in using reflective writing as part of her practice whereas the others were more familiar with using reflection during verbal debrief sessions with colleagues or when thinking about their practice. Therefore, for the majority of participants, the preparation of written reflective pieces of work about practice was a new challenge.

The subject lecturer regarded reflection as an important skill which teacher education students needed to learn the professional practice. Therefore, the framework provided a practical solution to support this area of practice. There was an expectation that the framework would support participants to develop their skills of reflection which would manifest in how they reflected at each of the three steps, and also in what they focused on in their writing. For example, , it was of interest whether they wrote about their feelings, learning, decisions, goals, professional skills, personal perceptions and others' views. Also, the framework was expected to guide participants to produce evidence of not only their reflective learning, but also their professional learning associated with practice experiences in the multimedia design subject. For the participants their experiences in the subject were not isolated from their professional practice as they were designing learning objects for practical use in their work. Therefore, explicit links to their professional work as well as their professional capability were expected.

Theoretical framework for analysis

To measure the levels and types of reflection in participants' writing a Levels of Reflection taxonomy was developed and used for analysis. This taxonomy is based on Hatton and Smith's (1995) four level framework, and the seven level Framework for Reflective Pedagogical Thinking developed by Sparks-Langer et al. (1990) (shown in Table 1).

Table 1: Comparison of two theoretical frameworks.

Framework for Reflective Pedagogical Thinking - Sparks-Langer et al. (1990, p. 27).	**Criteria for the recognition of evidence for different types of reflective writing (Hatton & Smith, 1995, p. 48).**
1 No descriptive language. 2 Simple lay person description. 3 Events labelled with appropriate terms. 4 Tradition or personal preference as rationale. 5 Principle or theory explained. 6 Context is considered plus principle or theory. 7 Ethical, moral, political issues are included.	1. Descriptive writing - not reflective, description of events. 2. Descriptive reflection- reflective description of an event and justification for actions. 3. Dialogic reflection - demonstrates a "stepping back" and "mulling over" of judgements and viewpoints. 4. Critical reflection - demonstrates awareness about multiple historical and socio-political contexts.

An indepth comparison of the theories underpinning the development of the Reflective Framework is available in Hegarty (2011, Appendix 10). As shown in Table 1, differences between the levels of the taxonomy and the underpinning theories exist at the first level of writing, where an account of events rather than reflection is expected. Conversely, in this research study, practitioners were expected to write reflectively at the first level by describing the feelings and emotions stimulated by their experiences, as this engagement is known to influence the quality of the reflection (Boud et al., 1985). To a lesser extent, work by McCollum (2002) and Rodgers (2002) also informed the taxonomy. By using the taxonomy, five levels of reflection were investigated in each of the participant's four written reflection assignments (28 in total). The levels were categorised as: Descriptive, Explanatory, Supported, Contextual, and Critical, and are listed in brief in Table 2.

Table 2: Levels of Reflection taxonomy, a summary.

Categories and Sub-categories (in italics)	**Description**
1. Descriptive reflection - *Noticing, Deciding, Stating, Self-Questioning, Goals*.	Writing is superficial with descriptions about what has happened and the decisions made but not why.
2. Explanatory reflection – *Personal; Professional; Deciding; Self-Questioning; Reactions; Learning; Stating; Goals.*	Analysis of the experience from a personal or professional perspective about decisions, reactions, learning and goals.
3. Supported reflection –- *Evidence Mentioned; Evidence Identified; Learning from Evidence; Reactions to Evidence*.	Evidence from the literature is mentioned in some way or referenced.
4. Contextual reflection – *Analysis; Cross-Linking; New Perspectives.*	Different perspectives are considered and compared to own views which may change.
5. Critical reflection –- *Application of Learning*.	Multiple perspectives and consideration of wider professional issues, how learning will be used.

During the process of analysis, categories were modified where the characteristics of the content necessitated this. For example, the presence of questions in participants' writing led to a sub-category called *Self-Questioning* being added to the taxonomy at levels 1 and 2. This process of constant comparative analysis enabled an investigation of relationships between categories and the exploration of existing patterns leading to an understanding of the case (Maykut & Morehouse, 1994). Other coding systems were developed to extend interpretative analysis of the data. However, these and the other forms of data which were collected (survey, participant interviews and subject lecturer interview, and written feedback) and the detailed findings of the study are not described in this paper (detail about this can be found in Hegarty, 2011). The findings presented in this paper focus solely on the reflective writing produced by participants as a result of using the Reflective Framework. Changes in the levels of reflection in participants' writing as they wrote were anticipated as they wrote according to each step of the Reflective Framework. To ascertain the quality of reflection in participants' writing, the levels and type of reflection were investigated, and evidence sought of how the framework encouraged professional learning and reflective practice was sought.

Results and Discussion

The findings are reported using pseudonyms for the seven participants. Four out of five levels of reflection - Descriptive, Explanatory, Supported, and Critical – were found in the written reflections (see Figure 2). Contextual reflection, defined in this research as the fourth level of reflection, was not found. Descriptive and Explanatory levels of reflection were found most frequently, and the proportions, measured as percentage frequencies, varied between participants. All participants demonstrated the lower, three levels of reflection – Descriptive, Explanatory, and Supported.

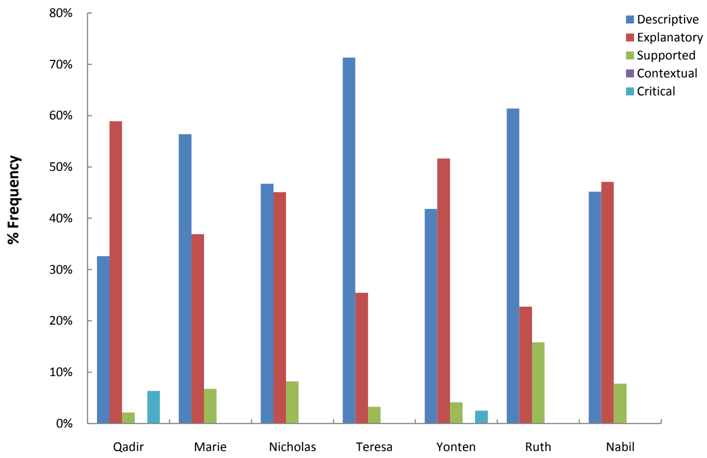

Figure 2: The distribution of five levels of reflection in written reflections (n=7).

This result was anticipated from the research on which the analysis of the levels of reflection was based (i.e., Hatton & Smith, 1995; McCollum, 2002; Rodgers, 2002; Sparks-Langer et al., 1990). Higher levels of reflection were either absent, in the case of Contextual reflection, or found at a low frequency, for example, Critical reflection.

Several different types of reflection were apparent at each level, each varying in frequency. For example, *Noticing* and *Stating* types of reflection were predominant at the Descriptive level of reflection (See Figure 3). *Noticing* was assigned to writing where participants "described their feelings and thoughts about their experiences, providing they did not analyse their experiences" (Hegarty, 2011, p. 156). *Stating*, in contrast,

was found when they described what occurred without providing rationale or emotional responses or references to a particular aspect of practice, for example their decisions and learning. Although, most participants commonly demonstrated *Stating*, not all participants demonstrated *Self-Questioning* which was generally found at a lower frequency than other types of reflection. Three participants (Marie, Teresa and Ruth) consistently used this technique in their writing, not only at the Descriptive level of reflection but also at the Explanatory level, and responded to their self-generated questions in their reflections.

The use of self-questioning is claimed to enable deeper reflection because practitioners who use this technique tend to demonstrate analysis of their experiences, and this may extend to critical reflection (Samuels & Betts, 2007). The participants who generated questions in their reflections during this study did not demonstrate critical reflection, but this may be due to the need to use questions which Fisher (2003) claims specifically prompt critical self-questioning about practice. She demonstrated improvement in the capacity of social sciences students to critically reflect by doing this. Self-questioning is also claimed to be a necessary skill for enhancing the practitioner's ability to learn from experience, and enabling them to act leading to changes in practice (Boud & Walker, 1990). They regard self-questioning as an important part of a practitioner's skill set. The use of questions by participants in their writing was anticipated, and possibly resulted from the guiding questions contained within the structure of the Reflective Framework.

For individuals, the frequency of each level of reflection was variable, and no consistent pattern was apparent across participants. Even though overall, participants wrote primarily at the Descriptive level of reflection (Figure 2), at an individual level, participants wrote, either equally at the Descriptive and Explanatory levels, or more so at another of the levels. For example, Yonten wrote more frequently at the Explanatory level than at the Descriptive level, but also demonstrated Supported and Critical levels of reflection (Figure 2). In contrast, Teresa exhibited mostly Descriptive reflection. The type of reflection exhibited by participants in their written reflections was varied as shown in Figure 3. For example, *Stating* and *Noticing* types of reflection, at the

Descriptive level, were most common. A further type of reflection, *Deciding*, was also found at a high frequency at the Descriptive level of reflection. This type of reflection was also common at the Explanatory level alongside *Stating*.

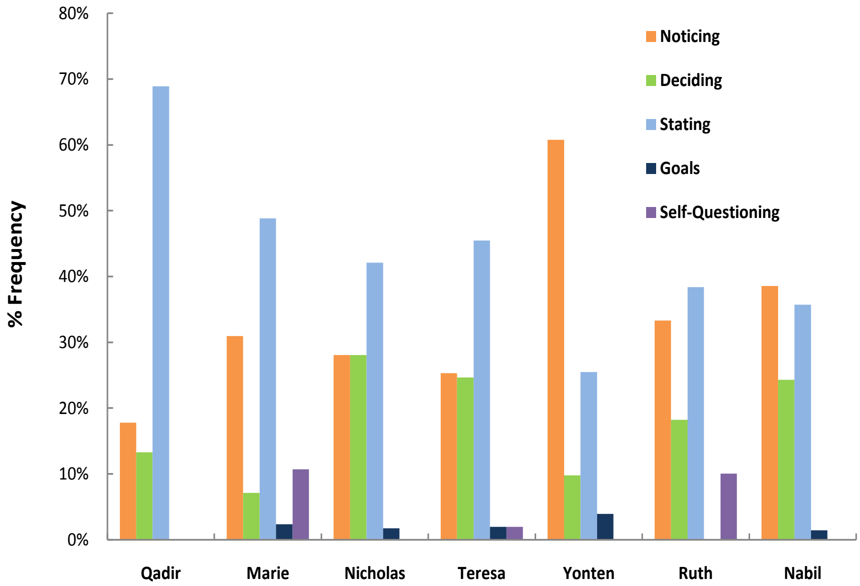

Figure 3: Frequency of Descriptive types of reflection for all participants (n=7).

Goals, although found less frequently than other types of reflection, were evident in all but one participant's writing. Setting goals was an indication that participants were monitoring their learning, and was cognisant with the use of metacognition, claimed to be associated with deeper levels of reflection (Fisher, 2003). *Evidence Identified*, at the Supported level of reflection, was also commonly found in participants' written reflections. This was an indication that they were citing others' work and writing about it in their reflections, although they were not critiquing and analysing multiple perspectives to the extent required for demonstrating Contextual and Critical levels of reflection. Illustrations of these aspects of the research can be seen in Hegarty (2011).

Levels of reflection at each step

The Reflective Framework appeared to encourage Descriptive reflection at Step 1 where it was found at a greater frequency that at the other two steps (see Figure 4). No other level of reflection was particularly evident at any of the three steps. Unexpectedly, Descriptive reflection, in comparison to Explanatory reflection, was also more frequent at Step 2. Links between the headings and prompts in the Reflective Framework and what participants wrote were apparent. For example, *Deciding* was found more frequently at Step 1 and at Step 2, compared to Step 3 where it was not prompted. Also, references to *Learning* were found most frequently at Step 3, and also at Step 2 where it was guided by the framework. Unusually, it was also found at Step 1 where it was not prompted. Critical reflection was found at a slightly higher frequency at Step 2 but was low at Step 3, even though participants were expected to critique their learning and actions with a view to acting on them at this step.

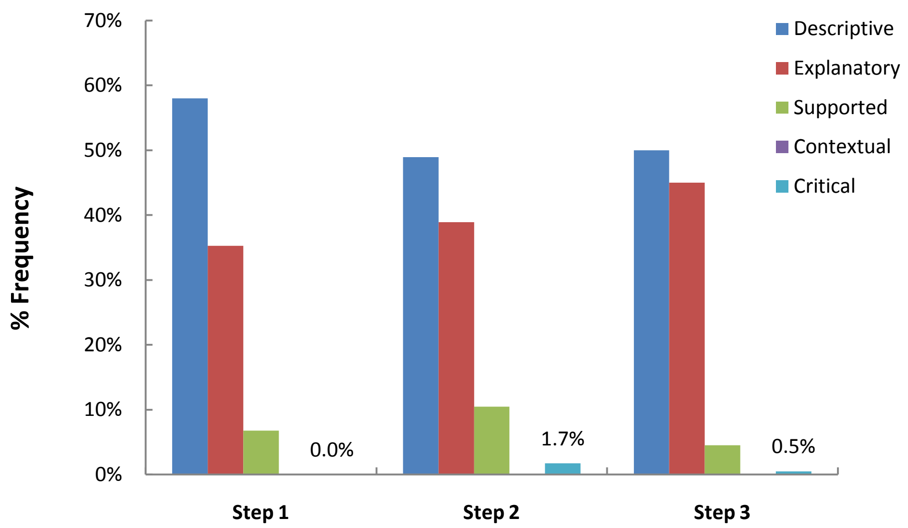

Figure 4: Levels of reflection at each step in the Reflective Framework (n=7).

Although, all participants used the framework to some degree in their written reflections, only two (Yonten and Nicholas) used it consistently for all four reflections. Evidence for this was provided by their use of the framework headings for each step. Although, use of the Reflective Framework varied, all participants found it helpful for guiding reflective writing, and the majority had plans to use the framework in the future to support reflective practice. Therefore, participants demonstrated levels of reflection beyond superficial description, and the framework was a useful tool for scaffolding reflective writing for professional learning and reflective practice.

When the content of the written reflections was analysed for evidence of professional learning and reflective practice, four themes became apparent: *professional capability*, *professional learning*, *professional practice*, and *professional context*. Five participants also demonstrated a connection between their reflections and learning in the multimedia design subject and their actions in practice which was indicative of professional learning and reflective practice. This evidence supported the types of reflection associated with learning and professional practice gleaned from analysis using the Levels of Reflection taxonomy.

Quality of reflection

The quality of reflection in participants' writing was not only indicated by the level and type of reflection but also the propensity of participants to use reflection for professional learning and reflective practice, and to generate questions during the reflective process. It was also apparent that participants considered others' perspectives in their writing as demonstrated by the degree of Supported reflection found. They also exhibited the expression of emotion and included their feelings when writing about experiences. This disposition is regarded as necessary if practitioners are to fully engage with their experiences (Boud et al., 1985)

However, participants did not critique multiple perspectives and compare them with their viewpoints and assumptions, a quality associated with both Contextual and Critical reflection in this study, and critical reflection in others' research (e.g., Fisher, 2003; Hatton & Smith; Ward & McCotter, 2004). For some researchers, reflective practice must include critical reflection as this is regarded necessary for transforming practice (Fook & Gardner, 2007; Minott, 2008). Even so, the capacity to monitor learning through setting goals and reflecting on what was learned (metacognition) was demonstrated by participants in the study and is claimed to be a necessary attribute for supporting reflective practice (Livingston, 1997; McAlpine & Weston, 2000, Parsons & Stephenson, 2005). It appears that participants were engaging in reflective practice, along with self-questioning which has been found to encourage reflection on practice (e.g., Borrell-Carrió & Epstein, 2004; Lemon, 2007; Samuels & Betts, 2007). Evidence of metacognition and the ability to express emotions was also apparent. Such dispositions appear to be linked to effective reflection associated with reflective practice. Engagement in reflective writing using the Reflective Framework may have been influential in changing participants' attitudes to reflection as well as developing their capacity for reflective practice. However, any connection between previous experience with reflection and the quality of the participants' reflective writing was not apparent. However, a shift in attitudes about reflection was evident.

On entry to the research, participants' previous experiences with reflective writing for professional learning and practice differed as did their views about reflection. The majority found writing the first reflection assignment challenging, and believed this arose from a "lack of familiarity with reflective writing and use of reflection as a learning method" (Hegarty, 2011, p. 196)). For Marie, writing her thoughts was threatening, yet she responded positively to the guidelines provided by the framework in scaffolding her writing, and found the process easier with practice. For example:

> Having to writing something down diary style was really confronting and I certainly didn't think I could do it and the guidelines … were helpful and … the reflections became more of a scaffolding ... for me (Marie, interview).

Yonten also found the Reflective framework helpful even though he initially found writing the reflections intimidating. Eventually, he shared the framework with colleagues in another subject because their unfamiliarity with reflection meant they were struggling to prepare written reflections. A contrasting view was expressed by Ruth who claimed that using the prompts in the framework took more time than her own previously established methods as she felt obliged to respond to each of the questions. Although, Ruth had previous experience in reflective writing most of her writing was at a descriptive level of reflection. Although, the majority of participants changed their opinions as a result of using the framework, and were able to see the value of reflection for learning and practice, Teresa's stance did not alter. For example:

> I found it … personally a bit of an awkward way to reflect …. I had to remember what I reflected on and put it in writing all the time, and I found it a more difficult way to reflect in a way, because I had to present things in such detail that [the lecturer] would understand" (Teresa, interview).

It is worth noting that Teresa had originally only used reflection as a way to 'think in her head' and this was the first time she had needed to reflect in writing. Five of the participants intended to continue to use the framework as a professional tool to support their reflective practice, and two of them intended to develop professional portfolios in the form of blogs. Following this research, the Three-Step Framework has been modified for use in guiding teaching staff to prepare blogs for reflective practice. As a result of the research, more emphasis has been placed on prompting the process of considering multiple perspectives and reflecting critically about incidents in practice. The impact of assessing the written reflections was not examined in this research. However, it is an important area as assessment is considered to be an inhibiting factor in the reflective process, particularly when used for reflective practice (Boud & Walker, 1998; Moon, 2004; Pedro, 2005; Stevens & Cooper, 2009).

Conclusion

Writing for reflective practice was scaffolded through the use of a Three-Step Reflective Framework developed for the study. The quality of reflective writing in this research was found to be linked to the levels and types of reflection. Three levels of reflection were commonly demonstrated in participants' reflective writing (Descriptive, Explanatory and Supported), yet critical reflection was rare. Participants commonly demonstrated a type of reflection defined as *Noticing* which indicated they were mindful of their experiences and able to write about their feelings, thoughts and knowledge, demonstrating they were engaging reflectively with their practice.

They also wrote frequently about their decisions and professional skills. The use of reflection for professional learning and self-questioning and references to learning and goals and other viewpoints were further indicators that participants were making use of a reflective process to make meaning of their practice experiences. Therefore, participants were able to develop skills for reflective practice through using the Three-Step Reflective framework. Also, particular dispositions emerged which were associated with engagement in reflective practice. The Reflective Framework was found useful in scaffolding reflective writing for an electronic design portfolio, and continues to be used in other capacities for supporting learning and reflective practice.

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Using design principles to improve pedagogical practice and promote student engagement

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Design principles are fundamental to the conduct of *educational design research* (or *design-based research*) studies, a research approach that is becoming more widely used in educational technology research and pedagogy. In this paper, we argue that design principles can be used to guide the design and development of learning environments in higher education that are based on sound practical and theoretical principles, and that can promote student engagement through innovative learning tasks. We review the use of design principles in educational research, and describe how these principles can be used to design and refine educational innovation and technology-based learning initiatives. The paper describes four phases of design-based research, together with examples of how existing principles can be analysed and used by teachers to inform the creation and dissemination of innovative solutions to educational problems.

Keywords: design-based research, student engagement, technology-based learning, instructional design

Introduction

In addition to the substantial challenges facing the higher education sector generally, such as global competition, socioeconomic access, the increasing need for highly skilled workers, an aging workforce, and rural and remote disadvantage (Bradley, Noonan, Nugent, & Scales, 2008), universities also face significant challenges in adopting and accommodating new technologies in their teaching and learning programs. The *2011 Horizon Report* (Johnson, Smith, Willis, Levine, & Haywood, 2011) noted that, in addition to world-wide challenges to accommodate new digital literacies and new forms of authoring (such as blogs, wikis, networked presentations. etc.) in all disciplines, individual organisational constraints are likely to be the most important factors in decisions to adopt new technologies. The report noted:

> Keeping pace with the rapid proliferation of information, software tools, and devices is challenging for students and teachers alike. New developments in technology are exciting and their potential for improving quality of life is enticing, but it can be overwhelming to attempt to keep up with even a few of the many new tools that are released. User-created content is exploding. (p. 8)

In the light of such challenges, and the need to adequately prepare students for new digital literacies, much attention has been paid to researching and implementing the means to support and improve student engagement. The area is, however, as argued by Bryson and Hand (2007), 'beset by its own complexity' (p. 351). They maintain that opportunities to improve student engagement are possible, at the course design level, through clearer curricular articulation, more attention to implementation, and strong alignment between outcomes and delivery. Others, such as Dickey (2005) argue that educators can learn much about student engagement from the design of games that present students with challenging tasks, role playing opportunities, affirmation of performance, and choice. Such recommendations for design effectively constitute design principles that enable teachers and instructional designers to use well-researched ideas as guidelines for their own efforts to enhance student engagement and learning outcomes.

The education literature is replete with design principles, although they might not always be called that. For example, the following lists from seminal works are forms of design principles because they give heuristics and guidelines for designing for particular outcomes:

Example: Bransford, Vye, Kinzer and Risko (1990) proposed that anchored instructional activities were characterised by the following design criteria:

- A single complex problem should be investigated by the students.
- Students identify and define their own questions.
- Students must have the opportunity to experience the problem from a number of different perspectives.
- Students work on the problem over a 'reasonably long period of time', that is weeks rather than days.
- Activities are logically related to the problem.

Example: Boud and Knights (1996) proposed that the following are important in introducing and establishing a productive climate for reflection:

- Articulating an educational rationale for the process
- Introducing a simple exercise to illustrate reflection
- Providing an opportunity for students to clarify their understanding of the idea
- Introducing a framework or model to aid thinking about elements of reflection
- Modelling a reflective approach in one's own presentation of the idea
- Identifying areas of the process that students can make their own
- Providing time
- Treating reflection as a normal activity.

Example: Oliver (2000) proposed guidelines for the design and development of web-based materials using new technologies:

- Choose meaningful contexts for the learning
- Choose the learning activities ahead of the content
- Choose open-ended and ill-structured tasks
- Make the resources plentiful
- Provide supports for the learning
- Use authentic assessment activities.

Example: McLoughlin and Oliver (2000) proposed ten design principles for culturally inclusive instructional design:

- Adopt an epistemology that is consistent with, and supportive of constructivist learning and multiple perspectives
- Design authentic learning activities
- Create flexible tasks and tools for knowledge sharing
- Ensure different forms of support, within and outside the community
- Establish flexible and responsive student roles and responsibilities

- Provide communication tools and social interaction for learners to co-construct knowledge
- Create tasks for self direction, ownership and collaboration
- Ensure flexible tutoring and mentoring roles that are responsive to learner needs
- Create access to varied resources to ensure multiple perspectives
- Provide flexibility in learning goals, outcomes and modes of assessment.

It is clear that such principles are useful for teachers wishing to implement improvements in their learning environments and pedagogical practice, and they exist in a range of different contexts. Van den Akker (1999) described design principles in more detail as heuristic statements in a format best illustrated as:

> If you want to design intervention X [for the purpose/function Y in context Z], then you are best advised to give that intervention the characteristics A, B, and C [substantive emphasis], and to do that via procedures K, L, and M [procedural emphasis], because of arguments P, Q, and R'. (p. 9)

Such design principles are not 'recipes for success' but are used principally 'to help others select and apply the most appropriate substantive and procedural knowledge for specific design and development tasks in their own settings' (McKenney, Nieveen, & van den Akker, 2006, p. 73).

The identification, application, testing, and refinement of design principles are infused throughout the phases of design-based research, as described in the next section.

Design principles in design-based research and evaluation

The ongoing use and development of design principles is a key defining element of design-based research (also known as *educational design research*, *design experiments*, *formative research* and *development research*) (van den Akker, Gravemeijer, McKenney, & Nieveen, 2006). At every stage of the research process, initial and evolving design principles inform and guide the direction and shape of innovation being developed as well as its implementation and testing, until ultimately, the evolution of draft guidelines into refined design principles become a critical product of the research.

The Design-based Research Collective (2003) suggested four areas where design-based research showed much promise in improving educational practice:

(a) exploring possibilities for creating novel learning and teaching environments,
(b) developing theories of learning and instruction that are contextually based,
(c) advancing and consolidating design knowledge, and
(d) increasing our capacity for educational innovation (2003, p. 8)

In this section, we review the phases of design-based research (as portrayed by Reeves, 2006 in Figure 1 below), and how design principles evolve throughout such research, culminating in sharable design principles that can guide teachers facing problems in similar or parallel pedagogical contexts.

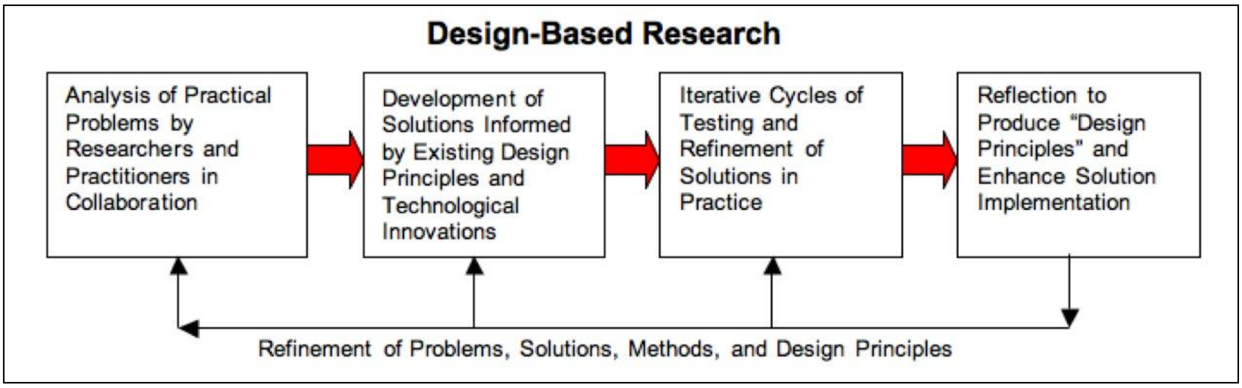

Figure 1: Design-based research (Reeves, 2006, p. 59)

PHASE 1. Analysis and exploration of a problem

In the analysis and exploration phase of design-based research, the problem under investigation is explored in an organic way by the researchers, practitioners and other stakeholders collaborating in the design research initiative. In other words, the problem is explored intensively, not solely from an academic perspective, but in the first instance, from the perspective of the people who deal with the problem on a day-to-day basis. As noted by McKenney, et al., (2006), it is only recently that practitioners have been consulted in early phases of research, whereas previously it might have been more common to consult them, for example, only at the formative evaluation phase.

In design-based research, teachers and researchers collaboratively explore the nature of an educational issue or problem facing students, and work together to create a solution (Design-Based Research Collective, 2003). It is important for teachers to be involved in this phase so that the full extent of the problem is known, rather than being interpreted solely by researchers. However, there is another key advantage to this close collaboration on the exploration of the problem—one that relates to the everyday experience of practitioners and the intimate understanding they frequently have with the problem and its potential solution.

The comparison of the everyday understanding and practice of practitioners and those of so-called 'just plain folk' has been noted by Lave and others (cf. Brown, Collins, & Duguid, 1989; Lave & Wenger, 1991). The issues faced by 'just plain folk' are generally more readily resolved by working with the resources available—those that exist within the context that produced the problem itself—rather than by reference to theoretical guidelines or algorithms. Practitioners, with their intimate knowledge of problems and their contexts and contingencies, can work with researchers to craft solutions appropriate to the context. As Brown et al. (1989) noted: 'The problem, the solution, and the cognition involved in getting between the two cannot be isolated from the context in which they are embedded' (p. 36). Consultation with practitioners who are familiar with the problem area of the research can provide rich insights into complexities inherent in a significant educational problem, because these insights are based upon their intimate and practical understanding of the issues. Practitioners may have developed their own heuristics for solving some aspects of the problem or at least coping with it. These heuristics can form the basis of draft design principles that may be used to guide the design of a solution created in the design and construction phase (i.e., Phase 2 in shown in Figure 1).

Consultations with practitioners are not always formal, and can take a variety of forms to produce different types of valuable data, such as:

- *Participant observation and conversation*: Participant observation by immersion in the setting provides an excellent opportunity to observe first hand the setting and the 'cognition involved' in exploring the parameters of the problem.
- *Interviews*: Deliberately targeting experienced practitioners for interview, together with novice professionals and students, will provide much information on the meaning that practitioners and other stakeholders hold for the everyday activities and issues that relate to the problem area.
- *Focus groups interviews*: The strength of a focus group is that ideas can be bounced off other participants, often resulting in a more robust understanding of the issues, together with potential solutions and ideas for the design of the intervention.
- *Reflective journals or blogs*: Having the agreement of 2-3 teachers who are willing to commit to this reflective recording will provide an invaluable means to explore the problem area first hand.
- *Other types of data collection* can also be used in this consultation process, but written questionnaires and surveys (even those using open-ended questions) should be avoided, as they are less likely to provide the type of in-depth reflective data that is required to fully benefit from the experiences of practitioners.

The data collected from consultations with practitioners can be analysed for themes and issues, and importantly to determine whether any practice-based advice or heuristics can be obtained to inform the design of the intervention. Such ideas can form the basis of draft principles for use in the design phase of the research.

PHASE 2. Development of solutions using existing design principles and technological innovations

The second phase of educational design-based research focuses on a solution to the problem that can be implemented in the educational setting, such as a classroom or online learning environment. While a general literature review is conducted in the first phase to inform the exploration of the problem, in this second phase the literature is again searched to find relevant theory that can guide critical and creative thinking, as well as existing design principles that may have addressed a similar or parallel problem. These principles (similar to the examples given earlier) inform the design of the learning solution or intervention that will potentially provide a solution to the problem.

Creation of draft principles to guide the design of an intervention takes careful thought and analysis because of the need to consider relevant learning theories together with existing principles, as well as ideas from the practitioners. As suggested by van den Akker (1999), using a stem (such as *[Condition x] may best be facilitated by learning environments that*:) will help to keep the principles quite specific and naturally prompt each to start with a verb (e.g., *allow, provide opportunities for, promote, enable, support*, etc.), which ensures that each principle can be related to an action or activity in the learning situation. Once the draft principles have been created, the proposed solution is designed and developed, according to the draft principles (Joseph, 2004). The design and development of the intervention will also be informed by evaluations conducted throughout planning and development, in particular, through needs assessments that inform design, and through formative evaluations that inform development (Reeves & Hedberg, 2003).

By the end of this process, draft principles will have been created from review of theory and research literature, from consultations with practitioners, and from previous research (such as a pilot study), and they will have guided the design and development of an intervention to address a significant educational problem.

PHASE 3. Implementation and evaluation in iterative cycles

The implementation and evaluation cycles of a mature product provide further opportunities to refine design principles. After the first full implementation of the solution with the target group of students and the analysis of the data, the learning environment is refined and then implemented again, in 'continuous cycles of design, enactment, analysis, and redesign' (Design-Based Research Collective, 2003, p. 5). At this stage, further reflection is also recommended for the guiding design principles themselves, and sometimes it is necessary to edit and refine them after analysis of initial findings.

PHASE 4. Reflection to produce design principles

Once a learning environment or intervention has been implemented, evaluated and refined in cycles, design principles can be 'captured' to comprise the sharable, published output from the research in order to inform future development and implementation decisions. This is done in iterative cycles of improvement that are not concluded until 'satisfactory outcomes have been reached by all concerned' (Reeves, 2006, p. 59). Design principles can be further refined by sharing them with other researchers and practitioners, through presentations and publications. Peer review of design principles is essential for the overall enhancement of professional practice to eventually yield improved educational outcomes, such as increased student engagement.

Using design principles to guide educational practice

It is unwise to consider design principles to be 'set in stone'. Instead, they are best regarded as informed reusable guidelines for others wishing to create their own solutions to educational problems across sectors. To further the idea of reusability, Collins, Joseph, and Bielaczyc (2004) aspired to the sharing of design principles across the wider community of educators:

> Our approach to design research requires much more effort than any one human can carry out … it will take teams of researchers and accessible archives documenting design experiments … to make these dreams at all possible. (p. 33)

At least one group has taken up this challenge in the form of the *Design Principles Database* (Kali, 2008; Kali & Linn, n.d.), developed and maintained by the Technology Enhanced Learning in Science (TELS) group. The web-based database contains hundreds of design principles, searchable by subject, audience and category. The database is intended to assist researchers to connect with others working in the same areas 'enabling designers to build on the successes and failures of others rather than reinventing solutions that others have struggled to develop' (Kali & Linn, n.d., para 1). The generation of principles specific to the conduct of design-based research has also been promoted by Ma and Harmon (2009) who argue that because of 'unresolved methodological issues' researchers can also contribute to understanding of the approach by also 'reflecting on their methodology to generate principles on how to conduct design-based research' (p. 86). Some researchers have already contributed to this understanding, such Markauskaite and Reimann (2008) who have explored the potential of e-research to solve challenges of scaling design-based research findings.

Because of its iterative and consultative nature, design-based research is unlikely to engender researcher-imposed directives on how problems should be approached, or in the words of Anderson (2006) 'those types of research that unilaterally descend for testing in a classroom and then disappear with the researcher once the experiment has been concluded' (Anderson, 2005). Reeves (2006) also cautioned against the notion of researchers mandating procedures and processes for teachers to implement: 'Our goal should not be to develop esoteric theoretical knowledge that we think practitioners should apply' (p. 61). However, when presented in the form of design principles, research findings have the potential to effectively bridge the gap between educational theory and practice (Wang & Hannafin, 2005).

Conclusion

In an educational technology class entitled *Learning Sciences*, Park, Choi, and Hong (2010) employed the use of story telling as instructional elements in higher education. Small groups of students selected existing fairy stories or cartoons as analogies to instructional and research approaches. In their presentation of this paper, Park, Choi and Hong described the investigation of design-based research by a group who chose the analogy of the Coyote and Road Runner cartoons. In the cartoon series, the Coyote tries a variety of complex and repetitive means to catch and eat the Road Runner, methods that 'invariably fail in improbable and spectacular ways' (Wile E. Coyote and Road Runner, n.d.). The lack of carefully considered design principles is characteristic of the failure of the Coyote's methods, the lesson being that design principles could assist him to avoid making the same mistakes over and over again. This very apt analogy can be extended to classroom practices, where new processes (or indeed technologies) are employed without theoretical and pedagogical foundation and are thus doomed to fail in promoting student learning and engagement.

Higher education courses, units and tasks that are based on design principles have a solid foundation in theory and practice. They are based on the ideas of practitioners (many with a wealth of experience and knowledge), on the writings of theorists, and on the findings of researchers. They are implemented and evaluated ideally until almost all the problems have been addressed, so they have significant input from students who have been part of the successively improving iterations, and the teachers who have guided them. Such learning environments have a very good chance of engaging students in meaningful and rewarding learning activities.

Design-based research has the capacity to change the ways that researchers and practitioners together investigate and solve significant educational problems in powerful ways. As noted by Anderson (2006) 'design-based research does not seek for universal solutions but rather for deep understanding of innovations and the factors that effect improvement in local contexts'. Design principles assist not only in the development of these solutions but through dissemination, provide the means to extend the results of research beyond the local context to educators in similar and parallel contexts worldwide.

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Leading an evidence-based, multi-stakeholder approach to evaluating the implementation of a new online learning environment: an Australian institutional case study

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An Australian institutional case study is presented on the evaluation approach being adopted for the implementation of a new online learning environment. Well conceived and inclusive evaluation is seen as essential for the quality management of online learning environments. The focus is on identifying and reconciling the informational needs of various stakeholder groups in the institution, and developing a plan of action covering the key period of implementation. The significant judgements required to carry out evaluation in a multi-campus environment cannot be under-estimated. This is particularly the case given the more recent move to devolving resources and responsibility for the successful implementation of the environment to faculties in the institution concerned. It calls for a more sophisticated conception and set of practices around distributed leadership, as aided by institutions' teaching and learning centres. A set of strategic recommendations are offered to help with the evaluation task.

Keywords: learning management systems, evaluation, quality management, teaching and learning centres

Introduction

This paper draws on work being undertaken as part of an Australian Learning and Teaching Council (ALTC) project, **Building distributed leadership in designing and implementing a quality management framework for Online Learning Environments (OLEs)**, involving Deakin University, University of South Australia, Macquarie University, RMIT University and University of Southern Queensland. One key aspect of the national project is the investigation of the evidence required to enhance the quality management of OLEs. Therefore, the focus here is on leading an evidence-based, multi-level and multi-stakeholder approach to the evaluation of the implementation of a new online learning environment with particular reference to institutionally approved and supported learning technologies like learning management systems. The paper outlines the importance of, and challenges associated with, undertaking inclusive evaluation taking account of a range of stakeholder information needs. This is required to best manage the quality of online learning environments over time. Such an evaluation is a major undertaking, and is not a straightforward task. It is fundamentally political in nature, requiring the declaration and reconciliation of different needs and interests. The way this challenge has been approached in one Australian university is explored. This is not a case study in the making of best practices. It is a case study on dealing with the realities of undertaking large-scale institutional evaluation of complex teaching and learning systems. The strategic and constructive role that teaching and learning centres can play in this endeavour is highlighted.

Background

In line with international developments, Australian universities have made very large investments in corporate educational technologies to support their commitments to online, open, distance and flexible education. Learning management systems (LMSs) have represented the centrepiece of these institutional investments over the last decade or more. Learning management systems are currently perhaps the most widely used and most expensive educational technology tool (Salinas, 2008), and, like many other learning technology trends before them, have been adopted by higher education institutions almost automatically and uncritically (Reynolds, Treharne & Tripp, 2003). The choice of a particular system is a significant decision-making event shaping institutional approaches to ICT-enabled learning for a considerable period of time, i.e. for most institutions at least five years. Many university leaders have a stake in making and implementing such a choice, ranging across University Senior Executive members, leadership of central teaching, learning, media production and IT groups and through various levels of faculty academic leadership. The latter encompassing such leaders as Associate Deans (Teaching and Learning), Heads of School and program and unit/course coordinators. Almost all staff in a university use and rely on its LMS in enabling student learning.

Many Australian universities have recently reviewed, are reviewing or will soon be reviewing their LMS technologies with a view to making decisions on the next generation of online learning environments and developments. In addition, adjunct specialist applications are often integrated into such systems to provide a one-stop-shop for students and teachers. LMSs, and associated corporately supported e-learning technologies, are seen by universities as ‘mission critical’. Running in parallel with these institutionally-supported developments has been the growing use and importance of externally hosted social media/networking sites. These too are contributing to an enhanced learning experience and require increasingly careful attention.

Having committed to a particular system, what types of data are collected at what levels of the organisation to assure and improve the quality of use, and how is evidence acted upon through the various decision-making structures of the institution? The importance of quality management systems, and their current state of underdevelopment in higher education, is highlighted by Fullan and Scott (2009). Turnaround leadership, they argue, is dependent on the development of such systems, and a greater focus on outcomes and impact (as opposed to inputs). They also observe:

> ...a focus on robust evidence is often not front and center when it comes to making decisions about what most requires improvement and attention in universities, what their key strategic directions should be, or how well their core activities are currently working in practice. ...A university culture characterised by a commitment to continuous evaluation, inquiry, and quality improvement concentrates on using evidence to identify what aspects of its current provision are working well and what most need enhancement (Fullan & Scott, 2009, p.80).

The effective leadership of OLEs is also dependent on such systems with the associated focus on learning and teaching outcomes and impacts, and such systems are nowhere more important than in areas of greatest strategic importance and value to the institution – corporately supported LMSs and associated e-learning technology investments. We concur with Fullan and Scott (2009) that much greater commitment to systematic institutional evidence gathering and use is required in the area of OLE implementations. The Australasian Council on Open, Distance and E-learning (ACODE) has developed benchmarks for e-learning in universities and guidelines for their use (ACODE, 2007). Benchmark 2: Planning for, and quality improvement of the integration of technologies for learning and teaching is particularly relevant. The description of this benchmark, a good practice statement and performance indicators follow:

> **Scoping Statement**: There is a need for institution wide quality assurance processes to ensure the appropriate use of technologies in learning and teaching. This will include planning, implementation, evaluation and feedback loops.

Good Practice Statement:
Institutions support and encourage the appropriate use of technology in learning and teaching through strategic planning processes at all levels of the institution. The focus is continuous improvement through systematic and regular evaluation of implementation strategies and outcomes. Such evaluation will in turn inform future planning.
Performance Indicators:
1. Institution wide processes for quality assurance are in place and in use to integrate technologies in learning and teaching.
2. Institution and Faculty plans are aligned with institution policy for the use of technology in learning and teaching.
3. Operationalisation is planned and evaluated.
4. Planning and quality improvement is resourced.
5. Collaboration for integrating technology in learning and teaching occurs across key functional areas.
6. Evaluation cycles are in place to measure key performance indicators for all key stakeholders.
7. Outcomes are reported to all levels of the institution.
8. Evaluation feedback is integrated in planning for continuous improvement purposes.

It is timely to shed light on how universities, through this institutional case study, are currently conducting planning, implementation, evaluation and feedback loops in the context of the new wave of decision making on OLEs, including social networking developments.

Framing evaluation of OLEs: stakeholder analysis

Institutional surveying of staff and students' perceptions of the value of various functions of the OLE that Deakin University adopted in 2003 was undertaken over a three-year period. From a user perception perspective, this survey data provided indicators for action foci to improve staff and student satisfaction, and also challenged one-size-fits all institutional policy regarding the use and support of OLE systems (Palmer & Holt, 2010). Since the time of this surveying, the OLE at Deakin has expanded beyond merely the LMS to encompass a portfolio of e-learning technologies including a synchronous communications tool, a system for audio-visual recording of presentations for later online distribution via downloading, a set of social software tools, a third-party online service for checking the originality of submitted work, and others. Given both the intervening period and the expansion of the range of technologies now included in the OLE, there is a pressing need to update this information, as well as to establish on-going, systematic monitoring of the OLE (Sharpe, Benfield, Roberts & Francis, 2006). With the changing times, comes a need to evaluate students' perceptions of the value of e-learning technologies in terms of their capacities to support strong student engagement, quality learning experiences and quality learning outcomes (Coates, 2006). To evaluate merely student satisfaction with technical-functional aspects of the OLE now falls short of meeting this need. More fundamentally, as the OLE has expanded from being solely the LMS to encompass a portfolio of e-learning technologies, a key question arises regarding the best ways in which elements from the portfolio of technologies can be organised and combined into learning environments to improve learning (Gibbs & Gosper, 2006).

Parties that have a 'stake' in the evaluation are those who can affect or be affected by its conceptualisation and conduct. Their needs, interests, expectations and circumstances need to be carefully considered. Holt, Rice, Smissen and Bowly (2001) identified the following parties as having a key stake in decision making on learning management systems:

- **University Senior Executive**, strategic competitive considerations
- **Management of administrative support units**, cost-effective service delivery considerations
- **Management of academic support units**, learning resource management and quality of education considerations
- **Faculty academic management/leadership**, faculty-based competitive and marketing considerations
- **Faculty academic and teaching support staff**, discipline- and program-based educational considerations (Holt et al. 2001, p.273).

Added to these parties, in Deakin's most recent OLE decision making and implementation phases, has been the University's commercial software services division, i.e. the developer of a major commercial student information system. This party was allocated the responsibility of overseeing the OLE decision-making process and project managing the implementation of the system. They have been particularly concerned to ensure that certain benefits and associated key performance indicators (KPIs) are being used to evaluate the benefits of the new system in use. The planned benefits and KPIs cover:

Benefit 1: Improved student experience
- KPI: More positive student perception of enhanced learning quality
- KPI: More positive staff perception of enhanced learning quality
- KPI: Increased student satisfaction with use of teaching and learning technologies
- KPI: Maintained student satisfaction with DSO [read new LMS as used with accompanying learning technologies]

Benefit 2: Reduction in online course delivery costs
- KPI: Reduction in staff time required to administer units in [new] DSO
- KPI: Increased ease of use for staff (compared with previous LMS)
- KPI: Reduction in ITSD [Information Technology Services Division] staff time required to support DSO

Benefit 3: More contemporary and flexible learning programs
- KPI: Increased innovations to program delivery via DSO
- KPI: Increased ease of use of online learning tools in DSO

Each of the stakeholders' interests naturally impact the ways in which these stakeholders would evaluate the benefits of any new OLE. Each set of interests carries its own self-evidently declared purpose for the evaluation. The purpose of the OLE evaluation has to be framed in an inclusive and non-biased fashion. In the University's case, through the function of an LMS evaluation working party (of which one of the authors has been a continuous member) established as part of the institution's overall LMS governance structure, the purpose of the evaluation was framed as follows: 'To inform all relevant stakeholders and their leadership on progress in realising the benefits of the new DSO in enabling the achievement of Deakin's flexible education vision, along with providing them with a basis for informed decision making'. The question to be addressed was: 'Does the new Deakin Studies Online (DSO) environment [read new LMS as used with accompanying learning technologies] make a difference to teaching and learning at Deakin University?' If the new DSO environment does make a difference, in what ways, how, when and where are the differences experienced? The key questions were underpinned by a series of more specific questions representing a range of views of the various stakeholder representatives involved in the working party's deliberations:

- Does the new DSO enhance the quality of learning and teaching?
- Does the new DSO enhance the efficiency of learning and teaching?
- Does the new DSO enhance the satisfaction of learning and teaching?
- Does the new DSO enhance accessibility to learning opportunities?
- Does the new DSO enhance the administration and management of learning?
- Does the new DSO impact academic workload (new compared to the old system)?
- Does the new DSO provide opportunities for the advancement of higher education research/scholarship?

While the benefits as outlined above were shared and more or less understood by various stakeholders at the beginning of the process, the evaluation scope was seen to be broader than this specification of purpose (the KPIs, on the other hand, were developed through a separate senior management mechanism and shared later in the working party's deliberations). It was felt that evaluation activities had to give stronger expression to students' and teaching staff members' experiences and wishes to contribute to enhanced system use over time. The deliberations begged still further the question of what was in and out of the scope of the planned evaluation. Was the focus to be on the teaching and learning implementation impacts of the new learning management system, as integrated with other institutionally supported learning technologies, all representing the new DSO environment for the University? Or, was the evaluation merely to focus on the new LMS itself, in isolation from other significant learning technologies? The consensus after extensive deliberation was for the former position to be adopted. While important, the assessment of the technical performance of the new DSO and the relationship with the vendor was not seen to be within the scope of this predominately teaching/learning focused evaluation approach. It was assumed these would be handled separately by the University's IT Division and commercial software services operation, respectively. Such evaluation activity, however, was noted in the overall plan (see Table 1 below).

An evaluation plan for the new DSO

While the DSO evaluation working party gradually worked its way through to an agreement on purpose (i.e. the overarching and subsidiary evaluation questions) and shared understanding on higher level benefits and KPIs, a concrete plan of evaluation activities needed to be determined, along with their timing and responsibility for their carriage. As for timing, the evaluation was seen to be needed over a three-year period from 2011 to 2013. The 2011 evaluation would focus on collecting institutional baseline data on the University's current DSO environment and evaluating initial transitioning to the new LMS through the pilot unit program. The 2012 evaluation focus would be on the complete implementation of the new LMS/DSO across the University, with special focus on the value of the new system's features. The 2013 evaluation focus would be on the integration of the new DSO environment across programs/courses as part of the University's new curriculum reform agenda.

The methods of evaluation to be used would cover:

- Institutional surveying of staff and student perceptions of the importance, satisfaction and use of various functions in the current and new LMS, and accompanying learning technologies
- Usage data extracted from the new system at institutional, faculty and program/course level
- Faculty-based surveying of staff and students involved in the new LMS/DSO pilot unit program
- One-on-one development support for teaching staff involved in the pilot unit program
- Sharing of academic developers' and teachers' experiences of the new system through faculty and University forums
- Interviews and focus groups with key staff involved in integrating the new DSO environment into their programs/courses.

The evaluation outputs would include:

- Institutional reports on staff and student use and value attributed to the new DSO environment
- System usage data reports
- Faculty reports and case studies on the use of the new DSO, including the value of new features
- Presentations at faculty and University forums
- Presentations at external academic conferences and events
- Academic publications.

The nature of evaluation methods to be used and their timing is summarised in Table 1 below. The three-year plan is still a work in progress. It represents a multi-level and multi-domain approach involving the work of various stakeholders located centrally and in faculties, and as spread across the University's distributed multi-campus and multi-city operation. It represents an amalgam of centralised and decentralised activities. The evaluation plan is distributed, along with the leadership and control of resources for its various components. The devolution of significant resources and staffing for supporting the implementation of the new LMS to faculties is a significant departure from previous institutional LMS implementation practices. The locus of LMS implementation control has shifted from the centre to the faculties and is represented in each faculty having its own LMS transition plan and local control over the resources to make it happen. Faculty variations in LMS evaluation and research interests and commitments naturally flow from this devolved implementation model.

Table 1: Institution plan of evaluation foci and activities

Evaluation/research activity	**2011**	**2012**	**2013**
Institutional surveying(teaching and learning centre)	Baseline staff and student data on current OLE	Staff and student data on new OLE	Staff and student data on new OLE
Faculty developmental evaluation (Faculties)	New OLE pilot unit program	New OLE initial roll-out	OLE mainstreaming
Faculty summative evaluation (teaching and learning centre with faculties)	New OLE pilot unit program – interviews with staff and surveying of students	To be determined	Not required
Research on integration of new OLE with curriculum development	NA	To be determined by faculties and teaching/learning centre	To be determined by faculties and teaching/learning centre

OLE technical evaluation (IT Division)	New OLE pilot unit program	Going live across the institution	Monitoring ongoing performance
OLE change management effectiveness (Project management centre)	New OLE pilot unit program	Going live across the institution	Full embedding of new OLE in institution's teaching and learning environment

Evaluation challenges

Work in planning the evaluation has raised a number challenges, which are explored below.

What is the purpose of the evaluation?

The purpose of any new OLE evaluation can be clear, that is, clear to those themselves who have a particular view about the benefits to be had from any new system implementation. The problem is that a wide range of views are in force, held by parties who might wish to draw others towards their points of view based on their sense of importance and authority. There are those who have broader and more limited benefits in mind, those who have interests in some benefits but not others, those who see benefits as realisable sooner rather than later, or who, in fact, require that such benefits are realised sooner than later. Some parties are open to unanticipated benefits (and, indeed, costs), while others are fixed on the defined benefits plan. Limited defined benefits call for limited and closed methods of data collection; more open and expansive views of benefits yet to be imagined call for a greater diversity of methods of both open and closed form. To work through these many and possibly conflicted views is not an easy exercise. We see some central organisational group, like a teaching and learning centre, as being best placed to help facilitate and coordinate some overall institutional plan of action (and the three authors of this paper are all actively contributing to it from the vantage point of being members of such a centre). This role was made more problematic within our institutional context as the evaluation plan was conceived at a time when the Centre was in the midst of major restructure and redirection with debates around what and how much should be in the new Centre and what and how much should be devolved to faculty and how the two would work together. A new Centre, accompanying a new LMS, accompanying a national external Australian Universities Quality Agency (AUQA) audit in the first year of implementation provided a highly volatile environment to plan centrally the evaluation task.

What types of evaluation should be conducted?

There was a general consensus in the University's DSO evaluation working party that baseline data should be collected on staff and students' views on the current LMS/DSO environment in the first year of the implementation plan (see Table 1). This surveying should be repeated in the following two years as parties moved into the new system. Two of the authors of this paper designed, produced and administered the surveys in concert with Senior Executive support. The surveys were modelled on those used over 2004-2005 during the initial implementation of the institution's previous LMS. The University discontinued these surveys when the system was reaching a maturity of use, and relied on two items in its standard unit-based student evaluation surveying to ascertain views on systems reliability and value for learning. The new staff and student surveys were expanded to include other accompanying learning technologies that had been added and integrated with the LMS since its initial implementation. The new surveys retain a focus on the importance and satisfaction of various features offered by the LMS, along with the subsequently added learning technologies supported by the institution. In addition, a new dimension has been added related to frequency of use. This was seen as a proxy measure of student engagement, an agenda popularised in recent years through the advent of the Australasian Survey of Student Engagement (AUSSE), which was also used in our own institution for a period. Student engagement relates to the time and effort devoted to purposively designed tasks, and frequency of use is a helpful measure of how much time students spend using various technology features. The survey for students also covers their perceptions of support for the use of the OLE, and, for staff, the adequacy of professional development and training opportunities in using the OLE to best effect. Both surveys have a question for respondents on how well informed they believe they are about the advent of the new LMS. The institutional surveys have received University ethics committee approval. We recommend that as much as possible all data collection methods go through the rigorous process of independent ethics review to ensure they are technically and ethically sound.

We certainly acknowledge that the surveys are product-centric. Questions of how features and technologies are selected, integrated and used by teaching staff is not central to the staff survey design, unless such information is volunteered through open-ended questions on best aspects of the OLE, and those that need improvement. A parallel argument can be made about the design of the student survey. It is again product-centric. It does not directly examine the student experience of engaging with their overall online learning environment. Ultimately, any type of data collection method will have its limitations. Institutional surveying of the type used in our case directly responds to senior leaders' concerns to find out whether the OLE is well used and well valued, i.e. is there an adequate return on the educational technology investment made by the institution? Senior leadership want and need evidence to at the very least know whether a good decision has been made, and that the new system will stand the institution in good stead over time. Exploring the more nuanced uses of the OLE needs to be considered at faculty, program and discipline levels. This is reflected in Table 1 where added depth of focus will be on those units piloting the new LMS in 2011 through consistent student surveying across all pilot units and depth interviews with the leaders of those units. With the new LMS pilot evaluation, unit chairs were asked, in interview, a range of questions covering how they used the new system, how easy it was to use the system for themselves as teachers and for their students, whether they used it differently to the current system, whether it had helped to enhance the quality of teaching and learning, whether administration and management was easier using the new system, along with identifying elements of the system that might have the biggest impact on enhancing learning, ideas on how it might allow staff to change their teaching over time, improvements that could be made, and any additional support or training that would be beneficial. Students undertaking the pilot units received a survey with closed-ended questions covering ease of access and use of various elements of new system in various modes/places, and open-ended questions covering whether the new system enhanced learning, was more reliable, along with identifying best aspects of the new system, areas needing improvement, ideas on what the new system could do but which it can't do currently, and views on any additional training/support needed to use the system better.

Additional forums are planned to be run to allow a broader range of parties (beyond unit chairs) to share their experiences of being involved in the pilot unit program. These forums will involve senior academic leaders, all those involved in teaching on the pilot units, and central and local faculty support staff. Additionally, faculties are collecting data on the fly in their pilot units to help improve the online learning experience as it is occurring. The longer term impacts of the new LMS on curriculum design and delivery are to be researched, although the exact mechanisms to do this are yet to be determined. The new LMS is being implemented at the beginning of the University's new teaching and learning planning period, and relates to the institution's commitment to undertake wide ranging curriculum review and reform.

Finally, apart from transmission of learning resources and facilitating learning interactions, one of the primary functions claimed for LMSs is the provision of evaluation information (White & Larusson, 2010). Most commercial LMSs have some form of built-in analytic reporting capacity that logs and tracks certain types of user activity, typically including number of logins, duration of logins, access to learning resources, communications and other interactions, completion of learning tasks, etc. (Dawson, Heathcote & Poole, 2010). This recorded 'student tracking' data provides system administrators and educators with potentially valuable information for evaluation of aspects of performance of the LMS (Mazza & Botturi, 2007). For example, tracking data on student use of an online discussion space was combined with other information and used to reveal distinct patterns of usage of the discussion space and which types of student posts were positively associated with desired learning outcomes (Palmer, Holt & Bray, 2008). This will be another layer of data analysis in our own institution's approach.

Who needs to approve evaluation?

This is not a trivial question as large-scale institutional surveying of OLEs usually needs to fit within an annual schedule of surveys of students and staff as approved by the University's Senior Executive (and as organised in our case through the University's Planning Unit which is responsible for all institutional data collection). Surveying of students' and staff members' views about various aspects of the institution's OLE must sit comfortably with an institution's ongoing system of student surveying on units and the perceived quality of their teaching. At Deakin, all coursework units are surveyed each time they are offered over a six-week period from late in the teaching period through until the end of examinations. External student surveying also needs to be taken in account. The surveying landscape can be very crowded and students placed in danger of being over-surveyed thus degrading survey responses. Different surveys running concurrently can be frowned upon. To commit students and staff to a further survey on the OLE, an institution must see its OLE as being strategically very important. It must wholeheartedly commit to the importance of collecting and using institution-wide data for improved decision making and improved practice. More practically, new surveying must be conducted during gap periods in the annual surveying calendar. The surveying, though, must make sense in terms of its timing and use. These logistical matters cannot be under-estimated. The best designed surveying will count for nothing if the surveys themselves can find no room in crowded institutional survey schedules. Enhancing the student experience must be central to the imperative to ask for and secure approval for major new data collection methods. This must be strongly advocated, and Senior Executive sponsorship is essential. The argument will not necessarily sell itself from afar. An added impetus for making such requests and having them seriously considered at the highest level might lie in being actively involved in a relevant nationally funded ALTC-type project where evidence gathering is a major focus of attention.

Who needs to accept responsibility for funding and conducting evaluation?

One might expect that any new systems implementation budget would make allowance for costs involved in carrying out an institutional evaluation plan. Those who manage such budgets can quite reasonably expect an upfront cost estimate. However, providing such upfront estimates is difficult as evaluation planning can be a very fluid exercise, with an agenda that is pushed and pulled between different parties with different information needs, which in turn may be much more or less expansive in nature. Cost estimates can be further complicated by expectations that it is the 'core business' of certain established institutional groups to undertake such work largely from their own resources. These might range from the absolute minimalist stance of using limited currently collected data to opening up whole new lines of rich data collection. Teaching and learning centres can be reasonably asked to make a significant contribution to evaluation activities, but they may not be in a position to run all necessary institutional surveying.

The added challenge in costing and conducting evaluation relates to the devolved nature of the LMS implementation, with faculties being allocated significant amounts of funding to support local developments. Their own transition plans can contain local evaluation commitments and associated funding allocations. This raises the issue of the need to be clear about what is being done centrally and what is being executed locally. It might be reasonably accepted that institutional surveying lies in the province of a teaching and learning centre. Equally, in an environment with strong faculty-based academic development resourcing, it could be reasonably assumed that the lead for research on the alignment of a new OLE with program or discipline curricula might come locally. However, there are activities which fall in-between these two ends of the continuum that can be seen as overlapping and possibly disputed territory amongst stakeholders. This can particularly be the case with planning the evaluation of any piloting of the new system, and in determining what data should be collected consistently across all pilot units and what data should be collected based particular faculties' specific interests.

How long should the evaluation task be sustained?

Our University is planning for special evaluation activities over a three-year period at this stage. Special activity relating to the evaluation of the pilot unit program is only required in the first year of implementation. It has been speculated amongst stakeholders that the benefits of some of the major new features of the system may not materialise in full until well down the track. At a point, special evaluation activity needs to give way to routine and ongoing data collection, which integrates with the institution's continuous quality improvement processes. We see, though, in the longer term, greater opportunities for specialist research projects on various aspects of the impact of the new OLE, particularly with the gradual uptake of significant new features. In the case of our own institution, renewed impetus will be given to both specialist evaluation and research projects through the establishment of a new Teaching and Learning Centre, focused on enabling desired learning futures, and encompassing research, scholarship, development and practice improvement in the realm of flexible education within its mandate.

How can evaluation best inform decision making and improve practice?

Leadership of OLEs is embedded at many levels of the management hierarchy and is exerted informally by leading edge users of any new system. Data collected at different levels for different stakeholders must feed into decision making through myriad structures and mechanisms. Higher level data collection must feed into the institution's OLE governance structure as related to standing committees of Academic Boards and IT planning/budgeting committees. Institutional data showing breakdowns by faculty needs to flow into faculty-based teaching/learning committees and their deliberations (at both faculty and possibly school/departmental levels). More nuanced program and unit data must feed into the leadership of courses, disciplines, units and their teaching teams. The above 'feed in' mechanisms relate to sharing and deliberating on data within vertical discipline-based hierarchies which characterise universities' organisational design (see Mintzberg's (1979) characterisation of universities as 'professional bureaucracies'). The challenge remains as to how to facilitate sharing of experiences and useful practices across faculty, departmental and discipline boundaries; that is, how to promote forms of horizontal leadership and learning. This is where the expertise of leading edge or pioneering academic teachers comes to the fore. In the name of the learning organisation (Senge, 1990), opportunities must be orchestrated to enable such boundary riding. Teaching and learning centres can provide these boundary straddling opportunities through forums, promotion through communities of practice and annual conferences.

The overall evaluation orientation

Educational institutions cannot conduct large-scale controlled experimental research on the utility of different learning management systems, or any other significant educational technology for that matter, for a host of pragmatic and ethical reasons. The practical issues range across the financial, legal and logistical. Few educational technology studies do, in fact, reach purportedly high scientific standards at any rate (see, for example, meta-analysis of online learning studies reported by Means et al., 2009). For example, no university could afford to run in parallel two LMSs to test their comparative utility, nor could they afford to randomly deny an LMS to one student cohort to test its efficacy in relation to those using it in a treatment group, certainly not if the control group constituted distance education students where access and equity considerations apply. Once decisions are made on large-scale enterprise-wide investments in things like LMSs, the institution is involved in long-term contractual commitments. There is no way of easily going back. This applies equally to the human resources that need to be developed over significant periods to reap the best outcomes from any technology deployed. We concur that the best research, scholarship, evidence and experience needs to be applied in educational technology decision making, deployment and use; but all of this is indicative, not definitive, in nature. Professional judgment making must come to the fore.

People cannot be or remain neutral players. Evaluation must have a strong formative, developmental orientation. It must be aimed at getting the very most involved and deriving the very best from what can be obtained from the investments made. Here, we cite the work of Guba and Lincoln (1989) who have explained and critiqued four generations of evaluation. In critiquing the first three generations of evaluation that revolved around measurement, description and judgement, they argue for the need for a new paradigm, 'fourth generation evaluation'. The authors emphasise that evaluation is not about revealing truths. They see evaluation as enabling stakeholder constructions, with negotiation to shared and more sophisticated understandings being the key. Courses of action are, therefore, determined through a process of negotiation between stakeholders, and are responsive to their needs. It is not easy to conduct a fourth generation evaluation as related to OLEs. And yet the spirit of this paradigm is laudable and in some ways desperately required to work through the maze of stakeholder needs and expectations.

Of equal usefulness is the movement around design-based research (DBRC, 2003). The DBRC argues that design-based research has five characteristics.

1. The goals of designing learning environments and theory development are interrelated.
2. Research and development occur "through continuous cycles of design, enactment, analysis and redesign".
3. Design research "must lead to sharable theories that help communicate relevant implications to practitioners and other educational designers".
4. Research must explain the way "designs function in authentic settings".
5. The development of these explanations uses methods "that can document and connect processes of enactment to outcomes of interest". (DBRC, 2003, p. 5.)

DBR sees research and development working in concert through a commitment to ongoing action and evaluation. It seems like a compelling approach to improving teaching practices and learning experiences over time with the advent of new LMSs, and OLEs more generally. The sorts of questions that could be addressed by DBR follow: What forms of online teaching support current pedagogy? What forms of online teaching enhance student learning? Do these differ for different learning areas and fields of study? What are the pedagogical principles on which online teaching is based? Are online offerings equitable? Do online offerings cater for cultural diversity among students? What forms of staff development will best ensure the maximum possible realisation of the pedagogical potential of online teaching and learning? How does online teaching and learning relate to promoting student-centred and lifelong learning?

Conclusion

Many people, both formally and informally, assume and exert leadership on the development of online learning environments in their institutions. They are located across various physical locations and operate in different domains and levels of the management hierarchies. Leadership emerges from the interplay of leaders and hence the focus of attention has increasingly been directed at cultivating distributed leadership to enhance organisational performance. This applies also to orchestrating institution-wide approaches to planning the evaluation of a new learning management system. In order to conceive and execute the best possible evaluation plan for the implementation of a major new institutional online learning environment the following recommendations are offered:

- Active Senior Executive support for the institutional evaluation.
- Clear statement of the benefits to be gained from the implementation of any new OLE.
- Understanding of how identified benefits relate to the needs of major parties/stakeholders throughout the institution.
- Evaluation plan determined for an appropriate period of time, i.e. at least three years.
- Use of an appropriate range of data collection methods which address the key benefit areas, and any associated key performance indicators.
- Clear distinction between evaluation to be conducted to meet institutional information needs and specialised research projects initiated at the local faculty level.
- Timetable for data collection and dissemination of evaluation reports.
- Protocols for the approval and dissemination of completed reports through Senior Executive to inform the practices of early adopters.
- Consideration of evaluation reports through well established governance mechanisms with a focus on required decision making.
- Flexibility where required to focus evaluation efforts on priority areas as they emerge over the implementation period.

Teaching and learning centres have a key leadership role to play in this regard. Centres are in a unique position to see overall institutional developments and needs. However, at least in our own institution, in a time of increasing devolution of academic development resources to faculties, the role must be seen through the lens of distributed leadership. A plan of action must be orchestrated with others and key aspects of it can only happen through the efforts of many throughout the organisation. The paper has attempted to give some insight into the challenges of evaluating the implementation of a new LMS, and how these challenges have been dealt with. Stakeholder interests need to be understood and reconciled in some manageable way. Much is at stake in relation to institutional performance and reputation. Valuable data must be collected and used wisely. Professional judgement making is required in quite a politicised environment. Our own institution’s plan is still in the making and will no doubt have to adapt to changing circumstances.

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Evidencing the development of distributed leadership capacity in the quality management of online learning environments (OLEs) in Australian higher education

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The poster will present findings from the first year of a two-year nationally funded Australian Learning and Teaching Council (ALTC) project, **Building distributed leadership in designing and implementing a quality management framework for Online Learning Environments** undertaken by Deakin University, Macquarie University, University of South Australia, University of Southern Queensland and RMIT University. The project is running over 2011-2012. This project aims to design and implement a framework that uses a distributed leadership approach for the quality management of Online Learning Environments (OLEs) in Australian higher education. The distributed leadership approach enables the development of the framework and in turn contributes to its implementation. The framework is the vehicle for building leadership capacity. The national project team itself represents a broad range of educational, technical and managerial expertise.

Keywords: quality management, online learning environments, distributed leadership

Project aim

The project aims to: Develop and disseminate through a distributed leadership approach an overall framework for the quality management of online learning environments (OLEs) in Australian higher education. The framework will help guide but not prescribe specific leadership actions in various organisational settings relating to new investments in OLEs, and the ongoing maintenance and enhancement of such environments for the benefit of student learning. It will be a transparent, workable and adaptable set of guidelines, which can also aid internal and external benchmarking of OLEs in the sector.

Key elements of the quality management framework

The poster will highlight the key elements involved in the quality management of OLEs, and their multiple alignments. Specific alignments of particular importance will also be highlighted as based on various investigations undertaken to date. This framework has emerged out of literature reviews, partner institutional profiling and an investigation into learning technologies in use across the sector. The elements of the quality management framework range across **planning, organisational structure, governance, technologies, resourcing and evaluation:**

1. **Planning:** external environmental analysis and trend spotting, strategic intelligence gathering, external benchmarking, organisational capacity analysis, institutional purpose, reputation, vision, principles, objectives and strategies, accountabilities, timelines, and resource implications
2. **Organisational structures:** nature, range, coordination and delivery of valued services (underpinned by clarity of understanding of needed expertise/staffing capabilities) for staff and students
3. **Governance:** institutional, faculty and school/department committees and forums (and associated responsibilities and accountabilities), policies and standards
4. **Technologies:** type, range, integration, promotion, and innovation and mainstreaming of emerging technologies
5. **Resourcing:** maintenance and enhancement of technologies, skills recognition and staff development, media production, evaluation activities, governance mechanisms, i.e. all other elements
6. **Evaluation:** stakeholder's needs, methods, reporting, decision making through governance structures, evaluation relating to the initial selection of new technology, and evidence gathering relating to the on-going assessment of its performance, value and impact.

Certain key element alignments are highlighted: Alignments between Planning/Evaluation/Governance; Alignments between Planning/Organisational Structure; and Alignments between Planning/Technologies. The importance of adopting an evidence-based, multi-stakeholder and strategic approach to evaluating the implementation of online learning environments is highlighted as a key element of the quality management framework and its implementation.

Distributed leadership

There has been significant interest in new lines of leadership theorising around distributed and shared leadership. This theorising sees a paradigm shift from a focus on the leader, as individual, and his or her traits, skills, styles and behaviours in relating to parties designated as followers to a focus on the phenomenon of leadership as enacted through various parties in multiple relationships with leadership intent and capability to achieve valued goals. These parties may be those in formal leadership positions at different levels and in different functional areas in the organisation who wish and need to act in concert, or it may involve those with particular interests and capabilities emerging as informal leaders for periods of time and acting in concert with those with formal leadership authority. Leadership of this nature is seen as distributed or shared (possibly even described as dispersed or networked). While scholars in these fields may take issue, for the purposes of this project, we will treat these terms as being interchangeable and draw upon literature in these domains in covering conceptual and practical matters.

Much of the interest on distributed/shared leadership has emanated from the schools sector at national and international levels (Leithwood, Mascall & Strauss (Eds.), 2009; Harris (Ed.), 2009; Spillane, 2006; Spillane, 2007). As applied to the schools sector, 'the core principle is one of extending or sharing leadership practice' in response to increasingly perceived structural limitations in advancing leadership and organisational performance (Harris, 2009, p.3).

In summing up the extensive literature on distributed leadership emanating from the schools sector, Spillane (2006, p.4) identifies three essential elements in framing a distributed perspective on leadership: Leadership *practice* is the central and anchoring concern; leadership practice is generated in the *interactions* of leaders, followers, and their situation; each element is essential for leadership practice; the *situation* both defines leadership practice and is defined through leadership practice. In relation to this project, distributed leadership is positioned as contributing to clarity of shared understanding of quality management framework elements and constructive alignments amongst them. To achieve this, distributed leadership must be acknowledged in all its forms, developed and be well aligned both vertically and horizontally. The overall responsibility for cultivating distributed leadership resides in senior formal leadership positions within the institution.

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Let's talk - providing virtual ESL learning support from a distance

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This paper describes the results of a pilot undertaken to find how suitable the Wimba virtual classroom option is in providing academic learning support from a central Learning Support Centre for English as Second Language (ESL) students not based on the main campus of the institution. With the increasing number of remote campuses being established there is a need to provide equitable learning support to remote students. While learners had positive perceptions of the virtual classroom's interactions as language learning tools, the pilot study highlighted some complications to the transition to virtual support. A number of lessons were learned and will be shared.

Keywords: virtual classroom, ESL learning support, equity of provision, remote campuses

Introduction

Virtual classrooms and web conferencing have been successfully integrated into higher education for teaching purposes and their effectiveness has been established through sustained research investigations. The suite of tools that these synchronous classrooms provide, according to the literature, allow instructors the interactive elements that today's learners need to succeed in both blended and pure distance learning environments (Kudyma, Aoki, & Liu n.d; Sweeney, 2009; Frutos-Perez, 2009). The virtual classroom "employs a combination of synchronous and asynchronous technologies such as audio, video and other data sharing and interaction tools (e.g., an interactive whiteboard, document sharing, desktop sharing and multimedia discussion forums) to provide an integrated learning environment where multimodal interaction with both human and materials can be facilitated" (Chen & Wang, 2008, p97).

The flexibility in time, convenience of place, (Wu & Hiltz, 2004; Henry & Li, 2005) accessibility and equal opportunity to all learners are the major advantages cited by many researchers who support the use of virtual learning environments (Everett & Ahern, 1994; Lamy & Goodfellow, 1999; Ortega, 1997; Warschauer & Kem, 2000). Their use creates opportunities for those who would otherwise not be able to take part in learning.

However, it appears the virtual classrooms are not well used, especially if a traditional didactic approach is adopted, (Andrews et al 2008), or if the students are confused by the multiple avenues available for interaction (McBrien, Jones & Rui, 2009) or if the controls of the classroom are not given to the students to make use of as well (Ng, 2007). It has been suggested that instructors need training in how to use these classrooms effectively (Barrett, 2010) to transition from face to face to virtual interactions, and clear guidelines on how to structure the sessions appropriately (Pelliccione & Broadley, 2010). If as the literature suggests, teachers are cognisant of the need to adapt their practice and adopt strategies as fundamental as recognising the importance of socialisation and informal exchanges (Finkelstein, 2006), turntaking (Deutschmann & Panichi, 2009) and reducing the transactional distance (or cognitive space between learners and instructors), (Moore 1993) the classrooms are a powerful tool in the teaching and learning process for the programme of study, **and** the provision of academic learning support, particularly to ESL students.

Although the advent of a virtual classroom environment is relatively new, the impact of using such tools in language teaching itself has already been proven (Ward, 2005; Lafford & Lafford 2005). Additionally, learning a language can be an anxious process for many due to second language learners' inhibitions (McIntyre et al., 2003). However, a virtual learning environment has proved to be conducive to language learning as it appears to reduce student self-awareness and social anxiety, which results in increased language production, and the environment has the potential to address various difficulties facing distance language learners (Bradley & Lomicka, 2000; Wallace, 1999; Carnevale, 2003; Roed, 2003).

This paper describes a pilot which was carried out to determine whether the attributes of the virtual classroom were a viable option to meet the **ESL learning support needs** of the diverse student body located at remote campuses, away from the centralized, in-person provision of the institute, and therefore provide a more equitable service to students.

Context

The institute has multiple remote campuses in various areas in addition to the main campus. The Learning Support Centre is situated on the main campus with subject specialists who provide extra academic support to the students. The role of the specialist ESL Learning Advisors at the institution is to give language support to mainly ESL students. These students who need extra academic/language support can access the service in person at the main campus outside their class time, individually or with a group. Lecturers can also refer students to the Learning Advisors when they themselves identify students in need of additional support. Learning Support Centre records clearly show, however, that **remote** campus students rarely access the Centre's services. Reasons usually given by students are that getting transport to the main campus is a barrier, and the time involved is better spent in other ways. Likewise, travel time and scarce resources are the main factors that limit the Learning Advisors themselves from going to the remote campuses more frequently. Facilitating the learning of students via a virtual classroom then was seen as a possible solution to this problem.

Process

A pre-survey established that the students and staff were ready to try the virtual support concept, therefore an appropriate time was negotiated with the lecturers at the remote sites to deliver trial sessions. Topic sentence and paragraph writing skills emerged as a common need amongst the participants. Carefully structured lessons were devised to suit the virtual environment (Pelliccione & Broadley 2010). PowerPoint slides and quizzes were uploaded to the Wimba classroom. Technical issues needed to be dealt with and the Advisor had to master the virtual classroom environment and was given support from the Learning Technology Centre staff to make the transition to virtual Advisor. (Barrett 2010). Care was taken to address each aspect that would reduce the three aspects of "transactional distance" as identified by Moore (1993). Each session utilised the two way audio, one way video and text chat functionality (to **encourage dialogue** about the topic being covered), presentation materials and carefully spaced online quizzes with immediate feedback (**lesson structure**). Sessions were archived so that students could revisit the lesson later (assisting **learner autonomy**) (Moore, ibid). Informal exchanges were encouraged before and during the sessions (Finkelstein 2006). The trial support sessions were arranged at times to suit the class lecturers and most of them attended with their students. Learning Technology Centre staff were on hand to deal with any technical issues both at the main campus and at the remote sites.

A total of 65 students took part in the pilot from various language backgrounds and age range. Each class received only one session. Although the theme of the steps of the writing process was the same for each group, sessions were modified according to the student's levels (upper intermediate to advanced).

Results and Discussion

Analysis of Student Short poll

At the end of each of the Wimba sessions students were asked to complete a short poll while still in the classroom environment to gauge the success of the experience. Questions covered both the content and the process as shown below.

Table 1: Student Poll Results

Question **N=65**	**No, not at all**	**No, not really**	**Yes, a bit**	**Yes, completely**
The lesson was interesting	2%	9%	32%	57%
The lesson helped me understand the topic	2%	2%	52%	46%
I am comfortable using the Wimba classroom	2%	9%	38%	52%
I would like to see more ESL Lessons through Wimba	6%	5%	31%	58%

Unfortunately, given the time constraints, the experience could not be repeated for the students, so the outcomes are based on a single instance in each case. Overall, the poll results show that the majority of the students were positive about their learning experience and would like to see more lessons through the virtual classroom. The range of reactions may well have been influenced by the technical difficulties experienced, the newness of the approach and the diversity of the student group.

Analysis of Lecturer feedback

After the sessions the class lecturers were approached for their overall feedback. All perceived that the introduction of learning support such as this via the Wimba classroom was a positive step and useful to students. They all agreed that participation once in the environment was simple, but some help was needed at the beginning to take students through the access process because although students are fine with general computer use, they need a few pointers for navigating to the site, logging in and finding the classroom itself. There were issues with student microphones; some worked and some didn't. Many students had to rely on the text chat function to communicate during the session which was frustrating. However, overall class lecturer satisfaction with the lesson outweighed the dissatisfaction due to technical difficulties/shortcomings they witnessed.

Learning Advisor's reflections

The provision of support via a virtual classroom offers great promise but also poses significant challenges to both staff and the students. For the Learning Advisors too, the process of delivering a range of virtual classroom sessions requires considerable planning, preparation, forethought and skill, which initially required significant allocations of time. Materials once created can be reused though.

The importance of lecturer buy-in

Lecturer enthusiasm appears to be necessary to overcome student passivity or lack of motivation to embrace this unfamiliar means of getting learning support for students, and it was a challenge getting cooperation from lecturing staff at the remote sites. Lecturers are aware of the need for equity of support but do not routinely promote the Learning Support Centre with or for their students. The virtual classroom option could therefore be a more easily accessible support mechanism which could be promoted more rigorously.

Technical issues

Hardware in the remote computer labs was an issue, even though the set up should be the same as that at the main campus. Frequently audio could not be used on the machines as although headsets with microphones were supplied, the microphone did not work plugged into either the front or the back connection. This did not provide a welcoming environment and although computer savvy students were not thrown, those less familiar with technology were somewhat put off by the delay and non-performance. Additionally there is currently no soundproof area at the base venue (in the Learning Support Centre itself) from which to conduct these virtual classroom sessions. It is hoped that if the trial is extended a more suitable area can be found.

Conclusions and recommendations

The pilot has proved the concept of providing equitable learning support to remote campuses via a virtual classroom. There are great opportunities here that allow flexibility, and with the right conditions, the Learning Support Centre staff can offer assistance on a range of subjects to students no matter where they are.

The following recommendations have been made therefore to ensure the success of such a service and to eliminate the issues identified. **S**upporting remote campuses in this way can be achieved if:

- There are high levels of coordination and collaboration by all parties: IT infrastructure services, the staff development unit, Learning Support Centre staff, faculty administrators and lecturing staff
- Technical access to the online classroom is prioritised
- Teaching staff are encouraged to promote the service through high level sponsorship which stresses the strategic importance of the initiative to utilise virtual the support service
- An on-site, face to face orientation for the lecturers demonstrates the possibilities of remote support and the operation of the virtual classroom

A more flexible approach to programme delivery is a strategic direction for the institute. Alongside that is the challenge of providing an equal level of learning support to students at remote campuses to ensure their retention and success. This pilot, though brief in order to prove the concept, uncovered a number of logistical challenges that will need to be addressed, but given the cost savings in both travel and time will be worth persevering with. Following the success of the pilot, it is hoped that the virtual classroom service can be expanded to be a routine part of the Learning Support Centre provision for students at remote campuses of the institute. With the strategic direction of the institute in mind, to take learning to where the students are, the lessons learned here can be utilised to enhance equity in provision for a range of services of support normally accessed only on the main campus.

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CHANGING DEMANDS, changing directions.
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Changing worlds: Virtual worlds for higher degree research, supervision and networking.

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Abstract and Symposium Plan

The DEHub Virtual Worlds Working Group (VWWG) consists of Australian and New Zealand higher education academics investigating the role that virtual worlds (VWs) play in the future of education. A sub group of the VWWG that includes Higher Degree Research (HDR) students and supervisors have been meeting regularly in the VW of second life. Many of these HDR students are the only student within their institution researching VWs. In many ways they lack the peer support that is so important to facilitate an expedient and successful completion of PhD candidates' dissertations. Through the regular VW meetings the HDR VW group have overcome the isolation of working alone and have developed a strong collegial network that extends beyond their individual institutions. These students and supervisors represent a cross section of researchers who are using VWs as a vital resource for their investigations, collegial networking and student-supervisor communication. Meeting with like-minded HDR students has facilitated a range of opinions and debate in relation to supervisor roles, methodologies, VW skills and research techniques.

The panel consists of six Phd Candidates at different stages of their candidatures, from beginning through to submitting, as well as two experienced supervisors. Two of the panel will be present through the VW of Second Life. Each panel member will contribute to the discussion as they present their experience in relation to each of the following topics:

1. Global possibilities, hypes and trends
2. Creating community among HDR students
3. Barriers encountered by working with non VW supervisors
4. Positive aspects to meeting with HDR supervisors in VWs
5. Value of networking in an immersive environment

The audience will be invited to actively participate in the discussion. Questions will be posed to the audience in relation to their own experience as HDR students and supervisors. The audience will take away with them a sense of the potential for VWs to change the way in which we conduct higher degree research, supervision and networking.

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Re-engineering for Australia’s engineering skill shortage

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To address Australia’s engineering skills shortage, the University of South Australia has teamed with Open Universities Australia to create an online version of an approved Associate Degree in Engineering from 2012. This initiative involves large-scale pedagogical and technical staff development. Content is being modularised. Current lectures are being recorded and summarised for delivery using our new Moodle-based Personal learning environment. Asynchronous assessments and activities are being written and tested for individual and small group learning and community building. Simulations, visualisations and interactive experiments are being created and sourced to support practical skill development. Mahara ePortfolio systems are helping to engage students in reflection and support collaborative learning and career planning. Virtual classrooms provide regular synchronous Helpdesk consultations. The re-engineering process is creating a blend of traditional and cutting-edge learning experiences which is also re-energising our current face-to-face and regional teaching as well as satisfying the needs of a new cohort of students.

Keywords: engineering, OUA, Moodle, Mahara, Echo360; online, blended, practical, simulation

Changing demands, changing directions

Australia has a growing demand for engineers. The domestic supply continues to be low with Australian higher education providers graduating only half of the numbers of engineers required to meet our local demands (Pearce *et al*., 2010). In 2010 the Australian Government funded the establishment of the Australian National Engineering Task Force (ANET) to investigate and address engineering labour shortfalls that are constraining Australian innovation and growth (ANET, 2010).

Improving pathways into Engineering

Opportunities exist for Higher education providers to address this shortfall of engineering graduates by improving pathways to engineering programs and supporting retention of students (Godfrey & King, 2011). To improve pathways, the University of South Australia (UniSA) has recently developed an Associate Degree in Engineering (Hamilton & Dansie, 2011). Access to the program was broadened through supplementing standard entry mechanisms with the ATN engineering selection test (ATNEST). The program comprises four introductory courses to supplement prerequisites, eight common first-year courses and four specialisation courses from the second year of the students' preferred engineering stream. Opportunities to transfer to the full degree become available once students have completed at least eight Associate Degree courses.

Removing constraints in higher education

The Australian government provides funding to universities through the Commonwealth Grants Scheme (CGS). To provide more opportunities for people to study at university, in 2012 the limits on the number of students that universities can enrol in undergraduate programs will be revised to allow student enrolment numbers to be demand driven (DEEWR, 2011). Another change has allowed Open Universities Australia (OUA) to offer programs, rather than just units, and therefore attract CGS funding. Currently OUA does not offer undergraduate engineering units as part of its offerings. Late in 2010, OUA approved the development of the existing UniSA Associate Degree in Engineering for delivery through OUA from 2012.

Engaging staff in online learning

New tools

Over the last 3 years, UniSA has been progressively built a new Personal Learning Environment (PLE), called learn**online**, that comprises several fully-integrated components including:

- Moodle 1.9 as its Learning Management System (LMS),
- Copyright monitoring tools
- Turnitin anti-plagiarism (embedded in Moodle's Assessment module)
- Mahara ePortfolio
- Adobe Connect Virtual Classroom
- Echo360 Automatic Lecture recording system (LRS) and Personal Capture at desktop, and
- UniSA Program and Course Management system (UniSA, 2011).

By 2012, all components of learn**online** will be operational.

New processes

The learning objectives and assessment for each of the courses to be transformed are already approved and accredited and remain unchanged. Only the teaching and learning arrangements are being adjusted for OUA.

The processes being used to support the development of Associate Degree courses to OUA units include:

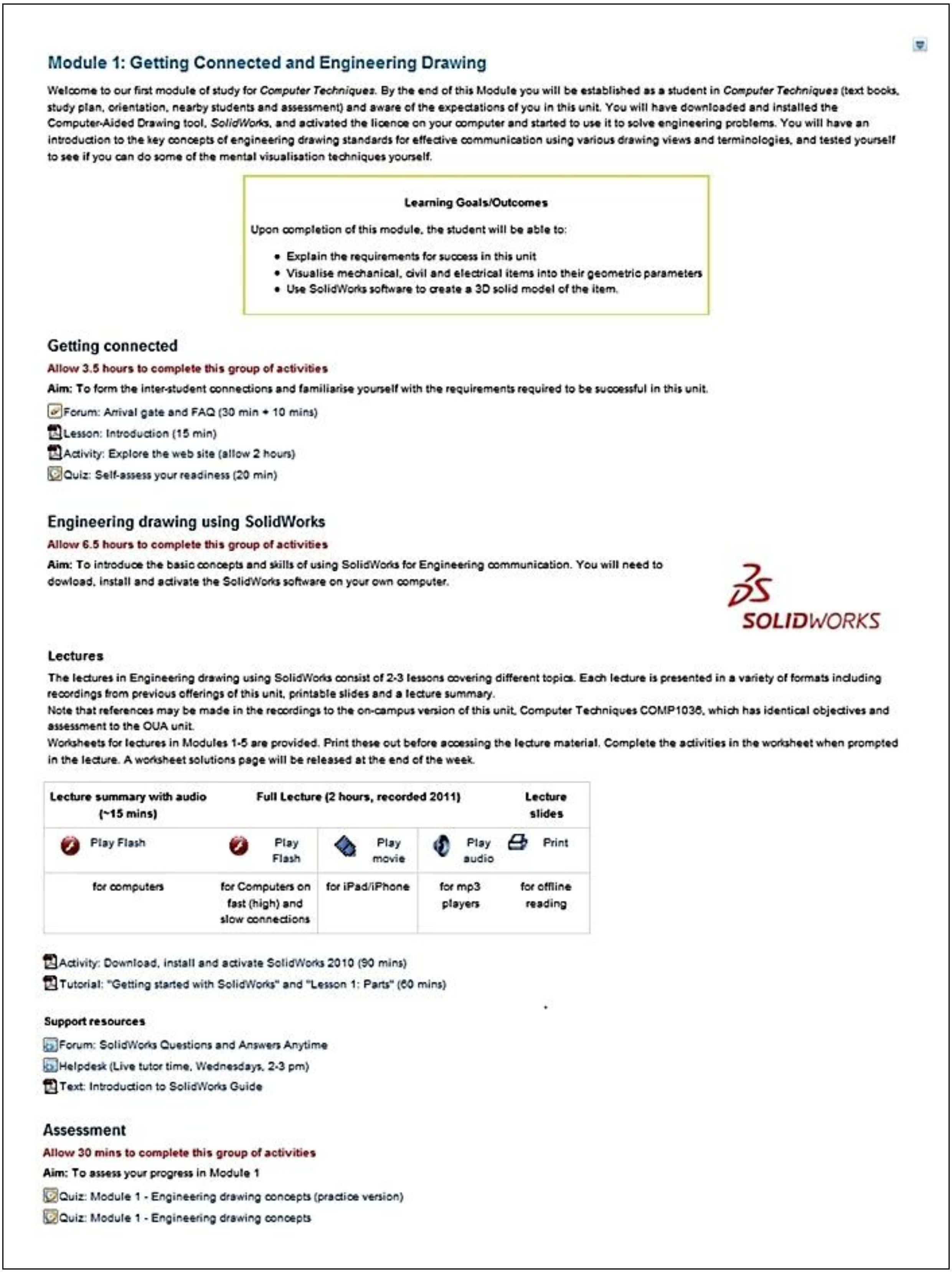
- a central team website incorporating course portfolios and links to development sites
- scheduled regular meetings with unit development teams
- the use of a project management documentation (Unit Development Plan, UDP)
- the use of a reflective ePortfolio to support staff development
- creation of a standardised website and presentation design for program (Figure 1)
- financial incentives and infrastructure support for each course coordinator
- facilitated content modularisation with existing course coordinators (Smith, 2008)
- support of an instructional designer and PLE expert for website building
- the employment of the senior tutor to support development of engaging learning activities to support the different stages of learning in the unit (Salmon, 2004; Conrad & Donaldson, 2011),
- facilitated capturing of live lecture materials
- preparation of accessible lecture summaries (scripted voice over PowerPoint)
- creation of eReaders of copyright compliant resources
- exploration of relevant simulations and experiential online activities
- creation of embedded Teachers notes wiki for each unit to support new teaching teams
- development of intensive face-to-face laboratory sessions where required for delivery in partner

universities in each State or approved workplaces or community settings

- ensuring copyright compliance of resources through training, support and audit
- creation of standard resources (e.g. self-readiness quizzes, unit logos, time budgets, guided web site tours) and communication protocols
- integrated formative and summative evaluation
- evaluation by current course coordinators for parity of learning outcomes and
- assessment of units by OUA against their rubric.

Implications

Much of the development processes used for OUA has capitalised on what we have learnt from experiences in our engineering programs (e.g. embedding of experiential learning opportunities (Duff *et al*., 2007), the use of social software (Quinn *et al*., 2008; Johnston, *et al*., 2009), reflective ePortfolios (Fielke & Quinn, 2009) and the creation of shared blended learning courses as part of the federally-funded Engineering Hubs and Spokes project with the Australian National University (Blackmore *et al*., 2010)).



Module 1: Getting Connected and Engineering Drawing

Welcome to our first module of study for *Computer Techniques*. By the end of this Module you will be established as a student in *Computer Techniques* (text books, study plan, orientation, nearby students and assessment) and aware of the expectations of you in this unit. You will have downloaded and installed the Computer-Aided Drawing tool, *SolidWorks*, and activated the licence on your computer and started to use it to solve engineering problems. You will have an introduction to the key concepts of engineering drawing standards for effective communication using various drawing views and terminologies, and tested yourself to see if you can do some of the mental visualisation techniques yourself.

Learning Goals/Outcomes

Upon completion of this module, the student will be able to:

- Explain the requirements for success in this unit
- Visualise mechanical, civil and electrical items into their geometric parameters
- Use SolidWorks software to create a 3D solid model of the item.

Getting connected

Allow 3.5 hours to complete this group of activities

Aim: To form the inter-student connections and familiarise yourself with the requirements required to be successful in this unit.

Forum: Arrival gate and FAQ (30 min + 10 mins)
Lesson: Introduction (15 min)
Activity: Explore the web site (allow 2 hours)
Quiz: Self-assess your readiness (20 min)

Engineering drawing using SolidWorks

Allow 6.5 hours to complete this group of activities

Aim: To introduce the basic concepts and skills of using SolidWorks for Engineering communication. You will need to dowload, install and activate the SolidWorks software on your own computer.

SOLIDWORKS

Lectures

The lectures in Engineering drawing using SolidWorks consist of 2-3 lessons covering different topics. Each lecture is presented in a variety of formats including recordings from previous offerings of this unit, printable slides and a lecture summary.
Note that references may be made in the recordings to the on-campus version of this unit, Computer Techniques COMP1036, which has identical objectives and assessment to the OUA unit.
Worksheets for lectures in Modules 1-5 are provided. Print these out before accessing the lecture material. Complete the activities in the worksheet when prompted in the lecture. A worksheet solutions page will be released at the end of the week.

Lecture summary with audio (~15 mins)	Full Lecture (2 hours, recorded 2011)			Lecture slides
Play Flash	Play Flash	Play movie	Play audio	Print
for computers	for Computers on fast (high) and slow connections	for iPad/iPhone	for mp3 players	for offline reading

Activity: Download, install and activate SolidWorks 2010 (90 mins)
Tutorial: "Getting started with SolidWorks" and "Lesson 1: Parts" (60 mins)

Support resources

Forum: SolidWorks Questions and Answers Anytime
Helpdesk (Live tutor time, Wednesdays, 2-3 pm)
Text: Introduction to SolidWorks Guide

Assessment

Allow 30 mins to complete this group of activities

Aim: To assess your progress in Module 1

Quiz: Module 1 - Engineering drawing concepts (practice version)
Quiz: Module 1 - Engineering drawing concepts

Figure 1: Example of a module of learning in a unit with objectives, engagement activities, recorded lectures, learning activities, synchronous and asynchronous support resources and assessment

Ongoing staff development is a major component of the project. Engineering course coordinators have already been using aspects of the developing PLE for 18 months and our first year engineering teaching team has been particularly encouraged to be involved in user group testing and pilots of the new integrations as they become available. The UDPs and learn**online** ePortfolio tool are being used to support unit development teams with their continuing development, especially around the redesign of practice-based learning and the creation of equitable and accessible learning experiences for online learners across all the units of the program. Staff and schools are also benefiting from the modularisation of learning process and appreciating that well designed learning modules can be reused in many different ways. Systems to develop and credential incoming tutors for facilitating online learning in engineering are being developed in time for first delivery of the OUA units in February 2012.

Our investment in online resource creation has already had a positive flow on effect for on-campus students as greater choice and flexibility becomes available for students to access their learning. Presentation quality in lectures for face-to-face students has also improved through simple changes such as standardized PowerPoint templates, mandatory voice amplification and minimisation of white board use in large lecture theatres.

Our students studying engineering at our regional campuses are also benefitting from the transformation process through the development of new online course materials and trials of new learning activities and communication systems. It is possible that our regional commitments in engineering may permanently shift to largely online provision, replacing the hardware-focused videoconferencing approach that currently requires duplication of lecturer effort.

Ultimately, this re-engineering process will help Australia address its shortfall in engineers as greater numbers of students, who would normally have been excluded from, or delayed their engineering education because of work or family commitments, will now be able to commence on a pathway to an engineering degree. Coupled with improved admission procedures through the ATNEST and changed Higher Education Policy, this initiative is a positive step towards addressing Australia's engineering skill shortage.

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Can Tablet presented lectures promote engagement of first year bioscience students in lecture note-taking?

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Lectures are one of the major teaching methods at University, but many academics are disillusioned about the value of lectures because of poor attendance and ineffective note-taking by students. Tablet technology in lectures has the potential to promote student engagement and improve note-taking. In this study, a case control design was used to investigate the effect of Tablet lectures on note-taking and attitudes of first-year bioscience students. The results of the study could possibly add to our knowledge of the use of Tablet technology in lectures to large numbers of students.

Keywords: Tablet PC, engagement, lecture note-taking, bioscience, academic skills

Purpose

The aim is to compare lecture note-taking skills and attitudes of bioscience students taught by lecturer-presented Tablet PowerPoint with students taught by lecturer-presented PowerPoint slides. It is possible that annotation of PowerPoint slides with digital ink allows the step-wise construction of conceptual knowledge and, as such will be more engaging and will promote more effective note-taking than the traditional PowerPoint lecture.

Methods

Two lecture cohorts of first year bioscience students were set up by students self allocating. The test cohort of 280 students received Tablet PowerPoint lectures for a 3-week period, while the control cohort of 200 students had PowerPoint lectures without annotations and script writing. Pre- and post-testing involved marking notes of a 4-minute online lecture at http://www.ted.com/talks/dean_ornish_says_your_genes_are_not_your_fate.html. Two different scoring rubrics were used to mark lecture notes: rubric one marked points made in the lecture (0-50 scale); rubric two marked major concepts (0-10 scale). Student attitudes were evaluated by lecture attendance, by a likert-scale questionnaire validated by the University, and by written comments. Statistical analysis with Minitab v.13 was used for two sample t-Tests and Analysis of Variances.

Results

The majority of students in both groups came from B. Nursing and B. Occupational Therapy courses but self-allocation to the lecture cohorts resulted in B. Emergency Health students being allocated to the test cohort and B. Midwifery students to the control cohort. Therefore the student composition of the cohorts was different and this was reflected in a significant difference in end-of-semester exam scores: test cohort mean 61.3% (sd 16.6); control cohort mean 56.7% (sd 15.8) (p=0.003).

Lecture attendance

Attendance at Tablet lectures remained steady over the 3-week period in contrast to a decline in attendance in the control lectures.

Table 1: Student attendance (n, %) at lectures

	Week 1	**Week 2**	**Week 3**
Test cohort: Tablet PPT (280)	212 (76%)	217 (78%)	232 (83%)
Control cohort: PPT (200)	162 (81%)	147 (73.5%)	125 (62.5%)

Student attitudes

A 5-point likert questionnaire on lecturing was completed by 70% of students. The questionnaire items relevant to note-taking are shown in Table 2. Student responses to item 1 were significantly different.

Table 2: Mean scores (and standard deviations) of student responses

Questionnaire item	**Test cohort**	**Control cohort**	**p-value**
1. The lecturer's pace of presentation allowed me to take adequate notes	4.27 (0.89)	3.89 (1.07)	0.0006
2. I could comprehend the language and vocabulary used by the lecturer	4.41 (0.78)	4.24 (0.97)	0.087

Written comments: Some students found the pace of the Tablet lectures too slow while others found the pace helped in note-taking. For example:

> The presentation method helped a lot. Often in lectures it is difficult to make notes because the lecturer goes too fast and by the time you are half way through a sentence they are explaining another point that you are trying to listen to, so you forget what you were writing down….labeling diagrams and writing down points helped to eliminate this and also helped with spelling, ensuring you heard correctly what was said.

Lecture note-taking

A lower proportion of students in the test cohort chose to participate in the note-taking activity: pre-test 136/212 (64.2%), post-test 83/232 (35.8%) in the test cohort, compared to 125/162 (77.2%), post-test 85/125 (68%) in the control cohort. An Analysis of Variance for mean scores of lecture notes marked by rubric 1 is shown in Figure 1.

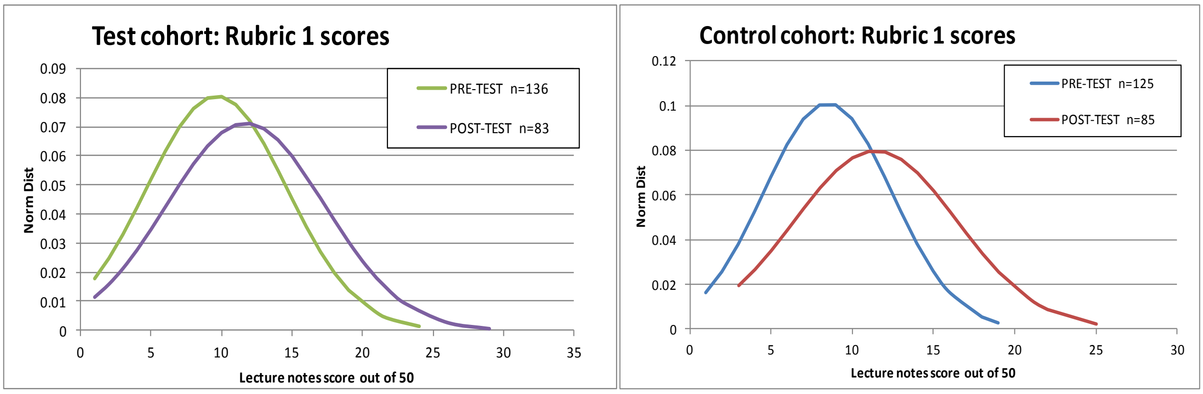

Figure 1: Rubric 1 pre-test and post test scores of lecture notes

There was a highly significant difference between the pre and post test mean scores ($p<0.001$) but no differences were found between the test and control cohorts ($p=0.37$).

Pre-test and post test scores marked by rubric 2 (not shown) produced similar results. Like rubric 1, there was a highly significant difference between the pre and post test scores ($p<0.001$) but no differences were found between the test and control cohorts ($p=0.35$).

Conclusion

Better lecture attendance and generally more positive attitudes of bioscience students to note-taking in Tablet PowerPoint lectures were observed. However there was no evidence that lecture note-taking improved as measured in this study. It is possible that the lower participation rate of the test cohort in the note-taking activity may have skewed the results and also, the appropriateness of the measuring tool could be questioned. Measurement of lecture note-taking by marking samples of actual notes written in lectures may be more appropriate.

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Adoption of web and mobility technologies in a multicultural population of hospitality and leisure students: search for empirical evidence

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The aim of the research is to gather empirical evidence on the current use of Web 2.0 and mobile technology in the population of first semester international students. The evolution of usage over time is analyzed. A quantitative analysis, comparing the results at an institute of higher education in Switzerland with those of three Australian universities was performed. The results from the research demonstrate that on average, 2010 students use computers more than their Australian counterparts in 2006. Significantly fewer students in 2010 did not use Web 2.0 technologies and mobile devices compared to 2006, which is important for learning styles and delivery of blended learning practices. The results of the first stage of this research support the notion that this cohort of students uses Web 2.0 and mobile technologies to communicate and consume content.

Keywords: millennials, learning styles, higher education, web 2.0, mobility

Introduction

On one hand the debate (Bennett et al., 2008) is still raging about whether the “Net Generation” (Tapscott, 1998, 2008), or “Digital natives” (Prensky, 2001), or “Generation Y” (McCrindle, 2002), (AKA “Echo boomers”, “Millenial Generation”) are really tech savvy and their brains are ‘wired’ differently from that of previous generations. This implies that educators and educational institutions need to adapt their teaching practices and learning environments (Oblinger and Oblinger, 2005). According to Kennedy, Dalgarno, Gray, Judd, Waycott, Bennett, et al. (2006, 2007, 2008, 2009), the reality of millennials’ adoption of leading-edge Information and Communication Technologies (ICT) has not been evidenced scientifically and higher education institutions need to do further research before changing their ways.

On the other hand the Internet and especially Web 2.0 (Anderson, 2007) and mobile (Mellow, 2005) technologies with their multimedia, interactivity, user-generated content and social networking offer promising new ways of engaging (Tosh et al. 2005) the Net Generation in the classroom (Lorenzo and Dziuban, 2006).

At our institute, the technology used by students in and out of the classroom has evolved considerably in the last 5 years. Students are required to have their own laptop; they have wireless broadband access to the Internet on campus and in their residences. A vast majority favors the new generation of “smart” phones which they use to access their university-provided email account. Today, faculties observe students using their laptops and smartphones constantly in the classroom; where tablet computers started appearing in the fall semester of 2010. For the last four semesters of 2009 and 2010, in one course, students have been designing and building web 2.0 applications as part of a class project.

Literature debate

The Internet has empowered young people to challenge knowledge and grow into critical thinkers (Tapscott, 1998, p. 88). The opportunity to inform and express themselves through, for example, chat groups has an influence on each element of self-esteem: social, academic and physical (Tapscott, 1998, p. 91-92). Seely Brown (2002) also identifies a need to consider the Net generation’s altered aptitude to absorb and create information. Generations considered as ‘information literate’ can be frustrated by traditional learning and their attention can be difficult to capture (Seely Brown, 2002). They are no longer simply absorbing information; they blend skills to consume and create information with varying degrees of “information fluency” (Lorenzo and Dziuban, 2006, p. 3).

With less optimism, Prensky purports that physiological changes in the digital native brain have altered learners’ capacity for reflection and critical thinking (Prensky, 2001, p. 3). Prensky’s initial paper “Digital Natives, Digital Immigrants” (2001) was presented with little or no empirical evidence to back his claims regarding the digital natives’ characteristics and their implications for higher education.

Subsequent surveys and interviews were used to fill the gap of evidence. A “Study of Students and Information Technology” survey was carried out by the EDUCAUSE Center for Applied Research (ECAR) in 2004. Their findings concluded that students’ experience with technology is primarily about convenience and communication. Students clearly stated a preference for moderate use of IT in the classroom. The most common technologies mentioned in the survey were word processing (99.5%), emailing (99.5%) and surfing the internet (99.5%) for pleasure (Kvavik, Caruso, & Morgan, 2004).

In 2006, the Australian Learning and Teaching Council started a collaborative longitudinal research project entitled “Educating the Net Generation” (Kennedy G. , 2009). In a 2007 paper, they found that new technologies were not commonly used. These findings were surprising in the context of our institution where simple observation seems to disprove them. Whereas we cannot ignore the fact that most of our students are regularly using social networking websites and smartphones, we agree with the Australian team, that “more research is needed to determine the specific circumstances under which students would like their ‘living technologies’ to be adapted as ‘learning technologies’” (Kennedy, et al., 2008)

This is the first part of a research aiming to evidence that Web 2.0 and mobile technology usages are increasing with each new wave of students entering higher education and to verify the hypothesis that Web 2.0 and mobile technology influence students’ learning. It is expected that the results of the research will impact the institution’s blended learning policy and practices.

Web 2.0 and mobility technology

Although the term Web 2.0 seems to indicate the existence of a ‘second generation’ of web technology, there is no ‘date of birth’ of Web 2.0 merely an evolution of features and usage over the years since Tim Berners-Lee invented the World Wide Web (www) in 1989. The term Web 2.0 is associated with O’Reilly media and the year 2004.

In his paper, Tim O’Reilly argued that Web 2.0 technologies leverage the network (i.e. the Internet) effects and the collective intelligence of its users (O'Reilly, 2005). The paradigm shift concerns two other aspects: user-generated content – web 2.0 users are both producers and consumers of content – and convergence – web 2.0 services are available on multiple computing platforms increasingly mobile.

Technologies commonly associated with Web 2.0 are: social networking, blogs, podcasts, RSS, ratings, wikis, digital content sharing and web services. All of them have been ported from the computer to the new generation of smartphones and tablets.

Methodology

The first phase of the research investigates students' actual use of Web 2.0 and mobile technologies and uses a quantitative methodology, collecting primary data from a student population of first semester students at an international institute of higher education located in Switzerland. The research is based upon the questionnaire designed by the Australian team, made available through 'Creative Commons' licence. Some questions were completed with extra propositions to reflect the evolution of technology, for example: "Use the computer to watch a film".

The population consisted of all (318) first semester students in Hospitality or Leisure at an international Institute of Higher Education located in Switzerland. Data was collected through online questionnaires feeding a relational database system. The questionnaires were created using the Survey Monkey web service[18]. The security and privacy of the web service is ensured through an institutional subscription. The web service sent each student a unique survey link through a message delivered by their mail server. The system then tracked who had responded, who had not responded, who opted out. The system managed responses and automatically selected non respondents to send researcher-initiated reminders. In the first phase, the survey was restricted to one campus only. The survey was conducted according to the institute's code of ethics. Participation was voluntary and students could elect to remain anonymous. The survey was not answered during any class. To guarantee full anonymity, respondents' email and IP addresses were not stored in the survey.

97 students (30.5%) filled the survey but only 55 filled it completely. Of the respondents, 54.6% were female and 45.4% male. 98% were between the ages of 17 and 24 with 88.6% between 18 and 21. 40% of respondents come from Western Europe, 26.3% from Asia, 16.3% from Eastern Europe, the rest, 16.9% come from all other regions of the world except Central America. Though the survey generated a lot more data than analyzed in this paper, only the data that matched that published by the Australian team was retained. The data was summarized in exactly the same way as that used by the Australian team:

- A percentage of respondents was calculated for each technology (e.g. Use a computer to play games) and regularity of usage (e.g. Once per week).
- A 'mean regularity' was calculated by allocating a value to each of the usage frequency, from 0 "not used" to 7 "several times a day" and averaging it across the relevant usage.
- The mean regularity was used as a proxy measure to compare the two surveys.

Results

The data tables for the Australian and this research are in Appendix 1. We shall use *usage* to mean a habitual or customary continued practice and *regularity* to describe the frequency with which respondents use technology.

Table 1 shows the percentage of responses for a series of technologies linked to media manipulation and electronic games. The percentage of students in Switzerland who do not 'use a computer for creating or editing audio and video' is almost 50% lower and the percentage of students who 'use a computer to play digital music files (e.g. iTunes) several times a day is almost 50 % higher.

The chart in **figure 1** compares the mean regularity of the two surveys. Except for 'playing games on a console', the students in Switzerland in 2010 display a higher regularity of usage than the Australian students in 2006; the gap is wider for 'creating presentations' and 'play digital music files'. The contours of the curves are similar except for the dip in using a console to play games.

[18] http://www.surveymonkey.com

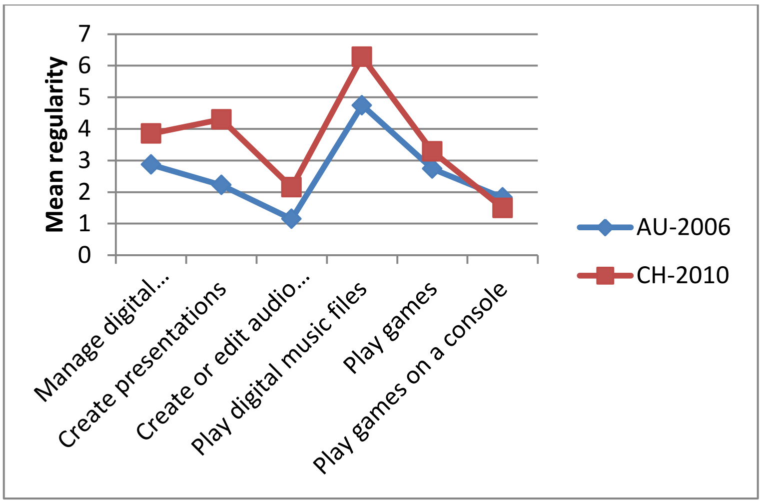

Figure 1: Comparison for media and games usage

Table 2 shows the percentage of responses for a series of usage of mobile phones. The regularity of usage has increased across all mobile phone usage. The classic usages of mobile phones to make calls, send text messages and take photographs or films have increased less rapidly than other usages. For new usages linked to 'smartphones' like 'Use a mobile phone to access information / services on the web' or 'Use a mobile phone to send or receive email' several times a day, the percentage of students is multiplied by 10 and 20 respectively.

The chart in **figure 2** compares the mean regularity of the two surveys. The students in Switzerland in 2010 display a higher regularity of usage than the Australian students in 2006; the gap widens for 'use as a MP3 player': 'Use a mobile phone to access information / services on the web' and 'Use a mobile phone to send or receive email'. The contours of the curves are divergent over the last four usages linked to the new generation of smartphones whose ownership is unsurprisingly more widespread in 2010 than in 2006.

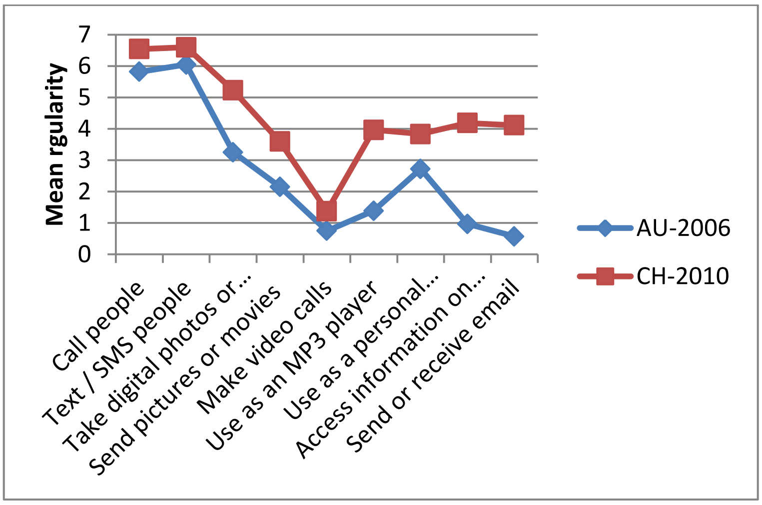

Figure 2: Comparison for mobile phone usage

Table 3 shows the percentage of responses for a series of usage of traditional web technologies. Very low percentages and zeros for lower regularities (not or seldom used) emerge across all usages except e-commerce, e-banking and web site creation and maintenance. The percentages of multiple daily usages linked to education like accessing a portal or researching information have doubled. The percentages of multiple daily usages for communication have more than doubled.

Figure 3 compares the mean regularity of the two surveys. For e-commerce, e-banking and web site creation and maintenance the students in Switzerland in 2010 display the same regularity of usage as the Australian students in 2006. For all other usages, their regularity is higher. The contours of the curves are similar except for streaming audio files over the web. This increase verifies the demise of the traditional music industry and the rise of YouTube-like services.

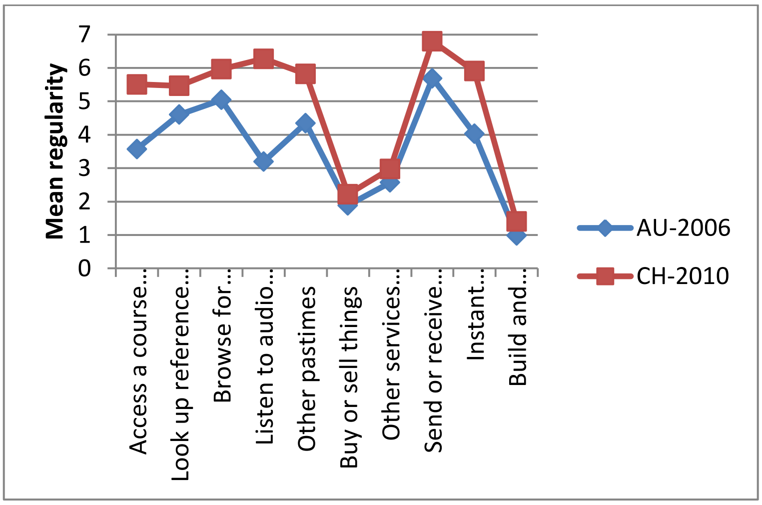

Figure 3: Comparison for traditional web technology usage

Table 4 shows the percentage of responses for a series of usage of web 2.0 technologies. More than 75% of students in Switzerland use social networking several times per day. This was less than10% in Australia in 2006. The percentage of students who have never used the web to make a phone call was divided by ten between 2006 and 2010 and that of students who have never used web conferencing or used the web to read a RSS feed by four. The percentages of students who have never published a podcast (64.8%), kept their own blog (64.8%), contributed to a wiki (58.2%) remain high in 2010 and have not decreased as fast as other usages (they were 85.2%, 72.6%, and 84.9% respectively in 2006).

The chart in **figure 4** compares the mean regularity of the two surveys. The students in Switzerland in 2010 display a higher regularity of usage than the Australian students in 2006; except for keeping a blog and to a lesser extent publishing a podcast. The gap is particularly wide for social networking, sharing digital content, making phone calls, web conferencing and reading blogs. The contours of the curves are quite different which demonstrates that some web 2.0 technologies have been adopted exponentially since 2006; social networking in particular.

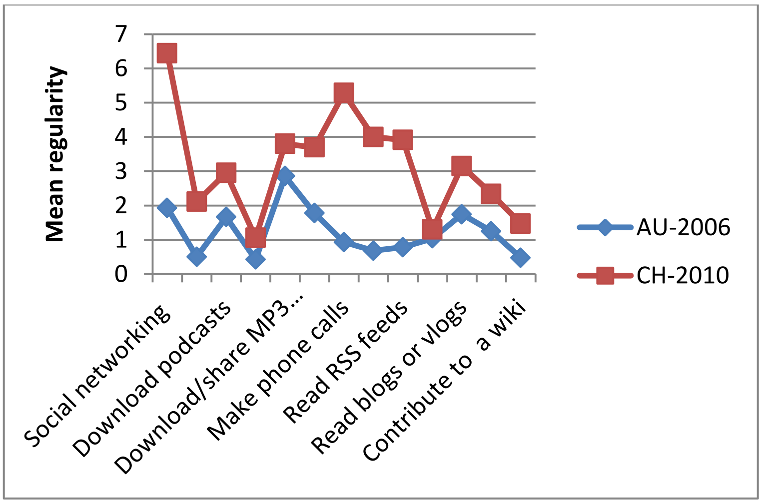

Figure 4: Comparison for Web 2.0 technology usage

Discussion

From the above comparisons we can infer that students at our institute have developed their usage of technology in two main areas: communication and information consumption.

The development of communication is evidenced in mobile technology by the increase in usage to call, send text messages, but especially send/receive emails. In web technology, this is evidenced by increased usage of sending/receiving emails, chatting, social networking, web conferencing and phoning.

The development of information consumption is supported by the increased use of computers, mobile phones, together with the web to play and share digital content and access information.

The results of this research demonstrate a substantial increase in adoption of those Web 2.0 technologies used for communicating. We can say that, in 2010, when students leverage the network effects, it is predominantly for social usage and when they leverage the collective intelligence of the web, it is for their own consumption.

In this research, the concept of user-generated content is discretionary and regroups “Create presentations”, Create or edits audio and video”, “Build and maintains a website”, “Publish podcasts”, “Keep/comment on a blog/Vlog” and “Contribute to a wiki”. User-generated content does not include submitting mandatory assignments to the course management system. Indeed, except for creating presentations, students in 2010 are not displaying practices of content generation which is a main feature of Web 2.0. On the other hand, their mobile phone usage for email, personal organizers and access to information, illustrate how they are taking full advantage of convergence.

To verify the assumption that a large part of the differences between the student populations in Switzerland and Australia can be explained by the evolution of usage over the 4 years since the first research was initiated, the data from the “Generations and their gadgets” report by the Pew Research Center’s Internet & American Life Project was compiled (Pew Research Center, 2011) to create table 5 and the chart in figure 5. **Figure 5** shows that except for desktop computers, the percentage of ownership has increased between 2006 and 2010. For all technologies except desktop computers, the millennial generation’s level of ownership is higher than the total adult population.

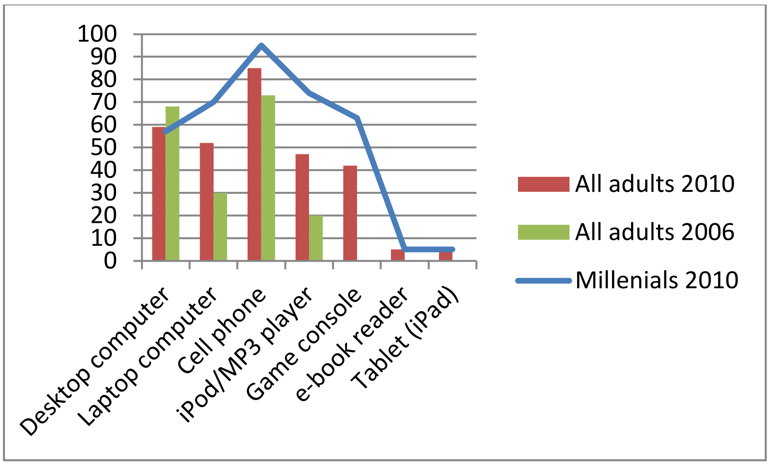

Figure 5: Percentage of ownership of each technology

Table 5 shows that the millennial generation (18-34 years of age) has a larger percentage of ownership than the adult population (18+) in general; 95 % own a cell phone, 74% a MP3 player, 70% a laptop and 63% a game console. The millennial generation variation in ownership between 2006 and 2010 is twice that of the adult population for MP3 players and very close to twice as large for laptops and cell phones.

Table 5: Percentage and variation of technology ownership

	All adults 2006	All adults 2010	2006/2010 variation	Millenials 2010	2006/2010 variation
Desktop computer	68	59	-13%	57	-16%
Laptop computer	30	52	73%	70	133%
Cell phone	73	85	16%	95	30%
iPod/MP3 player	20	47	135%	74	270%
Game console	0	42	Not defined	63	Not defined
e-book reader	0	5	Not defined	5	Not defined
Tablet (iPad)	0	4	Not defined	5	Not defined

Conclusion

The Australian team concluded that, in 2006, students from the "Net generation are not big users of Web 2.0 technologies" (Kennedy, et al., 2007), however in 2010, the empirical evidence demonstrates that they can be big users of some of the Web 2.0 technologies. Indeed when a large percentage of students use some of the technologies several times a day, it could be inferred that those technologies have become part the students' life style.

N-geners have been known to associate fun with learning because of technology (Tapscott, 1998) and ubiquitous Internet and cell phones are influencing behavior, development and learning attitudes (Tapscott, 2009). The extensive use of Web 2.0 and smartphones evidenced by this research indicates that these have become embedded in the life styles as well as learning styles of the students and that educators need to adapt accordingly. If the results of the first survey are confirmed by subsequent surveys, concrete proposals will be made to the institute's Blended Learning Steering Committee.

In 2002, Seely Brown said "Now, with incredible amounts of information available through the Web, we find a "new" kind of learning assuming pre-eminence-learning that's discovery based. (...)" Indeed, Web surfing fuses learning and entertainment, creating 'infotainment'." This research confirms that they are primarily information consumers, motivated by convenience and communication (Kvavik, Caruso, & Morgan, 2004). Although Lorenzo and Dziuban posit that Net-geners blend skills to create and consume information (2006, p.3), this research challenges the notion that they are creators of information.

In the next stage of the research, the team will use statistical analysis to explore the link between technology usage and factors preventing students from becoming content generating users when, at the same time, they are adept at sharing digital content. Other factors like the specificity of the student population (international and affluent) and its homogeneity (studying only hospitality and leisure) will also be explored.

The survey was run again in the first semester of 2011 on another cohort of first semester students on one campus but we plan to revise the survey to achieve a much higher completion rate while maintaining data comparability. In the future, the same survey will be conducted at other campuses in sister schools and we propose to carry on observing the evolution of students usage as they move from semester to semester.

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Appendix 1: summary data tables (in % of respondents)

Media and games

Table 1

Australia 2006 =A Switzerland 2010 = S	Several times per day		Once per day		Several times per week		Once per week		Once per month		Every few months		Once per year		Missing/ not used	
Use a computer	A	CH	A	CH	A	CH	A	CH	A	CH	A	CH	A	CH	A	CH
To manage or manipulate digital photos/images	3,9	5,7	3,4	7,5	11,9	24,5	12,8	18,9	25,3	24,5	19,8	13,2	12,9	1,9	9,9	3,8
to create presentations	1,5	0,0	1,4	7,1	5,0	35,7	6,3	41,1	26,1	12,5	26,4	3,6	22,2	0,0	11,2	0,0
to create/edit audio and video	1,4	1,9	0,8	1,9	2,8	7,5	3,7	5,7	7,7	24,5	12,2	22,6	24,0	11,3	47,4	24,5
to play digital music	35,8	68,5	13,3	7,4	16,4	14,8	8,6	7,4	6,2	0,0	3,2	0,0	2,7	0,0	13,8	1,9
to play games	8,0	5,7	6,5	15,1	11,6	18,9	9,9	15,1	14,3	9,4	12,7	3,8	13,1	7,5	23,9	24,5
Use a console to play games	4,1	3,8	2,6	1,9	6,5	3,8	7,0	7,7	12,2	3,8	12,9	23,1	15,5	3,8	39,2	51,9

Mobile devices

Table 2

Australia 2006 =A Switzerland 2010 = S	Several times per day		Once per day		Several times per week		Once per week		Once per month		Every few months		Once per year		Missing/ not used	
Use a mobile phone	A	CH	A	CH	A	CH	A	CH	A	CH	A	CH	A	CH	A	CH
to call people	54,6	74,1	15,2	13,0	14,9	9,3	5,8	1,9	2,5	0,0	1,2	1,9	0,5	0,0	5,4	0,0
to text / SMS people	67,0	83,3	10,5	5,6	10,3	7,4	3,2	0,0	1,9	1,9	0,9	0,0	0,5	0,0	5,6	1,9
to take digital photos or movies	15,0	22,2	5,9	27,8	14,2	25,9	14,6	11,1	14,2	7,4	4,7	1,9	3,5	0,0	27,9	3,7
to send pictures or movies to other people	7,8	14,8	3,7	7,4	8,0	22,2	9,3	5,6	12,9	14,8	8,5	14,8	5,1	3,7	44,7	16,7
to make video calls	3,1	7,5	1,0	0,0	2,3	5,7	2,8	7,5	3,7	3,8	3,9	5,7	5,4	3,8	77,9	66,0
as an MP3 player	7,1	25,9	2,5	11,1	5,2	14,8	5,5	13,0	4,6	3,7	3,7	5,6	4,4	0,0	66,9	25,9
as a personal organiser (e.g. diary, address book)	13,0	29,6	8,5	11,1	11,7	11,1	8,9	5,6	8,3	9,3	4,0	1,9	3,3	0,0	42,2	31,5
to access information / services on the web	3,2	35,2	1,9	9,3	3,1	14,8	4,2	5,6	4,5	5,6	5,1	1,9	6,7	0,0	71,4	27,8
to send or receive email	2,7	44,4	0,7	3,7	1,5	11,1	2,0	1,9	2,3	3,7	2,8	1,9	5,8	0,0	82,2	33,3

Traditional web

Table 3

Australia 2006 =A Switzerland 2010 = S	Several times per day		Once per day		Several times per week		Once per week		Once per month		Every few months		Once per year		Missing /not used	
Use the web	A	CH	A	CH	A	CH	A	CH	A	CH	A	CH	A	CH	A	CH
to access a portal/CMS	14,2	29,1	17,9	25,5	19,8	21,8	7,7	14,5	4,1	9,1	2,3	0,0	3,7	0,0	30,3	0,0
to look up reference information for study	14,4	30,4	13,3	17,9	32,8	32,1	18,4	8,9	11,3	8,9	3,6	1,8	1,3	0,0	4,9	0,0
to browse for general information	23,0	47,4	20,2	17,5	27,7	24,6	12,8	7,0	8,7	1,8	2,7	1,8	1,2	0,0	3,9	0,0
to listen to sound recordings	10,8	65,5	8,3	10,9	16,7	18,2	13,1	1,8	12,9	1,8	7,6	0,0	4,2	0,0	26,3	1,8
for other pastimes	22,3	41,1	15,6	19,6	19,7	28,6	12,7	7,1	8,4	1,8	4,1	0,0	2,4	0,0	14,8	1,8
to buy or sell things	2,9	3,6	2,7	1,8	5,4	9,1	7,4	3,6	16,0	25,5	17,4	21,8	12,8	5,5	35,4	29,1
for other services	4,1	5,5	5,8	5,5	13,4	14,5	14,2	10,9	16,9	27,3	6,8	12,7	5,8	3,6	32,9	20,0
to send or receive email	38,0	88,9	26,9	7,4	20,6	1,9	7,2	0,0	2,4	0,0	1,1	1,9	0,4	0,0	3,4	0,0
for instant messaging/chat	26,8	62,3	12,7	13,2	14,4	5,7	8,8	9,4	6,6	1,9	4,2	0,0	3,7	3,8	22,8	3,8
to build and maintain a website	3,1	3,7	2,6	7,4	3,2	3,7	3,7	3,7	4,0	1,9	4,4	5,6	9,9	20,4	69,0	53,7

Web 2.0

Table 4

Australia 2006 =A Switzerland 2010 = S	Several times per day		Once per day		Several times per week		Once per week		Once per month		Every few months		Once per year		Missing /not used	
Use the web	A	CH	A	CH	A	CH	A	CH	A	CH	A	CH	A	CH	A	CH
for social networking	9,0	76,4	7,0	5,5	6,9	10,9	6,1	3,6	5,4	1,8	3,8	0,0	5,3	1,8	56,5	0,0
for social bookmarking	1,3	13,0	0,9	1,9	1,2	9,3	2,2	5,6	2,8	11,1	2,7	1,9	7,2	3,7	81,7	53,7
to download podcasts	3,5	7,0	4,1	7,0	8,9	12,3	7,5	17,5	8,8	17,5	5,8	7,0	4,6	5,3	56,7	26,3
to publish podcasts	0,7	1,9	0,8	1,9	1,8	3,7	2,2	3,7	1,6	9,3	2,4	5,6	5,2	9,3	85,2	64,8
to download and/or share MP3 files	9,9	16,4	6,0	5,5	16,5	16,4	10,8	18,2	12,2	20,0	7,4	7,3	3,3	3,6	34,0	12,7
to share photographs or other digital material	3,7	13,2	3,6	3,8	8,6	24,5	8,4	17,0	11,8	17,0	6,8	5,7	4,4	1,9	52,7	17,0
to make phone calls	3,0	31,6	1,8	19,3	4,3	26,3	3,5	12,3	4,6	3,5	3,4	0,0	5,0	0,0	74,3	7,0
for web conferencing	2,3	26,8	1,5	5,4	2,7	19,6	2,4	12,5	3,4	5,4	2,2	5,4	4,8	5,4	80,6	19,6
to read RSS feeds	2,2	16,4	2,5	12,7	3,5	25,5	3,2	12,7	3,1	3,6	2,1	3,6	4,1	3,6	79,3	21,8
to keep your own blog	3,2	5,6	2,7	5,6	4,2	3,7	4,9	1,9	4,6	3,7	3,2	5,6	4,5	9,3	72,6	64,8
to read other people's blogs	4,9	11,3	4,4	9,4	7,3	17,0	8,1	9,4	9,2	15,1	6,0	3,8	5,1	3,8	55,1	30,2
to comment on blogs	3,6	11,3	3,3	1,9	4,9	15,1	5,8	1,9	5,7	11,3	5,2	11,3	4,7	3,8	66,8	43,4
to contribute to the development of a wiki	1,5	1,8	1,1	1,8	1,4	12,7	2,1	3,6	1,7	7,3	2,2	9,1	5,3	5,5	84,9	58,2

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Learning style and digital activity: An ecological study

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In order to understand student engagement in higher education through the use of digital technologies, it is necessary to appreciate the broader use of differing technologies. Forty-eight first-year university students completed an online survey that queried patterns of digital activity across home, school and community contexts and that included rating scale items that measured learning style (i.e., active-reflective, sensing-intuitive, visual-verbal, sequential-global). Results suggest that students vary widely in digital activities and that such variation is related to differences in learning style. For example, active learners were more likely than reflective learners to engage in digital activities in the community and users of some specific application, as opposed to non-users, were more likely to be verbal than visual learners. Implications for instructional applications of digital technology in higher education are presented.

Keywords: technology; digital technology; learning style; techno-microsystem; ecological model

Introduction

The use of digital technologies to engage higher education students has been a topic of debate for some time. A preliminary understanding of the ways that students use technology, in all aspects of their life, is paramount to such debate. Previous studies have been conducted to investigate the impact of digital technologies on student engagement (Chen, Lambert & Guidry, 2009) and the effect of student engagement on learning outcomes (Carini, Kuh & Klein, 2006). This study, conducted in a first-year undergraduate course, aims to contribute to the understanding of learning styles and digital technology use.

Literature Review

The use of emerging technologies by undergraduate university and college students is well documented for two reasons. First, “college students have been at the forefront of social change since the end of World War II” (Jones & Madden, 2002, p. 5). They were among the first to use the internet for communication, file sharing and playing games and to have regular broadband access. Second, universities develop and implement technological instructional innovation (Dede, 2005; Nagler & Ebner, 2009). Currently, the implementation of instructional applications of digital technologies is fundamental in all universities and online university learning is increasing exponentially (Margaryan, Littlejohn, & Vojt, 2011). In this regard, junior university students provide a metric of pending social and educational trends (Johnson, 2007a). The Australian Bureau of Statistics (2009) organises demographic generations by using birthdates, share characteristics and significant world events. These demographic generations include 18-19 year olds referred to as the *iGeneration* or *Netgeneration*, 20-39 year olds referred to as *Gen X* and *Gen Y*, 40-59 year olds are *Baby Boomers* and individuals 60-79 years of age are referred to as *Lucky*. Such classification reveals the extent to which digital technology defines first-year university students who are most commonly 18-19 years of age.

Current description of patterns of digital technology use among first-year university students is often atheoretical and lacks the comprehensive approach necessary given the ubiquitous nature of young people’s use of technology. Johnson (2010a) recently proposed the *Ecological Techno-Microsystem,* a theoretical model that considers diverse uses of digital technology (e.g., information, communication and recreation) across environments (home, school and community) and the relationship of such use to all aspects of human learning and development. As presented in Figure 1, human learning is conceptualized as the consequence of ongoing reciprocal interactions between individual characteristics and environmental experience which increasingly includes digital experiences, particularly for junior undergraduate students frequently referred to as *digital natives* (Bennett, Maton, & Kervin, 2008). Indeed, approximately 96% of Australian first-year university students report owning a mobile phone, 89.5% report owning a desktop computer, 76% a digital camera, 72.5% a memory stick, 68.9% an MP4 player, 63.2% a laptop computer and 47.4% a digital game console (Kennedy, Judd, Churchward, Gray, & Krause, 2008).

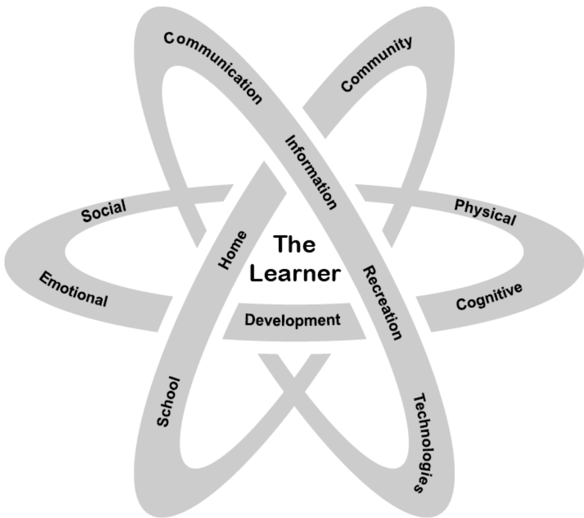

Figure 1: The Ecological Techno-Microsystem (Adapted from Johnson, 2010a)

Student characteristics and use of digital technology

Considerable research has established associations between patterns of digital technology use and university student cognitive, emotional, social and physical characteristics (Johnson 2005, 2006, 2008). Chen and Peng (2008) defined heavy internet users as junior university students in their sample who used the internet for more than 34 hours per week (one standard deviation above the mean). The study found that non-heavy users (≤ 17 hours per week) had better academic grades than heavy users and that heavy users were more likely than non-heavy users to be lonely, physically ill and depressed. Lanthier and Windham (2004) reported that social use of the internet was positively associated with male students' academic, social and emotional adjustment to university.

Dede (2005) described the learning style of digital natives as characterized by "fluency in multiple media, valuing each for the types of communication, activities, experiences, and expressions it empowers; learning based on collectively seeking, sieving, and synthesizing experiences rather than individually locating and absorbing information from a single best source; active learning based on experience that includes frequent opportunities for reflection; expression through non-linear associational webs of representations rather than linear stories; and co-design of learning experiences personalized to individual needs and preferences" (p. 10). Learning style, however, has been found to vary widely across university students (Johnson, 2007b). A review of the literature identified 71 theoretical approaches to learning style, many associated with tests of individual differences in style (Coffield, Moseley, Hall, & Ecclestone, 2004). Such tests require students to rate items in terms of their learning behaviour and preferences. Subsets of test items typically assess elements of a proposed taxonomy of learning style dimensions or continua. For example, the Paragon Learning Style Inventory provides an indication of learning style and cognitive preference in terms of introversion-extroversion, intuition-sensation, thinking-feeling and judging-perceiving (Shindler & Yang, 2003). The Index of Learning Styles (ILS) developed by Felder and Silverman (1988) specifically for university students has established reliability and validity (Felder & Spurlin, 2005) particularly for education students (Johnson, 2007b). The ILS classifies students along four continua or dimensions:

1. *active* (e.g., learns by doing and enjoys working with others) versus *reflective* (e.g., learns by thinking and prefers working alone)
2. *sensing* (e.g., practical, concrete thinker, oriented toward facts) versus *intuitive* (e.g., innovative, abstract thinker, oriented toward theory)
3. *visual* (e.g., prefers to learn with pictures, diagrams, and charts) versus *verbal* (e.g., prefers written and spoken explanations)
4. *sequential* (e.g., linear thinking, learns in small steps) versus *global* (e.g., holistic thinking, learns in leaps)

Saeed, Yang and Sinna (2009) reported that active learners prefer social bookmarks; reflective, sequential and verbal learners prefer podcasts; sensing learners prefer email; intuitive and global learners prefer blogs; and visual learners prefer vodcasts. In this regard, blended and online university courses should provide a range of instructional applications of digital technologies to ensure all learning styles are accommodated. Johnson (2007b) concluded that university students were aware of their learning styles and understood the conditions that facilitate their mastery of course content. Traditional post-secondary instructional contexts are not necessarily amenable to accommodating variation in student learning style. Large class sizes, limited resources and over-burdened teaching faculty are not conducive to active student involvement in learning processes and stimulating visual presentation of course content. "Instructional applications of web-based technology may provide mechanisms to accommodate student learning style more consistently in higher education" (p. 629).

Research issues and questions

The following research questions were developed to guide the study:

1. What are the ecological patterns of digital activity for junior university students (iGeneration)?
2. Are patterns of digital activity differentially associated with aspects of student learning style?
3. What are the instructional implications of such patterns and associations (or lack thereof)?

Methods

A questionnaire was developed specifically for this study. The questionnaire included demographic items necessary to describe the sample, forty rating scales items from the ILS (Felder & Silverman, 1988), specifically, ten items for each of the four learning styles and 19 digital technology uses (e.g., instant messaging) adapted from the list generated by Kennedy and colleagues (2008). Students were instructed to select all digital technology activities which they used. All students enrolled in an introductory educational psychology course (n = 123) at a university in Western Australia were invited, via email, to complete the questionnaire using Qualtrics an anonymous online survey application. Forty-eight students responded to the survey. Of these respondents, 56.3% were aged 18-19 years (iGeneration), 37.5% were 20-39 years of age (Gen X and Gen Y), 6.3% were aged 40-59 years (Baby Boomers) and there were no participants aged 60-79 years (Lucky). One respondent indicated part-time enrolment status while the remainder indicated full-time enrolment status. Thirty-six participants were female which is consistent with the gender distribution trends in the participating university. The proportion of students reporting each digital activity across each ecological context was tallied. T-tests compared mean learning style scores for students who did and those who did not report engaging in each digital activity.

Results

Table 1 presents the proportion of students indicating that they engaged in each of the digital activities listed in the online survey. Variation across students and across contexts was apparent. For example, less than one-third of students indicated that they read or contributed to blogs at home. Downloading/streaming music from the internet was common at home (80.4%) but rare at university (4.5%). Approximately one-quarter of students reported web conferencing from home while none reported the same digital activity at university. Using the internet to buy and sell was common at home (73.9%) but extremely rare at university (2.3%) and relatively rare in the community (12.2%). Some students conducted personal business while online at university (9.1%) but none reported watching television online at university, although 11.4% reported downloading and watching videos while at university. Blackboard was a common activity among participating first-year university students both at home (95.7%) and at university (90.9%), although a significant proportion (41.5%) also reported using Blackboard in the community. Approximately one-third of participating students reported downloading and playing games online while at home, 19.5% reported the same activity in the community, while only 2.3% reported playing online games while at university.

Table 2 summarises significant differences in learning styles between students who did and those who did not report engaging in specific digital activities at home. Notwithstanding a sample of convenience, distribution of scores within each group was approximately normal. Students who reported reading or contributing to blogs while at home tended to be more reflective (e.g., thoughtful and cautious) than students that did not report that digital activity at home. In contrast, students who reported using the internet at home to access maps and make telephone calls were significantly less reflective and more active than students who did not report that online behaviour. Students who reported using Twitter, blogs, photo sites and playing online games at home tended to be more intuitive (e.g., abstract and hypothetical) than students who did not report such use of digital technology at home. Students who reported using Twitter and blogs at home tended to be more verbal than visual in their learning style than individuals that did not report such use of digital technology at home.

Significant differences in the sensing-intuitive dimension of learning style (e.g. pragmatic versus hypothetical) emerged between students who did and those who did not report specific online activities at university (Table 3). Students who reported using social networking, conducting personal business and buying and selling things online tended to have more intuitive (i.e., hypothetical, creative and unconventional) than students who did not report such use of digital technology at university. No significant differences in the other dimensions of learning styles (i.e., active-reflective, visual-verbal, sequential-global) emerged between students who did and those who did not report specific uses of digital technology at university.

Table 1: Ecological patterns of digital activity among first-year university students (% indicating use)

Digital Technology Activity	Ecological Context		
	Home	University	Community
Instant message	71.7%	29.5%	41.5%
Email	93.5%	88.6%	73.2%
Use Twitter or similar application	8.7%	4.5%	9.8%
Use social networking sites (Facebook, Myspace etc.)	87.0%	70.5%	85.4%
Check information (news, weather, sports, facts etc.)	93.5%	70.5%	68.3%
Read or contribute to blogs	30.4%	9.1%	17.1%
Use maps (find places, get directions, plan routes)	91.3%	11.4%	56.1%
Conduct personal business	78.3%	9.1%	24.4%
Use Internet photo sites	43.5%	9.1%	12.2%
Watch TV	50.0%	0.0%	29.3%
Download/stream music	80.4%	4.5%	36.6%
Download or watch videos online	63.0%	11.4%	46.3%
Download or play games online	32.6%	2.3%	19.5%
Use the Internet for accessing Blackboard	95.7%	90.9%	41.5%
Use the Internet for accessing reference information for study	95.7%	81.8%	22.0%
Use the Internet for buying or selling things	73.9%	2.3%	12.2%
Use the Internet to build and maintain a website	10.9%	2.3%	2.4%
Use the Internet for making phones calls (e.g., VOIP using Skype)	41.3%	0.0%	4.9%
Use the Internet for web conferencing (e.g., Elluminate or webcam activity such as Skype)	26.1%	0.0%	7.3%

Table 2: Mean learning style differences between students who did and those who did not report digital activity at home

Digital Technology Activity at Home	Active-Reflective	Sensing-Intuitive	Visual-Verbal	Sequential-Global
Use Twitter or similar application: Yes No		17.0 14.1 t = -2.47*	15.8 13.2 t = -2.28*	
Read or contribute to blogs: Yes No	15.6 13.5 t = -2.96**	16.1 13.6 t = -3.34**	14.4 12.9 t = -2.13*	
Use maps (find places, get directions, plan routes): Yes No	14.0 17.0 t = 2.26*			
Use Internet photo sites: Yes No		15.3 13.7 t = -2.38*		
Download or play games online: Yes No		15.5 13.8 t = -2.49*		

Use the Internet for making phones calls (e.g., VOIP using Skype): Yes No	13.3 14.8 t = 2.03*			

* p < .05 ** p < .01

Table 4 presents significant differences in dimensions of learning style between students who did and those who did not report engaging in specific digital activities in the community (e.g., at work, an internet cafe or a friend's house). Notwithstanding a sample of convenience, distribution of scores within each group was approximately normal. Students who reported using Twitter, making online telephone calls and web conferencing in the community tended to be more reflective (e.g., thoughtful and cautious) than active (e.g., social and impulsive). Students who reported using Twitter and maps on the internet for directions, tended to be more intuitive (e.g., abstract and hypothetical) than students who did not report engaging in such online activities while in the community. Students who reported using Twitter, blogs, photo sites and making online telephone calls tended to be more verbal than visual in their style of learning.

Table 3: Mean learning style differences between students who did and those who did not report digital activity at university

Digital Technology Activity at University	**Active-Reflective**	**Sensing-Intuitive**	**Visual-Verbal**	**Sequential -Global**
Use social networking sites (Facebook, Myspace etc.): Yes No		14.9 13.2 t = -2.34*		
Conduct personal business: Yes No		16.8 14.1 t = -2.20*		
Use the Internet for buying or selling things: Yes No		19.0 14.3 t = -2.05*		

* p < .05

Table 4: Mean learning style differences between students who did and those who did not report digital activity in the community

Digital Technology Activity in Community	Active-Reflective	Sensing-Intuitive	Visual-Verbal	Sequential-Global
Use Twitter or similar application: Yes / No	16.5 / 13.9 / t = -2.17*	17.3 / 14.1 / t = -2.74**	17.8 / 13.0 / t = -5.11***	
Read or contribute to blogs: Yes / No			15.0 / 13.1 / t = -2.12*	
Use maps (find places, get directions, plan routes): Yes / No		15.2 / 13.6 / t = -2.33*		
Use Internet photo sites: Yes / No			15.4 / 13.2 / t = -2.19*	
Use the Internet for making phones calls (e.g., VOIP using Skype): Yes / No	19.0 / 14.0 / t = -2.16*		19.0 / 13.3 / t = -2.69*	
Use the Internet for web conferencing (e.g., Elluminate or webcam activity such as Skype): Yes / No	18.0 / 14.0 / t = -2.50*			

* p < .05 ** p < .01 *** p < .001

Discussion and implications for digital instructional practice

Results of the current investigation suggest that it is naive to consider all first-year university students (iGeneration) as identical in patterns of digital technology use. Jones, Ramanau, Cross and Healing (2010) concluded that while there were strong age-related variations, it was simplistic to describe first-year university students as a single generation. "The generation is not homogenous in its use and appreciation of new technologies and there are significant variations amongst students that lie within the Net generation age band" (p. 773). With respect to participating first-year university students, the extent of community based internet use was surprisingly high (e.g. social networking and checking email). University students may commonly use the internet while at work, at an internet cafe or at a friend's house confirming the ubiquitous nature of digital activity among the iGeneration. Virtually all university students surveyed reported using email, checking for information online, using Blackboard and accessing internet sites at home (Table 1). Nonetheless, results of the current investigation suggest considerable variability in other uses of digital technologies across ecological contexts.

Active leaners tend to retain and understand information best by doing, rather than simply listening or watching (Johnson, 2007b). Reflective learners, on the other hand, prefer to think prior to initiating action (Saeed et al., 2009). Active learners prefer to work in groups while reflective learners prefer to work alone. According to (Felder & Silverman, 1988), sitting through lectures without any form of active participation is particularly difficult for active learners. For the current investigation, the active-reflective dimension of learning style was differentially associated with digital activities at home versus in the community. Asynchronous communication technologies (e.g., Twitter and blogs) appeared well-suited to participating university students described as reflective learners. In contrast, participating active learners, characterised by pragmatism, reported using the internet to access maps and make telephone calls from home. Such practical uses of digital technology are consistent with the active learning style. Alternatively, synchronous applications of digital technology in the community (e.g., making telephone calls using Skype) were associated with more reflective, as opposed to active, learners. It may be that community use of digital technology allows for more processing time whilst, for example, students travel to work or to a friend's house. Indeed, community-based digital activities are less common and less spontaneous than digital activities at home and at school.

Students who score high on the sensing dimension of learning style tend to prefer learning factual information while intuitive learners prefer discovering possibilities and relationships (Johnson, 2007b). Sensors are most comfortable with well-established instructional methods and routines; intuitors prefer innovation and dislike repetition. Sensors tend to be patient with details and good at memorising; intuitors are better at grasping new concepts and are more comfortable than sensors with abstraction and hypothetical formulation. Sensors tend to be more practical and careful than intuitors (Saeed et al., 2009). Sensors prefer university courses that have connections to the real world (Felder & Silverman, 1988). For the current sample and across ecological contexts, the intuitive learning style, as opposed to the sensing style, was associated with use of innovative technologies. While early applications of digital technology focused on drill and practice (Barrow, Markman, & Rouse, 2008; Burton, Moore, & Magliaro, 2004; Efendiogla & Yelken, 2010) which are compatible with a sensing learning style, contemporary digital activities, by their very nature, reflect innovation and, consequently, are well-aligned with intuitive learners. It may be reasonable to suggest that a wide range of applications of digital technologies, from those that support rote memorisation to highly creative uses, are necessary to accommodate the full range of learning styles in any first-year university class.

Visual learners remember best what they see (e.g., pictures, diagrams, flow charts, timelines, video and demonstrations). Verbal learners prefer written and spoken explanations. In most university classes, little visual information is presented (Johnson, 2007b). Students mainly listen to lectures and read text. According to Felder and Silverman (1988), since most people are visual learners, many university students do not benefit from instruction that is compatible with their visual learning style. While digital technologies often include diagrams, photographs and icons, much of digital communication and information remains text-based (Johnson, 2010b). Language, whether verbal or written, is processed in the same part of the brain (Berninger et al., 2010). Unfortunately, it may be that online digital activity, as is generally the case with university teaching particularly in the social sciences, has failed to provide meaningful visual representation of information. As digital technologies emerge, student learning may be enhanced by increased use of pictures, diagrams, flow charts, timelines, video and demonstrations.

Sequential learners tend to gain understanding in a linear fashion with each step following logically from the previous one. Global learners tend to learn in large jumps, absorbing material without necessarily seeing connections. Sequential learns follow logical paths in finding solutions; global learners often solve problems quickly in novel ways once they ascertain the larger picture (Felder & Silverman, 1988). No significant differences in the sequential-global dimension of learning style emerged between students who reported and those who did not report any use of digital technologies across any ecological contexts. It may be that sample size (n = 48) was insufficient to detect significant group differences. It may also be the case that digital technologies do not favour linear versus holistic cognitive processing styles. Some digital applications (e.g., web 1.0 searches) are relatively linear and require sequential cognitive processing. In other cases, related visual images (e.g., social networking) provide connections that require global or holistic cognitive processing approaches (Johnson, 2008).

It may be worth noting that the fewest significant differences in learning style occurred in student reported use of digital activity at university. Unlike home or community-based digital activity, university online activities are often controlled by instructors and/or instructional context. Based on semi-structured focus group interviews with undergraduates, Bullen, Morgan, Belfer and Qayyum (2008) concluded that student use of digital technology at university was the consequence of "the student and instructor dynamic within a course or program, the technical requirements of the discipline, and the affordances that a tool provided within a given context" (p. 10). Margaryan and colleagues (2011) concluded that university students use a limited range of relatively well-established digital technologies. Use of collaborative knowledge creation tools, virtual worlds and social networking sites were uncommon. It may be that the iGeneration is being confined in their application of digital technology in university contexts. Individual difference in learning style may not be apparent due to the controlled nature of the digital environment at university. The question becomes, does this instructional control facilitate or impede student learning? Saeed and colleagues (2009) concluded that "today's learners are flexible in stretching their learning styles and are able to accommodate varying instructional strategies including the use of emerging web technologies" (p. 106).

Limitations and future research

A notable limitation of the current investigation is the narrow sample of first-year university students. All participating students were drawn from those enrolled in one required introductory education course offered at one university. Caution must be exercised in generalizing findings to first-year university students in other programs and other countries. For example, some universities have policies that restrict students from engaging in certain uses of the internet. Additionally, participating university students self-reported their learning style preferences and their use of digital technologies across ecological contexts. An enduring criticism of self-report measures is the potential of misrepresentation particularly to present oneself in a positive manner (Kreuter, Presser, & Tourangeau, 2008). Indeed, it is surprising that very few students (2.3%) reported playing online games while at university. Finally, the list of digital activities in the online survey was limited. Given that almost all junior university students own a mobile phone (Kennedy et al., 2008), use of mobile digital technologies should have been queried in the online survey. According to Pensky (2005), use of mobile "phones compliment the short-burst, casual, multi-tasking style of today's Digital Native learners" (p. 1). Reportedly, university students express excitement "about the opportunities afforded by the mobility and portability of mobile devices, in being able to learn anywhere and everywhere, and at their own convenience" (Litchfield, Dyson, Lawrence, & Zmijewska, 2007, p. 587). However, in a study by Loke and colleagues (2010), only 16% of participating undergraduate students made use of mobile learning infrastructure. Seemingly divergent and contradictory research findings may be reconciled by theoretical consideration of the diverse uses of digital technology (e.g., information, communication and recreation) across environments (home, school and community) and the opportunities and constraints that exist within those environments relative to specific patterns of use.

With respect to the Techno-Microsystem (Figure 1), the current investigation attempted to determine specific uses of communication, information and recreation digital technologies across all three environments in which such activity occurs (i.e., home, school and community). Consideration of learner characteristics, however, was limited to one aspect of cognitive development, -- learning style. Social, emotional and physical characteristics are associated with variation in digital behaviours (Chen & Peng, 2008; Johnson, 2006). For example, Lanthier and Windham (2004) reported that social use of the internet was positively associated with male students' academic, social and emotional adjustment to university. Similarly, numerous studies have linked various uses of the digital technology to university student health problems, depression and loneliness (Caplan, 2007 Engelberg & Sjoberg, 2004; Gordon, Juang, & Syed, 2007; Li & Chung, 2006). Chen and Tzeng (2010) concluded "that it is not how much time university students spend online but what they do online that is associated with academic grades and psychological adjustment" (p. 257). Subsequent comprehensive ecological research may examine the multitude of complex relationships proposed by the Techno-Microsystem, although the ecological contexts of digital activity are increasingly blurred by increasingly ubiquitous uses of digital technologies.

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Encouraging effective online discussions - a description of an evolving C^2MP project

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Although online discussion forums are considered an integral component of online learning in our College, the practice of how these are currently used does not always reflect the intended learning design. Discussions are often focussed on processes and administrative nature, rather than discussion about content. The aim of the project is to improve this usage, to include more in-depth and content-related discussions. The stages of the project and expected outcomes are explained.

Keywords: Effective online discussions; facilitator presence; online learning; staff development

Introduction

The aim of the project, the first stage of which is being carried out as part of the ascilite Collaborative Community Mentoring Program(C^2MP) (ascilite, 2011), is to improve usage of discussion forums, to include more in-depth and content-related discussions. Whilst the context of the project is in a small privately owned college, the results will be of interest to all institutions and staff who have a desire to engage their students in meaningful dialaogue.

Rationale and context

Anecdotal evidence from educators and some preliminary investigations current usage of online discussion forums in a small privately owned tertiary college (Australian College of Applied Psychology- ACAP) suggest that there is very little deep discussion about content in the online classroom for our units. Most discussion is about process focussing on administrative questions rather than being about content, and there is little evidence of engagement of students.

Whilst offering full tertiary degree and Masters programs our College is unique and structured slightly differently to a university, presenting different challenges and opportunities for learning and teaching support. We offer fully online, as well as on-campus, units and courses and our cohort is more mature-age students than those straight from high school, and many are studying part-time after many years away from school. Classes, which always have less than twenty students, are facilitated by part-time educators who are usually practitioners with some teaching experience. ACAP currently offers the Bachelor of Applied Social Science by flexible delivery, as well as on-campus. In flexible delivery, units are completed fully online, utilising Moodle as the

Learning Management System. Students also complete two practicum subjects and attend three face-to-face Counsellor Development Workshops, if completing the Counselling specialisation. Online discussions are an integral component of online learning in the ACAP context, including educator announcements, general forums and forums for discussion on specific learning activities.

The aim of the project is to improve this usage, to include more in-depth and content-related discussions. The project will research current usage of discussion forums as well as good practices and strategies that can be implemented to improve students' engagement with content, educator and each other.

Methodology

This project will be based on design-based research (Wang & Hannafin, 2005) and will work through the following stages

- identify an issue – ineffective use of online discussion forums
- evaluate current usage – this will include evaluation of usage logs and analysis of types of discussions currently occurring.
- analyse the problem – what are the issues – these include:- educators not aware of institutional expectations; educators not meeting institutional expectations of online presence; lack of educational awareness of how to facilitate effective online discussions; students unaware of how to effectively participate in online discussions; students not aware of expectations of participation expectations and students are independent learners who do not wish to participate in online discussions.
- develop and conduct surveys of educator and student perceptions.
- suggest possible courses of action – these may include:-more explicit guidelines for participation prepared for educators and students; a range of professional development opportunities provided for educators;
    - orientation sessions and training provided for students in how and why to participate in online discussions
- research literature to find examples of good practice and evidence for why and how these work
- develop an action plan – this will be based on the most appropriate and sustainable options identified from the literature review
- evaluate effectiveness of actions
- redevelop and redesign as needed

Literature review

A detailed review of literature will be undertaken to try and determine responses to a range of questions including the issues of evidence of the effectiveness of online discussions; best practice in facilitating online dicsussions; the factors that lead to effective online discussions
I will also draw on the expertise of my mentors and other participants in the C^{2}MP to formulate these responses.

Expected outcomes

Whilst this project is still in its infancy, and will continue well beyond the scope of the C^{2}MP there are some main deliverables that I envisage will come from this project including

- changes to ways in which discussion forums are incorporated into the online class spoace and promoted to studnets and educators
- support materials for students and Educators, including setting and communicating expectations
- professional development workshops and other resources for Educators

In addition there are a number of perceived benefits for ACAP including

- improved student learning and satisfaction
- improved student retention rates
- improved appreciation of the value of online discussions for educators

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Integrating bioscience and clinical learning through technology

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Successfully integrating bioscience and clinical learning is a major challenge for designers of medical curricula. A new learning system being developed at the University of Melbourne will make it easier for medical students to locate, access and utilise bioscience and clinical learning resources to support both formal and informal learning activities. Backed by a comprehensive database of curriculum, bioscience and clinical resources, students will have immediate access to the best available bioscience and clinical resources via interactive activity and search-based interfaces. Student portfolios, based around new patient record and procedural log systems will be fully integrated within the system. Implementation will be supported by an extensive program of evaluation and research, with particular emphasis to be placed on student's selection and use of digital resources and the use of electronic health records to support clinical learning.

Keywords: learning systems, resource use, electronic health records, student portfolios

Curriculum renewal

In 2011 the Melbourne Medical School (MMS) shifted from a six-year undergraduate (MBBS) to a four-year graduate (MD) curriculum. The shift to a graduate curriculum brings the MMS into line with the majority of Australia's twenty medical schools, although the MD is unique in being accredited as a masters level degree, The clinical components of the two curricula are broadly similar but formal campus-based biosciences instruction has been reduced from five semesters (two and a half years) in the MBBS to four terms within a single year in the MD. Whereas all students' requisite bioscience learning was embedded in the MBBS curriculum, the first year of the new MD is designed to consolidate and, where necessary, extend students' existing bioscience knowledge so they enter the clinical phase of their learning with an equivalent bioscience knowledge base.

The challenge

Successfully integrating the comparatively pure elements of bioscience learning with the strongly applied elements of clinical learning is one of the fundamental challenges of all medical curricula. At Melbourne, as in a majority of medical schools locally and internationally, problem- and case-based learning have been adopted in an effort to ground students' bioscience learning in a strong and meaningful clinical context (Barrows, 1996). The inverse – the application and integration of bioscience learning into clinical learning activities – is often less formally supported, the expectation being that students will adopt a self-regulated learning approach to draw and build upon their bioscience learning throughout their clinical years. However, in our teaching staff's experience, students aren't necessarily able to recall, locate or apply core key bioscience knowledge when required in clinical settings. Honing students' information management and seeking skills can help here. Today's medical students are expected to assimilate and apply, an ever increasing and complex body of medically related information. Added to this, they are time poor and must function at a consistently high level when working, and learning, in clinical settings. To work and learn effectively, they clearly need simple, rapid and effective access to both their core learning materials and an array of quality medical information sources. And, for maximum benefit, they need the necessary skills and tools to be able to combine, synthesise and assimilate and apply this information in an efficient and effective way.

Educational technology and the curriculum

Educational technology plays a major role in the delivery of the medical curriculum at most Australian medical schools and Melbourne is no different, although it was perhaps an earlier and more vigorous adopter than others (Keppell et al, 2001). Learning resources have been delivered via an LMS since 1999 and a suite of rich multimedia applications were developed to support the teaching of key areas of the medical and bioscience curricula between 1999 and 2005 – most of which are still in regular use. While both bioscience and clinical learning are well supported by educational technology, to date the majority of the technical innovation and support has undoubtedly been directed towards the campus-based (bioscience) components of the curriculum. The LMS has primarily been used to deliver problem-based learning resources, to host discussion forums and to support formative and summative assessment tasks, while rich multimedia applications have been delivered to students through shared computer laboratories and, for selected applications, via the distribution of physical media. Technology-based support for clinical students has focused largely on student management – e.g. allocation of student placements, timetabling and student messaging and announcements – and much of this functionality has been provided through an in-house Clinical Administration and Tracking Service (CATS).

Curriculum Connect

Educational technology will assume an even greater role in the delivery of the MD curriculum, supporting a range of new and expanded learning and teaching and administrative functions and activities. The majority of these will be delivered through a new in-house curriculum delivery and learning system – *Curriculum Connect*. The *Curriculum Connect* project has two major aims. The first is to create an engaging learning environment for MD students that is accessible, useful and relevant to them throughout their course – i.e. it is neither bioscience or clinically focused and equally supports and is integrated with all phases of the curriculum. The second is to provide a high level of integration between bioscience and clinical resources, allowing students working with bioscience resources to quickly and efficiently locate and access related clinical resources and vice-versa. *Curriculum Connect* attempts to meet these aims by (i) identifying and implementing new modes of access to existing resources, (ii) identifying and embedding access to new sources of high quality information that are aligned with both general and specific learning objectives within the new curriculum, and (iii) designing and implementing new learning activities that enhance the curriculum by leveraging these resources.

Improving access and adding value to resources

A considerable number of information resources are used to support the medical curriculum. These include lecture notes and recordings, textbook readings, journal articles, medical portals and multimedia software. Since 1999, the majority of these resources have been recorded in a curriculum database containing information about individual resources (e.g. author/s, summary, keywords) as well as the general and specific learning activities they are designed to support. This database is used by curriculum developers and teaching staff and although not directly linked to the LMS, is the primary source for content and resources supporting lectures, practicals and problem-based tutorials that are delivered through the LMS. For *Curriculum Connect*, the database is being redesigned and expanded and, in a major change to its use, students will have direct access to almost all of the resources and information it contains. Instead of accessing these resources through a series of static web pages, students will be able to interactively locate and access resources in a variety of ways. Event-based access of resources will be mediated through a personalised interactive timetable object, which lists and links to the resources associated with any scheduled event (lecture, tutorial, practical etc.). Case-based access will use a case 'browser' to present an aggregated list of resources associated with all the events associated with every virtual case. Search-based access will allow users to locate relevant curriculum resources by conducting keyword and title searches.

In the current LMS-based implementation, the focus is on delivering resources associated with the current week's activities – content is released on a week-to-week basis. While students can browse existing content by following links, there is no mechanism for aggregating or searching resources and there is no way to access resources associated with future events or phases of the curriculum. In *Curriculum Connect*, almost all resources will always be accessible. Moreover, value will be added to individual resources (and cases) by enabling students to bookmark, add notes to and comment on them. Each student's bookmarks, notes and comments will be aggregated so that they can quickly locate and access their preferred resources, while the system-wide implementation of shared comments will provide valuable context for discussions between students and staff. *Curriculum Connect* will also provide easy access to our existing suite of multimedia-based learning resources.

Supporting new learning activities

While the MD curriculum adopts a case-base rather than a problem-based framework to support students' bioscience learning, the differences between the two approaches are relatively subtle and many of the learning activities associated with the MBBS have been adopted within the MD with only minor modifications. More substantial changes are being implemented within the clinical phase of the curriculum (beginning 2012), with including the introduction of a student-centred patient record or Electronic Health Record (EHR) system. Whereas there is no general requirement for students in the MBBS to record their patient interactions on a regular basis (most students record a small number of interactions on an ad-hoc basis to support formal case presentations), MD students will be expected to systematically record a representative sample of their patient interactions using a semi-structured record/interview format. In conjunction with a clinical procedures log, these records will form the basis of students' new clinical portfolios. These portfolios are designed to play a dual role – to support students' learning and to improve their reflective practice (Driessen et al, 2005), and to inform formative and summative evaluation of students' clinical performance and progress. While the use of procedural logs within the clinical phases of medical curricula is relatively widespread, the use of more comprehensive electronic health records to support learning is still in its infancy (Elliott, Judd & McColl, 2011).

The EHR system will be tightly integrated with the other elements of *Curriculum Connect*, with particular emphasis placed on resource discovery and access. Users will have direct access to key clinical resources (e.g. Australian Medicines Handbook, Therapeutic Guidelines, MD Consult) and will be able to run simple keyword searches of the curriculum database, the university library (including all its medically related subscriptions) and selected medical portals from anywhere within a record. There will be some capacity for students to share their EHRs with other students and staff, although the extent to which sharing will be allowed is currently under review.

Implementation

Leaving the LMS

The LMS has played a central role in the delivery of the medical curriculum at Melbourne since 1999. While it has effectively supported the delivery of the bioscience component of the MBBS curriculum, it has been less suited to the demands of administering students and delivering content across a range of clinical contexts with a diversity of operational requirements. To support these activities, our in-house clinical placement allocation, timetabling and messaging system (CATS) has been incrementally developed and progressively rolled-out across the MMS's network of clinical schools during the past few years,

Successfully implementing some of the key ideas that underpin *Curriculum Connect* clearly involves the development of new components and systems. Some of these might have been developed as LMS compliant 'add-ons' but more likely would have operated independently and simply linked to from within the LMS (as CATS currently is) or, at best, the LMS would be superficially 'wrapped' around them, In either case there would be little or no real integration between the LMS and these independent systems. Given that we would be responsible for developing, implementing and maintaining these systems (which sits in stark contrast to our ability to control and adapt the university's LMS) we had the choice of either partially integrating our new components with the LMS or developing an entirely new and independent learning system. In the case of the latter, key LMS functionality outside the scope of our system would be provided by linking to specific modules of the LMS, or embedding these within our system's interface. After weighing up our options we decided to develop *Curriculum Connect* as an independent learning system. Design and development of the new system began in early 2010. As the MD curriculum was due to start in 2011 and we expected development of the complete system to take at between two and three years we elected to retain the LMS to deliver bioscience content for 2011 and we will continue to rely on it to support key elements of both the MBBS and MD curricula as *Curriculum Connect* is progressively developed and rolled out.

Rolling it out

Curriculum Connect is being rolled out through a staged implementation. In Stage I (February 2011), all MD students were provided with a USB stick containing approximately 30 multimedia-based learning resources and a basic 'software browser' application for searching, previewing and launching them. In Stage II (September 2011) students' USB sticks were updated with a preview version of the 'full' *Curriculum Connect* application. This version included *Timetable* (event-based resources), *Cases* (case-based resources) and *Resources* (search-based resources) modules in addition to the existing *Software* (teaching software) module. A *Library* module providing students with direct access to key library subscriptions, resources and online textbooks was subsequently added via a minor update.

The main *Curriculum Connect* rollout will occur at Stage III, which is scheduled for the beginning of the 2012 academic year. This version will include all of the Stage II components plus an *Announcements* module (announcements through the LMS will be deprecated at this point) and *Patients* (EHR system) and *Procedures* (procedural log) modules for clinically based (2nd year) students. Key elements of the existing CATS system will also be integrated at this stage. The Stage III rollout will involve around 700 MD students (there are approximately 350 students in each MD cohort), increasing to the maximum of about 1400 students in 2014. A selection of screengrabs from development versions of the Stage II and III client applications are available at http://www.mdhsonline.unimelb.edu.au/curriculum_connect/ASCILITE_2011

During Stage IV (first half of 2012), specific *Curriculum Connect* components (the *Patients* and *Timetable* modules initially) will be released as mobile applications. We will initially target iOS mobile devices (iPhone and iPad versions of the *Patients* module are currently undergoing testing), but other platforms are likely to be supported at a later stage. Stage V (second half of 2012) will mirror Stage IV but targeting web browsers. The final Stage (VI – beginning of 2013) will see the delivery of an integrated multi-platform browser-based application.

Evaluation and research

From September 2011, *Curriculum Connect* will play a leading role in the delivery of the MD curriculum. Its success is critical and its implementation will be supported by a rigorous and ongoing program of evaluation covering both technical and learning and teaching related aspects of the system. Because we have access to its codebase we will (subject to ethical approval) be able to routinely capture targeted and detailed analytics about students' use of the system. These data (we have considerable expertise in capturing and analytics data – e.g. Judd & Kennedy, 2011a; Kennedy & Judd, 2007) will then be used to support comprehensive programs of evaluation and research related to *Curriculum Connect* and the MD curriculum more generally.

Two key research themes within this larger program will be (a) students selection and use of digital resources to support formal and informal learning activities, and (b) the use of electronic health records to support students' clinical learning. The first theme builds on work by Judd and Kennedy (e.g. Judd & Kennedy, 2010, 2011b) on the quality and context of electronic resources used by biomedical students to support self-directed learning. *Curriculum Connect* will allow us to more effectively establish direct links between students' use of individual resources and specific learning activities. In particular, data from this project will be used to (i) investigate the development of students' medical information literacy skills and to (ii) investigate the role of online information in informing students' clinical decision making.

The second theme represents an emerging field of research and is particularly relevant given the Australian government's current efforts to implement a centralised system of electronic heath records. A program of research around this theme is already under way, with a mobile version of the Patients module of *Curriculum Connect* currently being trialed with 45 hospital based medical students. This trial, which builds on a pilot implementation in late 2010 (Elliott, Judd & McColl, 2011) is designed to (i) assess the overall utility of the health records system as a learning tool in a clinical setting, (ii) assess the importance of mobile (bedside) access to students' use of the system. More intensive investigations involving the full student cohort are planned for 2012.

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Changing spaces: using technologies to enhance student and teacher engagement through effective pre-lecture engagement (EPLE)

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Many leading innovators in higher education are seeking to change the nature and purpose of face-to-face (f2f) sessions, aiming to morph the traditional university lecture into something that is more interactive and student driven. Underpinning this changing lecture dynamic is a focus on the learning that students are required to achieve in order to be best prepared for, and thus gain maximum benefit from, the f2f session. This project team has been successfully carrying out a range of effective pre-lecture engagement activities (EPLE) through the use of learning technologies, with attested improvement in student outcomes and progression rates, across two different disciplines. Both student and teacher engagement has been enhanced through the development of 'interactive online learning modules' (IOLMs) in Oral Health that are completed prior to the scheduled f2f session, and 'crash courses' (CCs) in Civil Engineering that are conducted in class within the first 10 minutes of the f2f.

Keywords: engagement, pre-lecture preparation, interactive lectures, learning technologies

Introduction

Underpinning many recent moves away from the standard lecture towards more interactive f2f sessions is a focus on what students need to do and to learn in advance of that session, so that they are appropriately prepared. Team-Based Learning (McCormack, 2011), for example, does this in a quasi-traditional manner, relying on pre-lecture readings, combined with reading guides and preparatory questions. On the other hand, the Integrated Online Learning Modules (IOLMs) approach (Karanicolas and Snelling, 2010) achieves this in a much more contemporary fashion, providing students with multi-media learning modules and online quizzes up to a week before the scheduled f2f. Despite this difference, both of these approaches place emphasis on moving a significant proportion of the ‘broadcast’ material, i.e. the one-way monologues that characterised the traditional university lecture, out of the f2f session and into a format that students access independently and work through at their own pace.

We are interested in what sorts of activities constitute *effective* pre-lecture engagement (EPLE) and in this context we have been exploring two different approaches across two disciplines, Oral Health & Civil Engineering at the University of Adelaide. EPLE activities have been developed using a variety of technologies, from the web-based IOLM approach in the Oral Health course, to the relatively straightforward use of a document camera in the Civil Engineering CCs (Willis, 2009). The IOLMs are available for student completion prior to the f2f, in contrast to the CCs that are delivered in the first 10 minutes of class time. Central to both these EPLE approaches is a feedback loop, enabling students to assess their growing mastery of the key concepts, and enabling the lecturer to adjust the f2f session accordingly, and in a ‘just-in-time teaching’ fashion (Carrington and Green, 2007; Novak, 2006). The aim of both these EPLE activities is to package key concepts and terminology in short episodes, allowing the student to develop a sense of familiarity with the fundamentals before embarking on a deeper understanding and exploration of the content.

For both disciplines the introduction of EPLE activities has transformed the traditional teacher-driven lecture into a more interactive and student-driven learning format, associated with much improved rates of student progress and engagement. Attending classes and participating in active learning experiences through social engagement helps to foster a sense of belonging and consequently impacts positively on student learning (Matthews, 1993). EPLE builds on the students’ level of confidence that enables them to engage in active and positive learning experiences. Kolari and Savander-Ranne (2007) acknowledge that the designing of appropriate pre-lecture assignments is most demanding and requires a great deal of self-reflection and interaction with students on the teacher’s behalf. However, the use of learning technologies in both the Oral Health and Civil Engineering programs, have assisted us in developing EPLE activities that manage to sustain our students’ interest through an increased level of interactivity, flexibility and teacher presence that the more traditional modes of pre-lecture preparation did not seem to offer.

Background of Disciplines

The two courses investigated in this study are within the Bachelor of Oral Health (BOH) and the Bachelor of Civil Engineering (BCE) at the University of Adelaide. While both the courses are at first year undergraduate level, there are several significant differences in respect of course content and student cohorts. In particular, for discipline specific course content the BOH has predominantly text-based and descriptive answers, while the BCE has purely numerical answers. In addition, the number of students is of the order of 40 and 600 for BOH and BCE respectively. There are also differences in terms of the *way* in which the EPLE activities and technologies are used within each discipline. For BOH, the IOLMs are presented prior to the lecture in the form of twenty-minute video podcasts. In contrast to this, for BCE, the crash courses are presented as a warm up to the lecture using a document camera for approximately ten minutes during the allocated f2f time.

Interactive Online Learning Modules

As there are no prerequisite entry requirements for the Oral Health program, students entering the first year human biology course come with a diverse range of experiences and levels of understanding. To overcome the learning challenges that this diversity creates, specific lectures introducing key concepts are selected as the priority areas for developing the IOLMs. Using the *Articulate* software package (Articulate Global Inc., 2011) the lectures are adapted from the existing PowerPoint lecture slides into an online module. A narrative dialogue is recorded for each slide by the two-person teaching team. One lecturer acts as the 'expert' and the other assumes the role of the learner. Approximately 50% of the material usually presented to students in a f2f lecture, is incorporated into the IOLM, allowing new terminology and key concepts to be previewed by the class up to one week before the lecture and as often as they require to gain a foundational understanding. At strategic points (usually every 4-6 slides), interactive checkpoint multiple-choice questions (MCQs) are inserted and linked to the assessment and grading facility in the university's learning management system (an implementation of Blackboard). Students undertake these checkpoints as a way of revising information covered in the previous slides and to provide them with formative feedback on their level of understanding. Furthermore, analysis of these checkpoint assessments is readily downloaded from the learning management system, enabling lecturers to identify areas covered by the IOLM that need more emphasis or explanation in the f2f session. A sample IOLM can be accessed at: http://ajax.acue.adelaide.edu.au/~allan/embrology/player.html. Note that students are allowed some class time to work through the IOLMs; providing a timetabled session underlines the important role that the IOLMs play in the learning process, rather than being just being considered as optional extras.

In addition, 3-4 minute video recordings, referred to as "QuickBytes", presenting key concepts are uploaded to YouTube and subsequently embedded in these modules. This provides students with further access to, and engagement with their teachers, reinforcing a strong teacher presence. A sample QuickByte video can be viewed at http://www.youtube.com/watch?v=G2TvfgiNHCs. These video recordings are made using a whiteboard and a simple digital point-and-shoot camera. There is very little editing required when transforming these videos into a format that can be uploaded into YouTube. From the teacher's perspective, the additional time invested into the development of these IOLMs is offset by the fact that these modules change the nature of the f2f into a more student driven interactive and engaging learning space. Once developed, these modules need very little input from the teachers to use in subsequent years.

Crash Courses

As the name suggests, 'crash courses' (CCs) are concise ten minute summaries of the ideas students are to meet in the ensuing lecture, and include overviews of the relationship to the sets of ideas articulated in previous lectures, and in the course generally. Initial results seem to indicate that this initiative has eased the sense of dislocation students experience when introduced to unfamiliar concepts. This strategy became the first step in a transformation of the traditional didactic lecture into an interactive workshop using simple technologies, such as a document camera. These CCs are recorded live and are available to students via the learning management system after the lectures to use as a general learning resource.

As the CCs provide students with the capacity to understand and become familiar with the key concepts and new terminology of the ensuing lecture, the learning space changes into a more workshop style format, increasing interactivity and providing more feedback to both students and teacher. MCQs are embedded strategically into the PowerPoint slides of the f2f and students attempt to answer these as they appear on screen. Once students have formulated their responses they are asked to explain their rationale to the student(s) next to them. Compared to previous cohorts who did not engage in this peer instruction (Mazur, 1997), the answers among the students more commonly converge on the correct one as indicated by the show of hands. This process gives meaningful and timely formative feedback to students on their performance and, equally importantly, gives the lecturer feedback as student understanding can be surveyed, and lecture content immediately adjusted to remedy any shortcomings. This interactive workshop style of teaching and learning might normally be reserved for tutorial sizes of 30 students rather than a lecture theatre full of hundreds of first years. However, the introduction of key concepts via CCs at the start of each lecture primes the class to actively participate in the learning experience. The lecturer acts as a facilitator of the students' learning by progressively giving hints and highlighting the potential pitfalls for each MCQ as they discuss their workings with neighbouring students. That they acquire and demonstrate their knowledge and skill before leaving the lecture theatre is imperative for an engineering curriculum, which must build knowledge, competence and confidence in interconnected, scaffolded and sometimes, small steps. The availability of the CCs post session enables students to revise and review the key concepts as often as required.

Impact on Student Engagement and Learning

Interactive Learning Modules

Since the IOLMs were implemented in 2008, there has been an average of 95% completion rate of each class of 36 students. Table 1 outlines the qualitative data that has been collected on the students' views between 2008-10 via formal student feedback surveys and focus groups, as well as unsolicited emails.

Table 1: Qualitative results for IOLMs from a sample of student feedback systems.

Formal student feedback surveys	• *I felt I had access to the tutors in my own home* • *I was able to pause the IOLM to reflect on fantastic analogies I will never forget* • *IOLMs are a convenient and valuable learning resource….they help me to understand the topic better before the lecture* • *Having visual and auditory resources helps reinforce the message more effectively*
Unsolicited student emails	• *Just wanted to say I really enjoyed the IOLM! I think it's a great way to learn things!* • *I have just finished the online learning module for connective tissue - it was great!* • *Have to say, loving this interactive online learning. If I don't understand something, I can pause, read up on it and follow the rest easier :)*
An analysis of results from student focus groups conducted from 2008 – 2010.	• *A more efficient learning environment - students felt that they learnt better than traditional approaches* • *Improved students' engagement to the point where they were discussing content outside of class* • *The dialogue of two lecturers was lively and entertaining, underpinned by their ability to provide effective explanatory images and metaphors.* • *Opportunity to access the IOLMs 'on-demand' and at a time that suited their schedules on or off campus* • *Asynchronous availability of their facilitators, through online collaborative dialogue embedded in IOLMs* • *Opportunity for students to attend the f2f session with the same level of understanding, arming them with the confidence and underpinning knowledge needed to engage in the application and integration of their conceptual understanding in the classroom environment* • *Identification and reinforcement of key concepts in both the online and f2f experience* • *Ability to contextualise and make sense of their learning through both independent reflection and collaborative peer group learning.*

In a quantitative sense, there has been a noted improvement in assessment outcomes for the Human Biology program. Using comparative assessment metrics, the class average for the final exam has increased slightly from 67% in 2007, pre IOLMs, to an average of 72% from 2008-2010 post IOLMs. However, the most significant impact has been witnessed in the student progression rates. The failure rate pre IOLMs for the semester 2 exam was 15% in 2007, decreasing to an average of 6% between the years of 2008-2010 and possibly signifying that the IOLMs have made the biggest impact on those students who have traditionally struggled with the content. Although the sample for each year has been relatively small (n=36) we are hopeful that these results are scalable to much larger cohorts wishing to adopt this approach. From the qualitative data it can be safely concluded that there is a very high level of student satisfaction as they express their preference for learning in this interactive paradigm, rather than the more didactic methods characteristic of traditional higher education learning spaces. The use of learning technologies has enabled the creation of IOLMs that foster student and as a consequence, teacher engagement.

Crash Courses

Over the period 2008-2010 the CCs approach has been associated with some significant improvements in student performance. The average grade has increased from 47% in 2008 to 72% in 2010; at the same time the failure rate has decreased from 32% to 5%. There has also been broad agreement that students receive adequate feedback, as expressed through standardised learning and teaching evaluations, increasing from 18% to 81% over the same time period. This dramatic response seems to be related to the formative feedback strategy that has been adopted for lectures, as the final assessment is based on electronically marked MCQs which offer little along the lines of effective feedback. In addition, a special survey asking if students viewed CCs as improving their understanding of lecture material received 98% broad agreement. A sample of unsolicited student emails provides a more comprehensive understanding of the students' perception of the effectiveness of CCs, as seen in Table 2:

Table 2: Qualitative results for Crash Courses: Unsolicited emails.

Unsolicited student emails	• *The crash courses provide an overall understanding of what will be learned and the outcomes that are expected. This makes the process easier to grasp as there is already an understanding of the end result or goal. The notes taken from the crash course have been useful when undertaking homework questions to easily see what is required and the process in completing the question. (2010)* • *The crash courses have been invaluable this semester for consolidating my learning after lectures and in preparation for tests and the exam. They offer a succinct overview of each topic in the course that forms a strong framework to build upon in the lectures. They are incredibly useful as a method to review past lecture material or to get a head start on a topic and go into further detail in the lectures. The crash courses allow the topic to be presented in a relatively short amount of time, allowing extra time for further in-depth discussions and relevant examples. The use of the crash courses followed by these examples allow me to gain a much deeper understanding of each topic. (2011)*

Summary and recommendations

From our experiences, material prepared for traditional f2f lecture based courses does not need to be radically overhauled, but can be selectively and incrementally adapted to an EPLE approach using readily available and user friendly digital systems. At the same time, we see EPLE as the transformative tip-of-the-iceberg when it comes to facilitating broader change in our higher education learning and teaching practice. Paying attention to the design of the pre-lecture engagement using learning technologies that sustain a strong teacher presence and level of interactivity, has for us driven a change in the very nature of the lecture session itself. Lectures have now become more active, and more interactive, with much of the traditional lecture content now being delivered to students through other means. We believe this makes for richer and more effective use of the f2f sessions that create a culture of engagement through the use of technology and interactive learning.

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Learner experiences of online learning in a blended learning situation: Different cohorts, different needs

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This paper discusses a key finding of a recent study of learners' experiences of blended learning in a case involving multiple cohorts of students in a single degree program. The theme of differing experiences across learner cohorts is discussed. The presentation includes quantitative data drawn from student surveys. The findings and discussion highlight considerations for teaching academics, academic developers and program administrators related to the implementation of blended learning.

Keywords: blended learning, learner experience, undergraduate, higher education

Introduction

As institutions increasingly employ blended learning to cater to diverse and dispersed student cohorts, evidence from early experience with blended learning becomes ever more important to inform ongoing improvement of blended learning programs (Sharpe, Benfield, Roberts, & Francis, 2006). In particular, the experiences of learners have been a valuable source of information for teaching academics, program leaders and academic developers (e..g., Bird, 2004; Carswell, Thomas, Petre, Price, & Richards, 2000; Thorpe & Godwin, 2006).

This paper focuses on preliminary findings from a formative evaluation of the experiences of learners in a blended learning situation. The findings suggest differences between three cohorts of students defined by a combination of their physical location and the particular blend they experienced. Quantitative data drawn from student surveys highlight learner experiences and draw out a key theme related to the differences between student cohorts, namely, that students in the different cohorts had distinctly different experiences blended learning within the same program. While this finding is consistent with other published finding which highlight the highly contextualized nature of successful blended learning (Sharpe, et al., 2006), it raises a number of discussion points for academic developers, teaching academics and program directors to consider in the implementation of blended learning in programs with multiple cohorts of students. The discussion foreshadows ongoing work on this study related to the continuing analysis of qualitative data collected as part of this study.

Context

The study in question was conducted within a four-year undergraduate degree program in an Australasian university. The program had historically been delivered in three parallel forms across two modes, including a) on campus at the university's main campus, b) on campus at a regional site and c) externally, via correspondence and online distance education. As a result of a program review, an extensive redevelopment of the program was undertaken involving extensive re-conceptualisation of the program in terms of structure, content, approaches to teaching, and all aspects of individual course designs. In particular, this development included the implementation of blended learning in which all students shared key features of the program including online learning environments for each course, a common set of learning materials and a program-wide online learning community. One intended outcomes of the redevelopment was to increase the similarity of learners' experiences across the program and reduce the likelihood of inequity in the experiences of students.

Notably, blended learning within the program including blending of both (a) approaches to learning and teaching and (b) modes of delivery to produce different blends for each cohort. Each individual course was redeveloped to create blended approaches which sought to produce the best learning outcomes for students. Regarding delivery, students at the main campus got face-to-face delivery from course coordinators for all contact sessions plus online learning between sessions. Students at the regional campus got face-to-face sessions from a combination of course coordinators and tutors for many/most contact sessions, plus online learning for some contact sessions and online activity between sessions. External students got online learning as the primary form of contact with one another and course teaching staff.

Methods

At the midway point of the four-year development process, a formative evaluation was undertaken to gauge stakeholder experiences with the implementation of blended learning. The evaluation aimed to identify (a) aspects of blended learning which were successful, as determined by the quality of stakeholder experiences and (b) opportunities to improve blended learning in the program based on negative stakeholder experiences. Data on student experiences with blended learning in the program was collected in three phases: a survey open to all students which produced a set of initial themes; interviews with a small group of volunteers and a focus group discussion with all interview volunteers. A preliminary analysis was conducted at the conclusion of each phase to identify key themes and inform the ongoing process. After the completion of all phases, a more comprehensive analysis was conducted to identify strengths of the early program developments as evidenced by positive learner experiences and opportunities for adjustments in the implementation of blended learning.

The findings in this paper are limited to the results of the student survey and preliminary analysis of student responses. The survey instrument was constructed to focus on key features of blended learning implemented in the program, including the new format of learning materials, the online learning environment, assessment structure, program content, views on blended learning and learner support. The findings are presented below with respect to the emergence of themes related to patterns in student demographics, student experiences of online components of the program and student views of blended learning.

Findings

The preliminary data analysis highlighted a number of key differences in student experiences within the whole program cohort which segmented the cohort into three groups based on the mode of enrolment: Internal (main campus, hereafter MC), Internal (regional campus, RC) and External (EE). In short, members of each of the three cohorts had seemingly very different experiences of blended learning within the same program. Selected findings are presented below (Table 1) including demographic features, student experience with online elements of the program and student views on blended learning. For the survey, the total number of students in the program was 178, with 46 survey responses recorded for a response rate of just under 26%. Notably, many of the comparisons made below are within each cohort, which included 20 in the MC, 14 in RC and 12 in EE. Percentages in Table 1 are expressed as a percentage of students in that cohort for each response.

Demographic differences

One unanticipated finding in the formative evaluation was the difference in the ages and educational background of students from the three cohorts. The MC group tended to be school leavers with 75% of that group in the 18-20 year old category and 60% of them attending university immediately after secondary school or a gap year. The RC group were split mainly between two groups: 20-25 year old group (38.5%) and an over 35 group (30.8%) and had either had time off before university study (35.7%) or completed bridging study after not completing secondary school (21.4%). The EE group was clearly older with 58.3% over 35 years of age and 54.5% having time off between secondary school.

Experiences of online components

The three groups were also divided on their experiences with online learning as part of blended learning in the program. Table one below summarises the results of student experiences with online learning against a four-point Likert scale of agreement including 'strongly agree', 'agree', 'weakly agree' and 'disagree'.

There were clear differences between the cohorts in terms of whether they felt comfortable studying online. Students in the MC and EE groups reported being generally comfortable learning online. In response to the statement 'I feel comfortable learning online', 80% of the MC group agreed and 83.4% of the EE group agreed or strongly agreed. In the RC group, 37.5% disagreed and 37.5% only weakly agreed. Online interaction was also seen to have different values to the different cohorts. While 75% of the EE group agreed or strongly agreed that online interaction was a useful way to work with others in the program, over half of the MC (75%) and RC (64.3%) had weak agreement or disagreed with the statement. A greater number of the EE (50%) and MC (50%) groups agreed or strongly agreed that communication was easy in the online environment, while over half of the RC group weakly agreed or disagreed with that statement. Further, there were questions from all groups about whether sharing and discussion in the online environment works well. In terms of specific learning activity, 100% of the EE group agreed that online learning promotes critical and creative thinking while 57.1% and 21.1% of the RC and MC groups, respectively, disagreed with that statement.

Student views on blended learning

Overall, there were mixed views of the value of online learning and, separately, blended learning. While 70% of the MC group and 75% of the EE group agreed or strongly agreed that the online environment helped them succeed, 38.5% of the RC group only weakly agreed and 30/8% disagreed with that statement. While there was strong support for blended learning in the EE group (91.7% agreed or strongly agreed) and moderate support in the MC (73.7% agreed) group, over 70% of the RC group either weakly agreed or disagreed with the notion that blended learning had enriched their learning in the program.

Table 2- Student experiences with online learning in the program

		MC	RC	EE
I feel comfortable learning online	Disagree	10.0% (2)	35.7% (5)	0.0% (0)
	Weakly Agree	10.0% (2)	35.7% (5)	16.7% (2)
	Agree	80.0% (16)	21.4% (3)	41.7% (5)
	Strongly Agree	0.0% (0)	7.1% (1)	41.7% (5)
The online environment helps me succeed in the program	Disagree	10.0% (2)	30.8% (4)	0.0% (0)
	Weakly Agree	20.0% (4)	38.5% (5)	25.0% (3)
	Agree	65.0% (13)	30.8% (4)	50.0% (6)
	Strongly Agree	5.0% (1)	0.0% (0)	25.0% (3)

Communication is easy in the online environment	Disagree	0.0% (0)	28.6% (4)	16.7% (2)
	Weakly Agree	50.0% (10)	35.7% (5)	33.3% (4)
	Agree	40.0% (8)	35.7% (5)	50.0% (6)
	Strongly Agree	10.0% (2)	0.0% (0)	0.0% (0)
Online interaction is a useful way for me to work with others in the program	Disagree	25.0% (5)	42.9% (6)	0.0% (0)
	Weakly Agree	50.0% (10)	21.4% (3)	25.0% (3)
	Agree	25.0% (5)	35.7% (5)	41.7% (5)
	Strongly Agree	0.0% (0)	0.0% (0)	33.3% (4)
The online learning environment makes me feel that I'm part of a community	Disagree	20.0% (4)	42.9% (6)	0.0% (0)
	Weakly Agree	45.0% (9)	28.6% (4)	33.3% (4)
	Agree	35.0% (7)	28.6% (4)	50.0% (6)
	Strongly Agree	0.0% (0)	0.0% (0)	16.7% (2)
Online learning promotes critical and creative thinking	Disagree	21.1% (4)	57.1% (8)	0.0% (0)
	Weakly Agree	42.1% (8)	21.4% (5)	0.0% (0)
	Agree	36.8% (13)	21.4% (5)	75.0% (9)
	Strongly Agree	0.0% (0)	0.0% (0)	25.0% (3)
Sharing and discussion in the online environment works well	Disagree	15.8% (3)	50.0% (7)	16.7% (2)
	Weakly Agree	36.8% (13)	35.7% (5)	50.0% (6)
	Agree	31.6% (6)	7.1% (1)	25.0% (3)
	Strongly Agree	15.8% (3)	7.1% (1)	8.3% (1)
The online environment promotes interpersonal connection	Disagree	22.2% (4)	42.9% (6)	16.7% (2)
	Weakly Agree	38.9% (7)	35.7% (5)	58.3% (7)
	Agree	38.9% (7)	21.4% (3)	16.7% (2)
	Strongly Agree	0.0% (0)	0.0% (0)	8.3% (1)
Blended learning has enriched my learning	Disagree	10.5% (2)	35.7% (5)	0.0% (0)
	Weakly Agree	15.8% (3)	35.7% (5)	8.3% (1)
	Agree	73.7% (14)	7.1% (1)	75.0% (9)
	Strongly Agree	0.0% (0)	7.1% (1)	16.7% (2)

Discussion

First and foremost, the data in Table 1 shows notable differences in the quality of student experiences experienced by the three cohorts. These are perhaps unsurprising due to the practicalities of the three forms of blended learning which emerged from the development process. Differences in the structuring of (e.g., the combination of face-to-face and online activity) and support for (e.g., in-person teaching staff vs. online teaching staff vs. peer support in the online community) learner activity between the three cohorts might be expected to produce different experiences (Ellis, Goodyear, Prosser, & O'Hara, 2006; Garrison & Kanuka, 2004). However, given that one of the aims of the program redevelopment was to redress perceived differences (i.e. inequities) between the experiences of students in the former version of the program, the finding that student experiences can be divided according to the location of the students and the associated blend they experience within the program is troubling. Further, it suggests that the re-development has been, to some degree, unsuccessful in improving equitable access to and experience within the program.

Notably, the survey results also highlighted previously unrealized demographic differences between the three cohorts which the authors are using to help give meaning to the differences in their experiences. For example, the MC group was the youngest group and the one most recently experienced with education in schools. This may have provided them with different experiences and expectations of the use of technology in the blended learning within this program. The RC group seemed to be older and (presumably) had more life experience than the MC group, but perhaps also had less recent experience with success in formal education. This could indicate different experiences and expectations for the use of technology than the MC group. Moreover, the fact that they had chosen to study on campus at a regional site lends some insights into their needs and expectations for in-person face-to-face contact and may help explain their negative experiences with and views of online and blended learning or the relative utility value they placed on the use of technology in the program (Christensen, Anakwe, & Kessler, 2001). The EE group was the 'oldest' group and this may imply more life experience than the other groups. Although the survey did not canvass their motives for external study, their choice to study externally was likely made in light of other demands in their personal lives. Presumably, this affected their expectations of interpersonal interaction and face-to-face activity, perhaps making them more accepting of online or blended delivery with (relatively) higher amounts of online interaction (Dabbagh, 2007). These factors and the resulting effects on student needs, expectations and experience underscores the need for a thorough front-end analysis for development projects such as this in order to inform practical decision making as part of the design and development process (Gagne, Briggs, & Wager, 1992).

In general, the results from the student survey suggest that students in the MC and EE groups are generally, albeit not universally, having positive experiences with blended learning in the program. However, in the RC cohort, the results are mixed and suggest a more generally negative experience, particularly with respect to *overall comfort with online learning*, *ease of use of the online environment*, *perceived value of online interaction* and *perceived benefit from blended learning*. These results indicate some degree of dissatisfaction with blended learning amongst students in the RC group.

Looking forward

The survey results raise a number of questions about the nature of the reported differences between the cohorts' experiences of blended learning in the program. In particular:

- *What expectations of blended learning did learners in each of the cohorts bring to the program? How have those expectations been met (or not met)?*
- *How are the expectations of teaching staff different across the blends experience by each cohort? How might this affect student activity and experience?*
- *How are the needs of learners related to the groupings suggested by the three cohorts? Are members of one cohort more (or less) prepared for online learning? What demographic features shape those needs? How can those needs best be addressed in future versions of the program?*
- *Do the differences in reported experiences indicate issues of equity within the program, across the three suggested cohorts? Do students have equitable access to teaching staff, feedback, support, learning materials and other key elements of the program?*
- *What are the differences in activity (as opposed to experience) across the three cohorts?*
- *What factors within the university's control (e.g. program orientation, division of labour amongst teaching staff, production of learning materials) are producing differences in the learners' experiences?*
- *Are the differences in student experience producing differences in student performance?*

These questions and the issues which underpin them were included in the later phases of data collection for the formative evaluation process within the program. At the time of writing those analyses were not yet finalized and will be reported at a later date.

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Wins and hurdles: The ups and downs in providing professional development in elearning

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Strategically aligning staff development to facilitate exploration and innovation in the application of learning technologies is a complex balancing act that integrates the influences of technological change, shifting institutional priorities and conditions, and uneven uptake among staff.

In this paper we focus on (one aspect of) a multi pronged staff development strategy in a university context. As an evidence base, we draw on staff participation and evaluation data for an 18 month period to explore some of the factors that have contributed to how the professional development (PD) program has evolved in response to local conditions while deploying good practice guidelines. Quantitative and qualitative data from staff surveys are analysed to determine the impact and effectiveness of the program and to explore the factors that have influenced the evolution of the program.

Keywords: elearning, professional development, training.

Introduction

Leadership development that contributes to the advancement of teaching and learning is the overarching goal of professional development (PD) within higher education. The many subsets, including elearning development that feed into this goal, demonstrate the complexity that characterises this area. The ways in which PD is delivered and the evaluation of its effectiveness is driven by the specific purposes within local environments. Of relevance to the present work are three purposes of PD, namely orienting new staff to the academic culture embedded in the institution's elearning portfolio, developing discrete skills to deploy learning technologies appropriately, and professionalising eteaching by developing good practice. In this paper we discuss an elearning PD program at a West Australian university and analyse the findings from our evaluation.

Background

Curtin has been providing distance education courses for more than 40 years and has been offering online programs since 1998. Until 2007, responsibility for professional development was split between the administrators of the learning management systems, who focused on effective use of the technology, and the Office of Teaching and Learning whose primary focus was on the PD of academic staff conducting face-to-face teaching.

The Centre for eLearning was established in 2007 and it brought together business management of learning technologies as well as instructional design and e-learning. At the same time Curtin began moving from five learning management systems to a single system for the whole university. The decision to migrate three of the four Faculties from WebCT to Blackboard meant that the Centre needed to develop a PD program that facilitated the migration process, addressed the rapid expansion of units being offered online through Curtin and Open Universities Australia (OUA) and introduced teaching staff to online communication and collaboration strategies to engage students.

Commencing in 2009 the PD program included:

- A weekly program of eight short workshops that covered the key teaching and administrative functions of Blackboard;
- A module on e-learning in Curtin's Foundations of Learning and Teaching program;
- The development of a comprehensive website that included tip sheets and videos on all aspects of online teaching and learning; and
- Regular newsletters to staff on effective use of learning technologies.

In 2010 this was supplemented by regularly scheduled drop in sessions using Elluminate *Live!* virtual classroom and additional workshops on Campus Pack blogs, wikis, journals and podcasts which focused primarily on teaching strategies afforded by the social media technologies.

Whilst the provision of PD is addressed using multiple strategies, workshops are widely considered as offering a cost effective approach (Doherty, 2011; Prebble, et al. 2004; Timperley, Wilson, Barrar, & Fung, 2007). Workshops are also an effective means for creating staff awareness of new technologies and for facilitating change in teaching practices in blended environments (Sharpe, Benfield, & Francis, 2006), hence the workshop program has been adopted as the Centre's primary elearning PD strategy.

The elearning professional development workshop program

Over an 18 month period, 226 workshops generated a total attendance of 1139 **(**consisting of 658 individual staff members, many of whom attended multiple workshops). Eight workshops were offered weekly throughout the semester and these were promoted via global email to staff, on the Centre's website http://cel.curtin.edu.au/professional_development/ and via a Twitter account. An online registration system enabled staff to schedule and book workshops. Two staff members facilitated every workshop, one leading the session and the other assisting, interacting and problem solving. Twelve or more topics were addressed within each workshop program, covering standard Blackboard training as well as additional topics focused on new learning technologies, technology upgrades, strategic projects, and special requests from schools and departments. All instructors (6 eLearning Advisors and two LMS managers) contributed to the development of the workshop programs and additional training resources are made accessible via the website. Standardised Blackboard training units (and accounts) are created for workshop participants to login to and practice without fear of making mistakes or deleting real documents from their own Blackboard units.

Methods

The approach adopted was driven by our aims to provide an effective ongoing PD workshop program based on good practice principles; and to be responsive to immediate and future needs of staff. To achieve these aims we adopted a design based research approach which allowed us the scope to explore how aspects of our educational design impacted on participants' learning experiences in the workshop setting through a cyclical development process, coherent implementation strategies, followed by a systematic evaluation process (Reeves, 2006; Herrington, Reeves, & Oliver, 2010).

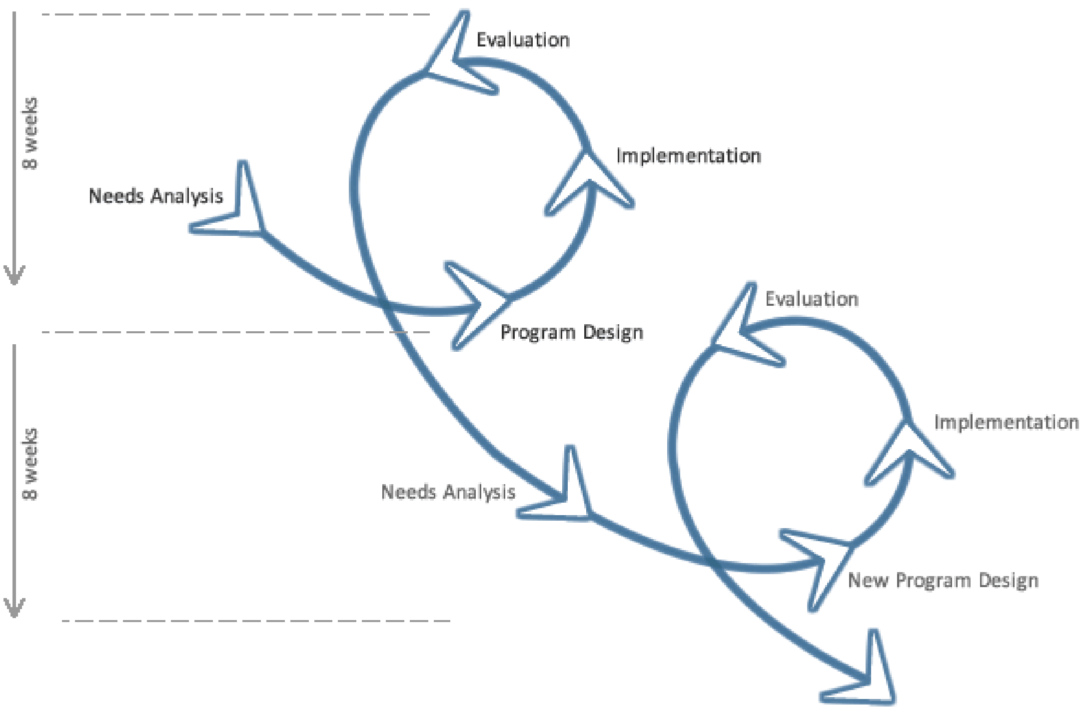

Figure 1: The design based research process applied during the development of this program

The data collection occurred over an 18 month period (2010 / 2011). A pre-course needs analysis was conducted to guide workshop planning and development. This online survey included fixed alternative type questions to elicit staff feedback on best times to run PD, how long the sessions should be, and the topics that staff thought would be most useful. An open ended question was incorporated to elicit additional information about specific needs and areas of interest. The data received informed initial program development.

A post-course evaluation was implemented at the end of each semester. The survey questionnaire consisted of nine items. In line with the principles of design based research methodology, the post-workshop evaluation survey was slightly modified in the second evaluation cycle as we wanted to update our workshop offerings and gather feedback on new sessions that staff would be interested in. In addition to the online survey, we also sought direction through reflective knowledge. As a collective, we reflected *in* action and *on* action (Gibbs, 1988; Schon, 1987), making mental notes of what worked and what didn't within particular workshops. This information was captured during PD planning meetings held at the conclusion of each cycle of workshops.

In this paper we report on the results of our overall evaluation and analyse the data in terms of the gains and hurdles that have impacted upon the elearning PD workshops, and consider possible implications for future work. This is done within a broader framework of good practice principles reflected in current literature.

Good practice principles

There is an abundance of literature on effective staff professional development practices, focused on both generic and context specific settings and strategies. Essentially five areas were targeted, namely development of elearning pedagogy; technological awareness and skills; accessibility, collective and active participation; and coherence (perceptions of usefulness, capacity to address immediate needs, types of activities, duration of the sessions, and available support).

Within an elearning PD context, it is critical to develop participants' understanding of how to teach online. Desimone (2009), Alexander (2001), and Garet, Porter, Desimone and Birman (2001), found that a dual focus on subject content knowledge and pedagogical knowledge has a significant positive impact on teachers' self-reported increases in knowledge and skills and changes in classroom practice. Rourke et al. (1999) and Doherty, Blake and Cooper (2009) give further strength to the importance of establishing cognitive and teaching presence within elearning environments. Blank, de las Alas, and Smith (2007) add that PD content should specifically address identified weaknesses or needs of staff.

Technological awareness and skills among staff is imperative for effective elearning implementation, continuing development and ongoing management. Alexander (2001) and Wayne, Yoon, Zhu, Cronen and Garet (2008) emphasise the importance of recognising and appropriately addressing the level of participants' technological skills including the need to promote new ideas about using educational technologies appropriately. Alexander cautions that teachers' conceptions of learning strongly influences course planning, teaching strategies and what students learn, and PD initiatives should address this. Thus, a balance between technological and pedagogical skills is advocated.

Enhancing the accessibility of professional development opportunities is a critical component in facilitating development within local settings. Garet et al. (2009), and Desimone (2009), suggest that the type and duration of PD activities affect teacher learning. Well resourced, activity driven authentic learning sessions, that require a realistic time investment by increasingly time poor academic staff offers a viable solution.

Collective and active participation strengthens motivation and authentic engagement in a learning environment, as such workshops are likely to promote collegial support as well. Along these lines, several writers have shown that facilitation of learning communities can act as levers for elearning development with regard to knowledge, skills and classroom practice (Desimone, 2009; Garet et al., 2009; Sharpe, Benfield and Francis; 2006). Desimone et al. (2002) noted that giving participants opportunities to talk, think, try out and hone new practices facilitate increases in knowledge and skills, and changes in teaching practices, which includes encouraging participants to voice their opinions and challenge their beliefs about elearning (Richardson, 2003; Sharpe, et al.).

The coherence of a PD program relates to how the program goals and its implementation are aligned with the identified and evolving needs of staff within a dynamic environment. Blank, de las Alas, and Smith (2007) suggested that PD should be relevant to the day-to-day teaching and learning operations and university policies to achieve improvements and sustainable teaching practices (Grant, Peterson, & Shojgren-Downer, 1996). Experiential aspects significantly influence participants knowledge and skills development and their use of the relevant tools (Desimone, 2009; Garet et al., 2009; Penuel, Fishman, Yamaguchi and Gallagher, 2007). Multiple factors contribute to the experiential component of PD, including collegiality (Richardson, 2003), social presence (Doherty, 2011; Rourke et al., 1999), type of activity and duration of the activity (Desimone, Garet et al.), and the capacity to meet immediate needs (Rourke et al.). Support and follow up activities are crucial to promote deeper understanding and extend practice of newly learned skills (Garet et al.; Richardson).

The ideas discussed in this section provided a pedagogical foundation for the workshops.

Results

The post workshop evaluation results provided data on attendance, participants' satisfaction rating of workshops attended, overall coherence of workshops attended, time preferences, topics of interest for future workshops, and suggestions for improvements. We received a response rate of 12.31% (n = 81), which provides a snapshot of attitudes and needs, but the limited sample size requires a cautious approach to interpreting the data and generalising findings to the population as a whole. Although workshops were offered regularly during semester, the collection of staff feedback only occurred at the end of each semester, usually when many staff were on leave. A possible factor contributing to the less than satisfactory response rate is the time delay between workshop attendance and implementation of the survey. In addition, the 'over surveying' of university staff is discouraged and many staff are in fact reluctant to complete **any** survey. Again, the hurdle of academic workload possibly impacted on both attendance at the workshops and the provision of feedback regarding the workshops.

Over the 18 month period 226 workshops were attended by 658 individual staff, although the total attendance was 1139 as many staff attended more than one workshop. This figure (658) represents 18% of the total Curtin staff population of 3500 (Curtin Annual Report, 2010), keeping in mind that not all staff have a teaching responsibility and so workshops in these areas would hold no interest for them. On average 75% of bookings resulted in actual attendance. Attendance data suggests that whilst reach was reasonably good, participation in the evaluation process was less satisfactory.

An interesting finding was that in 2010, 17% of workshop attendees were from the general staff pool, as opposed to academic or teaching staff. In 2011, this number increased to 24%. The demographics of these general staff members indicate an increased uptake in training by many support areas, such as Student Support, the Library and Careers Office. The application of elearning and web 2.0 technologies is no longer restricted to the academic domain; with many general staff members finding innovative ways to incorporate these tools and techniques into their non-academic roles.

Five of the ten workshops offered attracted the most attendance. The workshops with higher attendance, as shown in Figure 2, were offered more frequently in order to address staff needs.

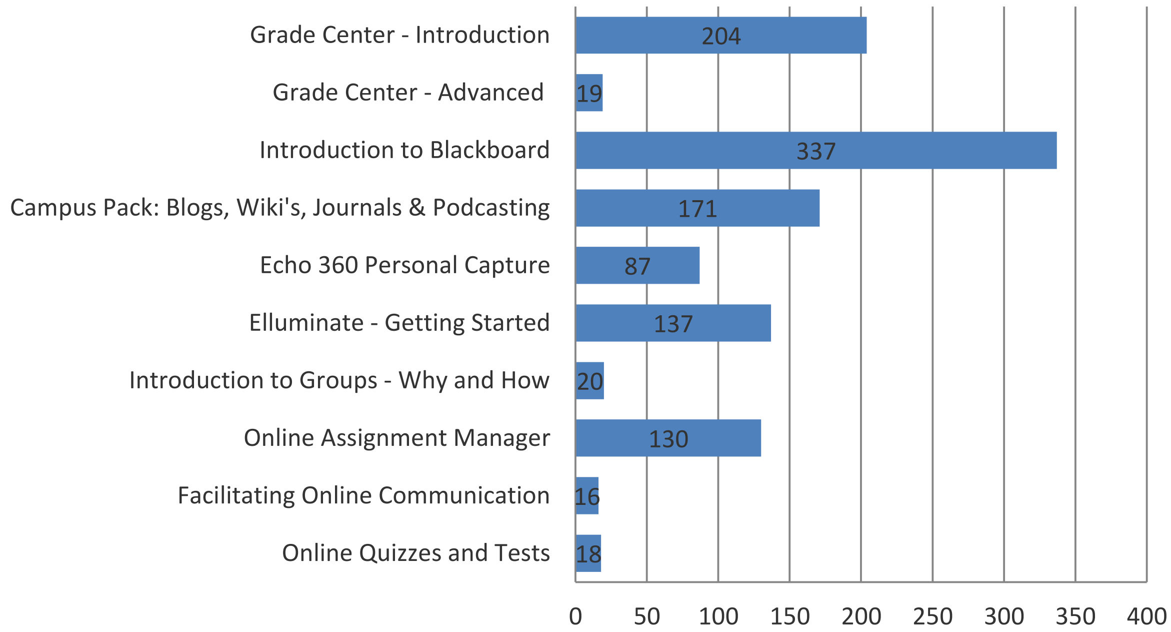

Figure 2: Number of attendees for individual workshops (n = 1139).

Respondents indicated high levels of satisfaction with all workshops that were offered, as shown in Figure 3. Favourable levels of satisfaction were found with ratings in the good/ very good range falling between 50-100%. Contrastingly, a small number of respondents rated three workshops as poor/ very poor; this rating was limited to 0 - 7% of the overall satisfaction for the relevant workshops. An 'average' rating was returned by some respondents for all but one workshop; this number varied between 5-50%.

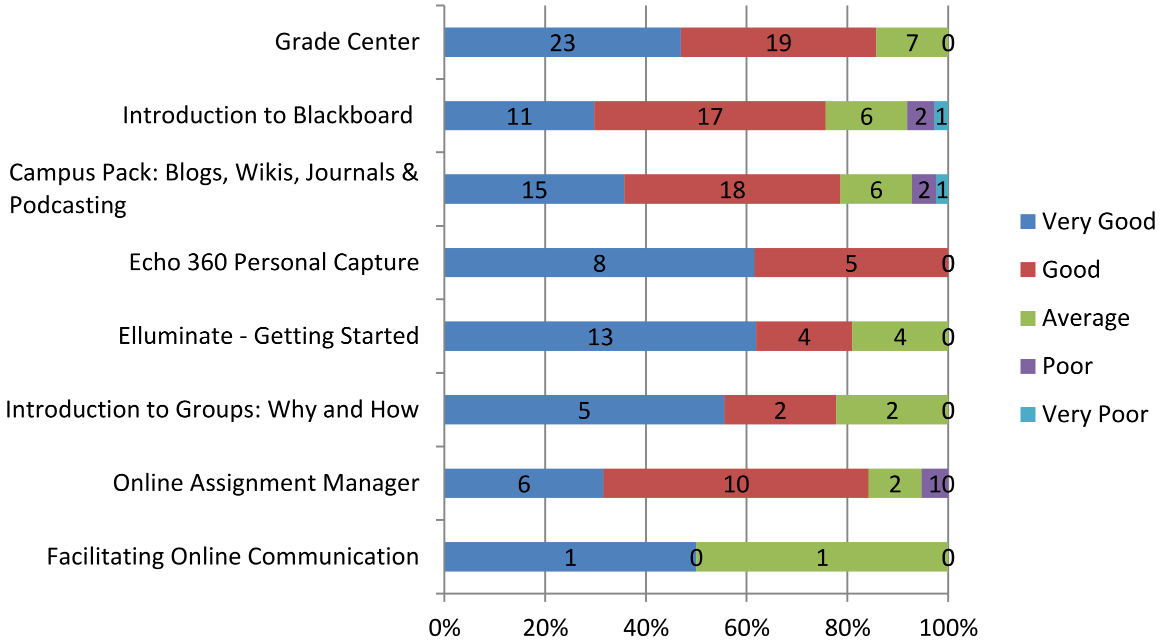

Figure 3: Satisfaction level with workshops attended.

To assess staff satisfaction with the level of support provided within the workshops two questions addressed whether participant questions were answered and needs were met. Ninety percent of respondents agreed / strongly agreed with these statements, suggesting that their learning was supported in the workshops. Five –ten percent of respondents submitted a response of disagree /strongly disagree, while 5-10% returned a neutral response.

Similarly, staff perception about the incorporation of elearning pedagogy was very favourable. Seventy eight percent of respondents agreed / strongly agreed that the educational benefits of the technology were explained. Two percent of respondents submitted a disagree response while 10% returned a neutral response. No strongly disagree responses were recorded.

Workshop coherence was evaluated in terms of two indicators - pace and structure, both of which yielded very positive results as shown in Figure 4. Between 78-80% of respondents agreed or strongly agreed that the pace and structure of the workshops they attended was appropriate for them. Respondents that disagreed or strongly disagreed on these indicators of workshop coherence again was limited to below 10%, with between 8-12% returning a neutral response.

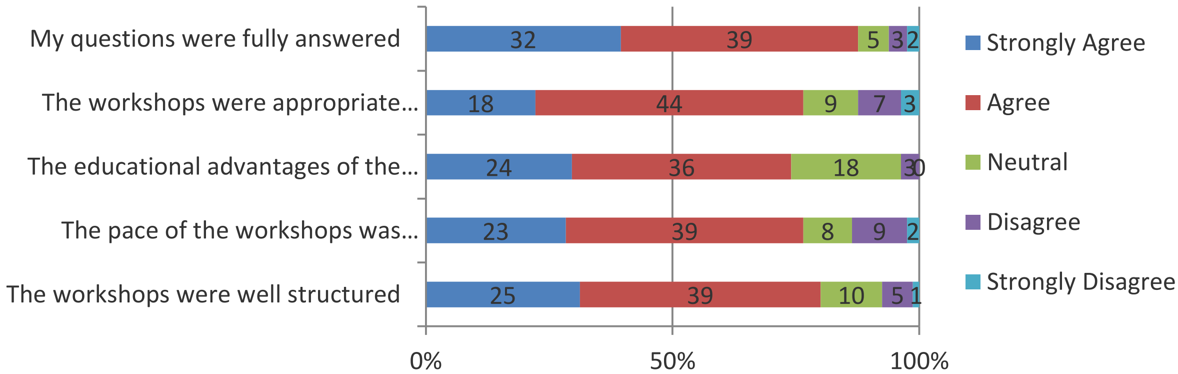

Figure 4: Satisfaction with support, epedagogy and coherence

Exploration of preferred times for workshops produced highly varied responses as shown in Figure 5. Sixty seven percent of respondents indicated a preference to attend workshops prior to the start of semester, during tuition free weeks, or during the semester breaks. However, given the spread of responses, no clear preferences could be determined other than scheduling in non-teaching periods.

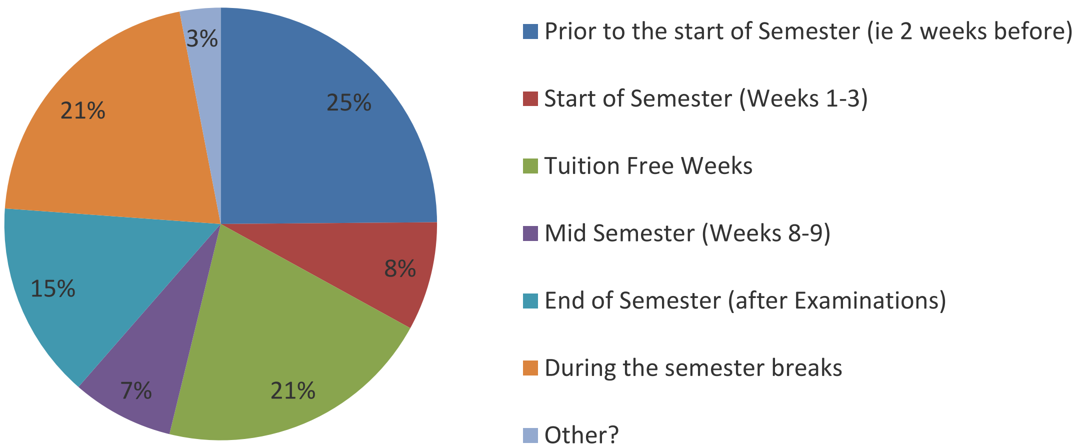

Figure 5: Preferred times for workshops

To guide future planning respondents were asked which workshops they were most interested in attending. Six new topics (highlighted in green) were added to the original offerings; the responses are presented in Figure 6. Apart from obvious interest in 'Quizzes and Tests', 'Grade Center Advanced', Elluminate (Getting Started)', and 'Campus Pack (Podcasting)' no prominent areas of interest were identified.

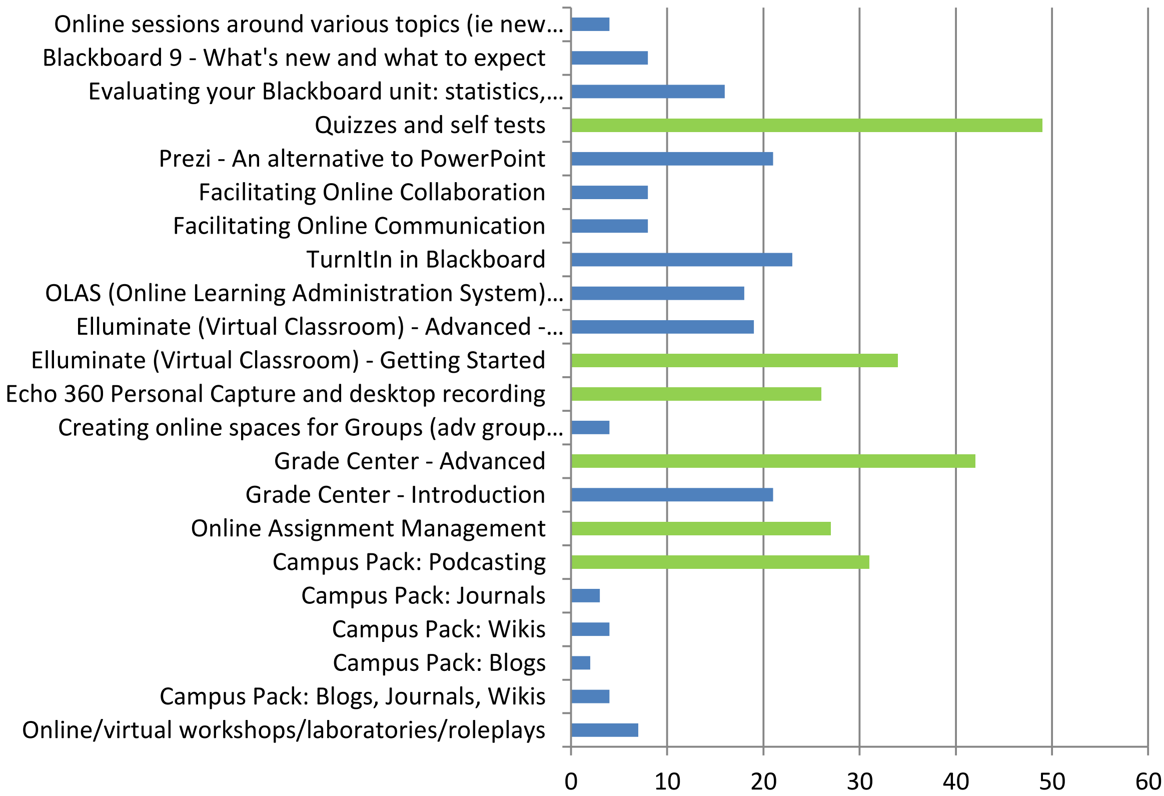

Figure 6: Topics of interest for future workshops

Further suggestions were invited through an open ended question. Nine respondents supplied feedback that pointed to their interest in being introduced to a wider range of tools (e.g. video editing), receiving training to optimize their use of advanced functionality within Blackboard (Assignment Manager, Grade Center, Group Management) and training to enhance their use of the Microsoft Office suite and the Curtin iPortfolio system. An interesting thread that was present in several responses was the request to guide staff in developing effective epedagogy practices and facilitate their adoption of innovative elearning strategies.

Discussion

The results show that the expanded PD workshop program has positively generated interest and participation resulting in 18% of all staff having attended these centrally offered workshops. We consider this a good outcome given that many staff also access elearning support available within faculties and schools. However, there remains an ongoing challenge to increase workshop attendance, particularly among new staff and those entering elearning. A further issue is the uneven attendance pattern across offerings. Predictably, the workshops focused on basic LMS functionality are very well attended whereas those focused on more advanced aspects are less so. This pattern is also true for elearning development across the institution, and remains a strategic challenge for those responsible for PD. Whilst managing the issue of non attendance (following a booking) is not a high priority at this stage, it is an area to be considered in the near future since much effort is put into tailoring workshops to meet the anticipated needs of those who have enrolled, which has implications for efficient workload management.

The high levels of overall satisfaction and satisfaction with pace and structure are acknowledged gains in terms of our learning design and delivery style as well as the contribution to bring about strategic shifts in how staff conceptualise elearning. Given the diversity of the attendee cohort (e.g. large number of sessionals, an increasing number of general staff, and a combination of experienced elearning practitioners and novices), designing workshops that cater to individual needs is an issue that has to be negotiated within each workshop, which is often exacerbated within the confines of the standard one hour duration within which we integrate instruction in epedagogy, active learning using technology, and participant dialogue (teaching presence, cognitive presence, and social presence). Having two facilitators (one leading and the other supporting and assisting) mitigates these issues significantly. However, whilst the diversity, group dynamics and approach to PD facilitation adopted are positive aspects (wins), the timeframe is sometimes a constraining factor and can be a double edged sword (a hurdle). The one hour duration for workshops is suited to staff availability but often means that workshop aims need to be narrowly focused posing a challenge to embrace good practice guidelines of creating scope to build deeper understanding accompanied by opportunities for hands on practice (Garet et al., 2009; Rourke, et al., 2009). Despite this perceived challenge staff felt highly supported within the PD environment and that their individual needs were met.

Whilst 171 staff participated in the 'Campus Pack' workshops, the individual workshops averaged less than 50% attendance. More than 300 units have implemented Campus Pack blogs and/or wikis and they are being used primarily in units with high student enrolment. Workshop attendees have therefore been focussed on issues associated with implementing the tools rather than the learning activities afforded by the tools. This aligns with our statistics that show non-basic workshops have lower attendance rates.

The development, implementation, and review processes have been invaluable in identifying areas for ongoing improvement and have enabled a short cycle of change, which has ensured that our PD offerings are responsive to identified needs and emergent issues as they arise. The latter is particularly important within an organisational climate where technology upgrades are frequent. An associated challenge is the need to manage collaborative and cooperative relationships with multiple teams including the technical support team on campus and support staff at Blackboard, Campus Pack and Elluminate. All upgrades result in up skilling workshop staff, redevelopment of training materials and updating workshops, which also means that future proofing workshops is an ongoing balancing act to ensure resources and materials reflect most recent upgrades.

Scheduling of workshops is a challenging area as it is increasingly difficult to identify a common period that is suitable to most staff. This is related to the high proportion of staff not actually based on campus, staff not being remunerated for attending elearning PD, and the simultaneous scheduling of multiple study periods which now means that there is no period during the year when units are not being taught. In light of these hurdles, our approach is to schedule an intensive workshop program in the weeks prior to and at the start of semester, and to continue to offer a reduced number of workshops during the semester; this appears to be working satisfactorily so far.

In terms of coordinating future planning to complement staff interests / needs on the one hand and institution wide directions in integrating new learning technologies on the other hand, the results were encouraging as staff interest is reasonably well anticipated. In contrast to this gain, a related hurdle is the implementation of an Academic Workload Management System in 2011 which appears to constrain opportunities for PD. Further hurdles include the size of our teaching lab, which only accommodates 10 staff, and University strategic priorities which can change without notice.

Implications for practice

This study has raised several implications for elearning PD practitioners that are specific to both the local setting and beyond. For instance, it has demonstrated the value of developing an elearning PD program based upon recognised and differentiated staff needs and to consider the most effective ways to schedule, coordinate and track participation, for efficient deployment of limited resources through sustainable practices.

A further implication relates to elearning PD for accreditation. In most institutions some form of mandatory staff development process is in place for new staff to gain an orientation to teaching and learning policies and practices, as is the case in the local setting. Contrastingly, it is expected that new staff will voluntarily participate in the elearning PD workshop program, despite the fact that many of them are employed exclusively to teach fully online. In this and other environments an absence of mandatory elearning PD may be the result of "domesticating tendencies of PD agendas" (Land, 2001, as cited in Southwell & Morgan, 2009, p. 8), which can be seen as an attempt to align PD to the specific and immediate needs of the institution for quality assurance purposes, as opposed to a more generic goal of advancing elearning practices. This is a strategic elearning issue and deserves further attention by policy makers.

There is also the need to pursue a more comprehensive evaluation process to assess our PD activities as it has often been reported that there is little correlation between staff reactions (e.g., enjoyment, satisfaction, usefulness, responsiveness to current needs) their learning, and changes to practice. But, whilst recognizing the need for comprehensive evaluation we are simultaneously mindful of Guskey's (1999) cautionary advice that "it is nearly impossible to obtain proof of the impact of professional development activities, but it is possible to obtain good evidence" (as cited in Southwell & Morgan, 2009, p. 8). Past research in this area does provide some significant directions for our future work, for instance, we are likely to explore content characteristics, process variables, and context characteristics, as well as organisational support and change, participants' use of new knowledge and skills and the related impacts on student learning outcomes. However, whilst striving to produce more comprehensive evaluation, we will be guided by the following advice from Nickols' (2000):

> There is no "cookbook" approach to the evaluation of training. To properly evaluate training requires one to think through the purposes of training, the purposes of evaluation, the audiences for the results of the evaluation, the points at which . . . measurements will be taken, the time perspective to be employed, and the overall framework to be utilised. (as cited in Southwell & Morgan, 2009, p. 8)

Conclusion

In administering the strategic elearning focus from the position of a centralised unit, optimization of further opportunities to align the general PD workshop program with the devolved elearning support available to staff within faculties and schools is necessary to generate targeted interest across particular cohorts (sessionals, novices, and mid-career elearning practitioners). This is likely to enhance participation and potentially generate a more even spread in elearning development across the institution.

Our analysis and discussion has revealed the complexities and uncertainties associated with the provision of elearning PD within a university environment. This we hope is a useful reminder of the complexity of factors that condition the effectiveness of elearning PD, within organisational contexts characterised by a constantly evolving learning technologies landscape, the challenge PD practitioners face to constantly refresh their knowledge of the technologies and update their resources, meet the needs of staff within a diverse and dynamic environment, and conduct comprehensive evaluation of PD activities to guide and enhance future initiatives.

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Understanding the reasons academics use – and don't use – endorsed and unendorsed learning technologies

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Educational researchers have a longstanding interest in the reasons why academic staff use technologies in their teaching. The investigation presented in this paper considered drivers and barriers to the use of technology in a higher education context where it is increasingly possible for academics to not only rely on endorsed, university-based systems and tools, but also on unendorsed tools available 'outside' the university. The findings from this study showed that most staff were using a relatively standard, endorsed technology tool-set and, in most cases, there was limited use of external or emerging technologies and tools in learning and teaching. Five clear profiles of academic staff were established that represented diverse motivations for using or not using technologies in teaching. The implications of the results of this study are discussed in terms of staff training, support and professional development.

Keywords: Technology Adoption, Drivers, Technology Use, Academic Development

Background

Drivers of Technology Use in Higher Education

While the type and range of technologies adopted by universities and their staff have changed over the years, there has been sustained interest in what drives both institutional and individual adoption and use of technologies in teaching and learning. As Snyder, Marginson and Lewis (2007) see it, the educational promise of information and communications technologies in University settings will only be realised if the ‘planets align’. And given the number of planets, satellites and pieces of space junk orbiting within institutional solar systems, this can be a complex space to analyse and understand.

Regardless, researchers have investigated and developed frameworks to account for the drivers and constraints associated with technology use in higher education. For example, in 2003 Shannon and Doube conducted an investigation of staff use of the University of Adelaide’s Learning Management System (LMS) (see Shannon & Doube, 2003a; 2003b; 2004). As part of this work, Shannon and Doube (2003a) provide a useful review of the reasons why technology is or is not used across different educational sectors. They summarise the key issues that impact on the uptake of technology as (paraphrased):

- workload and time
- knowledge and skills
- staff development and training
- tools and infrastructure
- recognition and rewards
- conceptions of teaching and learning, including concern about the value of technology, definitions of academic work in relation to teaching, and the quality of learning and other student outcomes; and
- institutional support.

Reporting from their own research study, Shannon and Doube (2004) identified a number of factors that constrained the use of technology or ‘web-supported teaching’ including, “time and workload pressures, concerns about knowledge and skills, conceptions of teaching and the value of web supported learning for improving student outcomes, and the perceived stability and integration of the University infrastructure and learning management system” (p. 114).

More recently, Birch and Burnett (2009) developed a framework for conceptualizing the factors that influence academics’ adoption and integration of technology in the context of distance education environments. The framework proposes that an interplay between institutional, individual and pedagogical factors accounts for academics’ adoption of technology in their courses. In their review they identify a range of factors, within each of these domains that correspond broadly to those of Shannon and Doube (2003a). For example, institutional constraints to technology adoption include lack of clear leadership and support and inadequate infrastructure; in the individual domain constraints include lack of time, negative attitudes from academics about the benefits of technology and the lack of reward for innovation. Finally in the pedagogical domain Birch and Burnett (2009) identified facilitators of technology use such as the perception that elearning environments can accommodate different learners’ needs, and can make learning more student-centred and independent.

In the international context Blin and Munro (2008) undertook an analysis of lecturers’ use of the *Moodle* learning management systems using an activity theory lens. Among their findings, Blin and Munro (2008) reported that dominant reasons why staff chose not to use features of *Moodle* in their teaching were perceived lack of relevance to their “course, subject or practice” (p. 487) and lack of familiarity or knowledge about the advanced features that were available to them. Lack of time was again raised as a concern for many staff – time to familiarise themselves with both the technical functionality of the system as well as how to best exploit it educationally.

A number of other researchers have considered barriers to and facilitators of technology adoption and use in higher education and, somewhat tangentially, why educational technology has failed to reach its transformational promise (see for example, Johnston & McCormack, 1996; Georgina & Olson, 2008; Giardina, 2010; Hannon, 2009; Selwyn, 2007; Nicolle & Lou, 2008; Goodyear, 1998; Kirkup & Kirkwood, 2005). From these reviews it can be seen that, regardless of the era, the technology, or the mode of learning under consideration, previous research has identified various institutional and individually-based factors that impact on why academic staff choose to, or not to, adopt technology in their teaching and learning. What is less as clear from the literature is how these various drivers or inhibitors of technology use are represented across the teaching staff of a particular university. That is, in any given context are the drivers and constraints equally weighted for individuals or do they vary, and if so, is this variation systematic. This is, in part, the focus of this paper.

Endorsed and Unendorsed Learning Technology Use

One of the shifts we have seen in the last five to ten years in higher education is the move to a shared model of learning technology provision. By this we mean that where once the provision of technology for the university's teaching, learning and assessment, and the management and administration of these activities, fell squarely within the domain of the university itself, in more recent times we have seen universities more prepared to explore alternative models for IT sourcing. This has included shifting a greater proportion of service provision from internally to externally hosted options (Goldstein, 2009; Katz, Goldstein & Yanosky, 2009), with an underlying business model of acquiring greater flexibility in purchasing IT capacity as it is required, and funding this from operational rather than capital budget allocations (Goldstein, 2010). For example, where once universities would provide staff and students with a dedicated university email service, internally hosted, to facilitate communication among and between staff and students, more recently we have seen a number of universities moving their email services to external providers such as Google Apps and Microsoft Live@edu (for overviews of the Australian, US and Canadian contexts see Bolt, Fitzgerald and Jessen (2010), Bristow, Dodds, Northam and Plugge (2010) and Pirani (2009)).

A similar movement or change has been seen in the provision of resources for teaching and learning. It was not so long ago that universities and their staff would largely create or source resources and tools that would be sanctioned for use in the classroom. The explosion of freely available content on the Internet and the ability of lecturers to make use of free or cheap web-based tools in their teaching has meant that, should they have the inclination and where-with-all, lecturers can now choose to by-pass the systems and services provided by the university (e.g. the centralised LMS). Lecturers can find online video and images to use in lectures, they can create wikis and blogs using services external to the university, and they can exploit existing social networking tools for teaching and learning purposes (see, for example, Kennedy, Dalgarno, Bennett, et al., 2009).

The interplay or even tension between centralized, endorsed, university-based resources and services and distributed, unsanctioned web-based resources and services parallels prevailing discussions about the use of Learning Management Systems versus the provision or creation of *Personal Learning Environments* for students at university. As Chatti, Agustiawan, Jarke and Specht (2010) argue "A common idea behind LMS-based technology enhanced learning solutions is that different tools are pushed by the educational institution and pre-packaged into a centralized system. A Personal Learning Environment (PLE), however, is a more natural and learner-centric model to learning that takes a small pieces, loosely joined approach, characterized by the freeform use of a set of learner-controlled tools and the bottom-up creation of knowledge ecologies" (p. 69). While it is somewhat unclear what a PLE actually *is* from this description, the notion that students (and lecturers) can use the services, tools, resources that *they* deem appropriate rather than ones that the institution controls and deems appropriate lies at the heart of the distinction we make between endorsed and unendorsed learning technologies.

Aim of This Paper

Given this background, the focus of this paper is two-fold; first, we sought to gather baseline evidence of the extent to which staff in a major research-intensive university were relying on university- and non-university-based technologies to support their teaching and learning. Second, we were keen to draw on previous research to consider the reasons why staff generally choose to use, and not to use, technologies in their teaching to support students' learning. Given that previous research has provided an indication of some of the drivers and inhibitors of learning technology use in institutions, our focus was on determining whether patterns or profiles of University staff could be established when it came to the barriers and facilitators of their technology use. If patterns, could be established, these may have implications for the way in which strategies, services and support could be provided in universities.

Method

Participants and Procedure

Participants targeted for this investigation were academic staff from a large, research-intensive, metropolitan university who were involved in teaching. An open invitation to complete an online questionnaire was sent to all university staff via a 'staff news' mailing list, and through Associate Deans in each Faculty and Graduate School. Staff were asked to complete a short questionnaire and an incentive of a chance to win one of five $100 vouchers was provided. The questionnaire was created in Survey Monkey and was available for three weeks during November and December 2010. A total of 286 completed questionnaires were received from academic staff, with more males (60.9%) than females (39.1%) responding to the survey.

Measures

A questionnaire was developed for this investigation that comprised six sections, with each section containing both closed- and open-response items. The content of the questionnaire was based on the particular technology environment at The University of Melbourne (i.e. the systems, tools and resources that were available to staff), as well as previous research on staff and students' use of technology (e.g. Kennedy et al., 2009) and the previously identified drivers of university staff uses of technology in teaching (see review above). The first section of the questionnaire asked about demographic information of the respondent, including number of years teaching and year levels taught; the second section focused on what university-based technologies were used in teaching; the third section focused on what non-university based technologies were used in teaching; the fourth section focused on reasons why technologies were used in teaching; the fifth section focused on reasons why technologies were not used in teaching. The final item on the questionnaire asked staff to comment on the one thing they would change about the use of technology in teaching at the university. For a copy of the questionnaire please contact the authors.

Only a subset of data from the questionnaire will be reported in this paper. We will primarily report on the quantitative data that considers those technologies staff were using and the reasons they indicated for using and not using technologies in their teaching. To determine technology use/non use, for a range of technologies (n=29; see below) staff were asked to indicate whether they had (i) ever used a particular technology in their teaching, (ii) whether they had used that technology in 2010, (iii) if they have never used that technology, or (iv) if they were not familiar with the technology. Separate questions were asked about university-based technologies (such as LMS-based tools and other centrally supported systems) and non-university based technologies (e.g., more generic tools and services available via the Internet). With regards to the reasons why staff choose to use or not use technology, 21 items were generated based on previous research and staff were asked to indicated how important each of these was in determining their technology use/non use using a scale from '1' (not at all important) to '7' (very important).

Results

Internal and External Technology Use

The first set of analyses considered the extent to which staff used particular university supported or endorsed technologies in their teaching. The pattern of responses from staff about whether they used a particular technology at all and whether they had used it in their teaching in 2010 were similar and so for simplicity the latter (2010 specific data) have been removed from the results. It can be see from Table 1 that two technologies enjoyed widespread use by staff: LMS subject sites (91.6%) and LMS announcements (83.3%). While not as widespread, two other technologies – lecture capture (58.4%) and assignment submission via the LMS (51.6%) – were used by the majority of staff. After these technologies there was a clear trailing off in the distribution for other university-based systems and tools included in the questionnaire. This is reflected by the majority of staff indicating that they had never used over half of the University-based technologies asked about. Even what may be considered rather mainstream tools, such as LMS Discussions, were only used by 36.7% of staff.

It was somewhat surprising that many university-based technologies were simply unknown to small but significant proportions of staff. *Respondus* (the tool that enhances quiz and assessment functionality in *BlackBoard*) *Sakai* (an LMS that provides a suite of resource sharing and collaboration tools), *Praze* (a peer-based assessment tool) and Readings Online (a tool and service that allows staff to make available and integrate electronic resources into their online learning environments via the library), all fell into this category.

Table 1: Staff Use of University-based Technologies

Technology	**Percentage**		
	Used at some time	**Never used**	**Don't know**
LMS Subject Sites	91.6	3.2	0.7
LMS Announcements	83.3	9.5	0.7
Lectopia	58.4	26.7	1.1
LMS Assignments Submission	51.6	37.5	2.0
LMS Grade Centre	43.8	41.7	5.0
Turnitin	38.0	46.0	4.8
LMS Discussion Board	36.7	48.6	0.8
Readings Online	22.4	58.5	10.4
LMS Group Tools	22.2	61.1	9.0
LMS Community Sites	20.9	64.9	7.5
LMS Wiki	15.2	75.8	5.6
LMS Blog	9.4	80.4	4.9
Praze	6.1	74.7	16.2
Sakai	5.3	74.0	18.9
Respondus	4.0	71.2	23.0

The second set of analyses considered the extent to which staff used technologies that were external to the university; that is, those not endorsed by the university (see Table 2). The technology that showed most widespread use was presentation software (82.2%) such as PowerPoint or Keynote. (In fact, while the University does not officially endorse the use of presentation software or a particular software application, given these technologies are well supported through desktop support and through provisions in teaching spaces, this endorsement is strongly implied). A striking finding is the relatively high use by staff of online video in their teaching, with almost half saying they are using it (48.4%). Beyond these two technologies, however, there is a similar – although more rapid – pattern of decline in technology use when comparisons are made with university-based technologies in Table 1. What is also noticeable when Tables 1 and 2 are compared is that fewer staff are indicating they 'don't know' about external technologies compared with many university endorsed ones (the clear exceptions being clickers and social bookmarking). Many staff seem more aware of technologies that are 'out-there' in the world than they are of ones available within and endorsed by the University.

Finally, it is worth making note of the use of two common Web 2.0 tools: Blog and Wikis. These tools have captured the attention of educators recently as their functionality aligns well with contemporary social constructivist models of teaching and learning (e.g. collaborative learning, inquiry-based learning designs). Through using these tools students are able to individually and collectively create, publish and share material online with their peers and teachers. As the utility of these tools became apparent to commercial educational technology vendors, they were quickly incorporated into the suite of tools available via enterprise LMSs. Similar tools, of course, continued to be available outside the university after their incorporation in LMSs. So it is interesting to compare the extent to which staff are embracing the university-based or non-university-based blog and wiki tools. It can be seen from Tables 1 and 2 that usage of internal and external blogs is almost identical (9.4% and 10.0% respectively) while the proportion of staff who have used an external wikis (9.3%) is marginally less than those who have used the LMS-based wiki (15.2%).

Table 2: Staff Use of Non-University-based Technologies

	Percentage		
Technology	**Used at some time**	**Never used**	**Don't know**
Presentation Software (e.g. PowerPoint, Keynote)	82.2	7.1	0.4
Online Video (e.g. YouTube; TeacherTube)	48.4	39.4	0.0
Mobile Phones	17.7	78.2	0.8
Desktop Conferencing (e.g. Skype)	12.3	79.9	0.0
Survey Tools (e.g Survey Monkey)	11.3	77.0	4.4
Google Docs	10.6	80.1	3.7
External Blog (i.e. non LMS)	10.0	80.3	3.6
External Wiki (i.e non LMS)	9.3	81.0	3.2
Social Networking Service (e.g. Facebook)	8.5	88.3	0.0
Podcasting (i.e. not Lectopia)	6.9	85.8	2.0
File Sharing Software (e.g. Flickr)	5.3	86.2	4.5
Instant Messaging (e.g. MSN, Yahoo)	4.5	93.1	0.8
Clickers (e.g. Keepad)	4.1	80.8	9.4

Social Bookmarking (e.g. Diigo; del.icio.us)	1.6	85.3	11.0

Drivers of Technology Use

The third set of analyses considered the reasons why academic staff choose to use or elect not to use technology in their teaching. The 21 items that were used to determine the reasons why staff chose to use – or not use – technology were submitted to a principal components factor analysis with a varimax rotation (see Table 3). A five-factor solution fit the data well and explained 61.8% of the variance in the solution. However, the fifth factor contained only two items, which is not ideal, and as such these two items were excluded from further analysis. (It is worth noting that one of these items, "I do not use technology because my workload is too high" was the second most strongly endorsed reason staff cited for not using technology; 68.9% of staff felt this was important). The final four-factor solution (see Table 3) explained 60.8% of the variance, had factors which showed clear conceptual clarity, and scales developed from these factors recorded high internal reliability (between .77 and .83). The labels derived for each factor and a description of them is presented below:

i. <u>Innovation and Learning</u>: This factor reflects reasons for using technology in teaching that are associated with the desire to develop innovative, technology-based learning activities that will assist student learning and understanding.
ii. <u>Support and Skills</u>: This factor reflects reasons for not using technology in teaching that are associated with concerns about getting appropriate support, particularly if self-perceived skills are low.
iii. <u>Relevance and Value</u>: This factor reflects reasons for not using technology in teaching that are associated with concerns about how relevant and valuable it would be for both staff and students.
iv. <u>Convenience</u>: This factor reflects reasons for using technology in teaching that are associated with making things more convenient for both staff and students.

These four scales were then used in a cluster analysis to determine whether distinct profiles or reasons for adopting technology in teaching and learning could be established across the sample. A clear five-cluster solution emerged from this analysis. Figure 1 provides a profile of the clusters across the four scales. The first cluster (n=41) displayed in Figure 1 reflects staff who tended towards the mid-point on the scale for all four reasons for using or not using technology. For want of a better term, these staff could be considered *Regular Citizens* in the academic community; there seem not to be strong drivers for technology use, nor particularly strong barriers to use. The profile of the second cluster (n =37) is dominated by convenience as a driver of technology use; we might like to call these staff *Convenience Driven* when it comes to their use of educational technology. While somewhat concerned about relevance and value, and certainly attuned to the true educational value of technology, they see most value in the ability of technology to make teaching and learning more convenient to them and their students.

The third cluster (n= 72) could be labeled *Perfect Citizens.* These staff are below the midpoint of the scale on reasons for not using technology – they are not that concerned about lack of relevance, value and support – but they are high on convenience, innovation and learning as drivers for technology use in teaching and learning. The fourth cluster represents a large proportion of the sample (n=95) and share a similar profile to the *Perfect Citizens* except <u>they are</u> concerned about lack of relevance, value and support. These *Dedicated Warriors* are motivated to use technology for the 'right' reasons (innovation, learning, convenience) but are, at the same time, not using some technologies and tools in their teaching and learning because of concerns about relevance and lack of support. Finally, there is a small group of *Disgruntled Pragmatists* (Cluster 5; n= 17). These staff, on the whole, are not driven to use technology for reasons of innovation and learning – they are well below the mid-point of this scale – and are mostly driven to use technology by convenience. But what characterizes staff in this cluster is the very high importance given to both reasons *not* to use technology.

In a final set of analyses we undertook a preliminary exploratory analysis of the association between the 'endorsed' and 'unendorsed' technology use of staff and the four 'drivers' of technology use (*Innovation and Learning*, *Convenience*, *Support and Skills*, *Relevance and Value*). For example, it may be that staff who are particularly concerned about support are less inclined to use technologies that are unendorsed and external to the university, where support may be less reliable.

In order to undertake this analysis, we created a relatively simple metric of endorsed technology use based on the sum of university-based technologies a staff member indicated they had ever used. Similarly, a measure of unendorsed technology use was created by summing the number of non-university-based technologies a staff member indicated they had used. We then used each of these measures as dependent variables in a one-way MANOVA where the five staff 'profile' groups were used as the independent variable. A significant multivariate effect was recorded ($F(8)=3.94$; $p < .001$) and there were significant univariate effects for both endorsed ($F(4) = 5.10$; $p = .001$) and unendorsed ($F(4) = 4.02$; $p = .004$) technologies. This indicated that the five profiles of the reasons why staff use learning technologies discriminated the degree to which staff used both endorsed and unendorsed learning technologies (see Figure 2). Post-hoc comparison tests revealed the significant differences between groups for endorsed and unendorsed technology use. For endorsed technology use, *Perfect Citizens*, *Convenience Driven* users and *Dedicated Warriors* on the one hand used a greater number of endorsed technologies than *Disgruntled Pragmatists and Regular Citizens* on the other. While significant overall, there were few differences between groups for unendorsed technology use, with the only post-hoc difference occurring between *Perfect Citizens* and *Disgruntled Pragmatists*.

Table 3: Rotated Factor Structure for 'Reasons for Use' Items

Item	Factor			
	1	2	3	4
It allowed me to innovate	.793			
It aligned well with the learning activities I had designed	.757			
I though it would help assist students learning in my discipline	.727			
I thought it would help students develop technology based skills	.646			
I wanted to try out new technologies	.637			
Concerns about getting technical support		.888		
Concerns about getting administrative support		.827		
Concerns about my technical skills		.781		
Just too hard		.667		
Concerns about the reliability of the technology		.532		
Not really needed or relevant			.758	
Concerns about whether it would work with students			.663	
Concerns about value for students			.658	
Concerns about the value for me			.653	
Not really sure how to make it educationally useful			.626	
Not a priority for me as an academic			.605	
It made things more convenient for me				.865

It made life easier administratively	.810
It made things more convenient for my students	.659

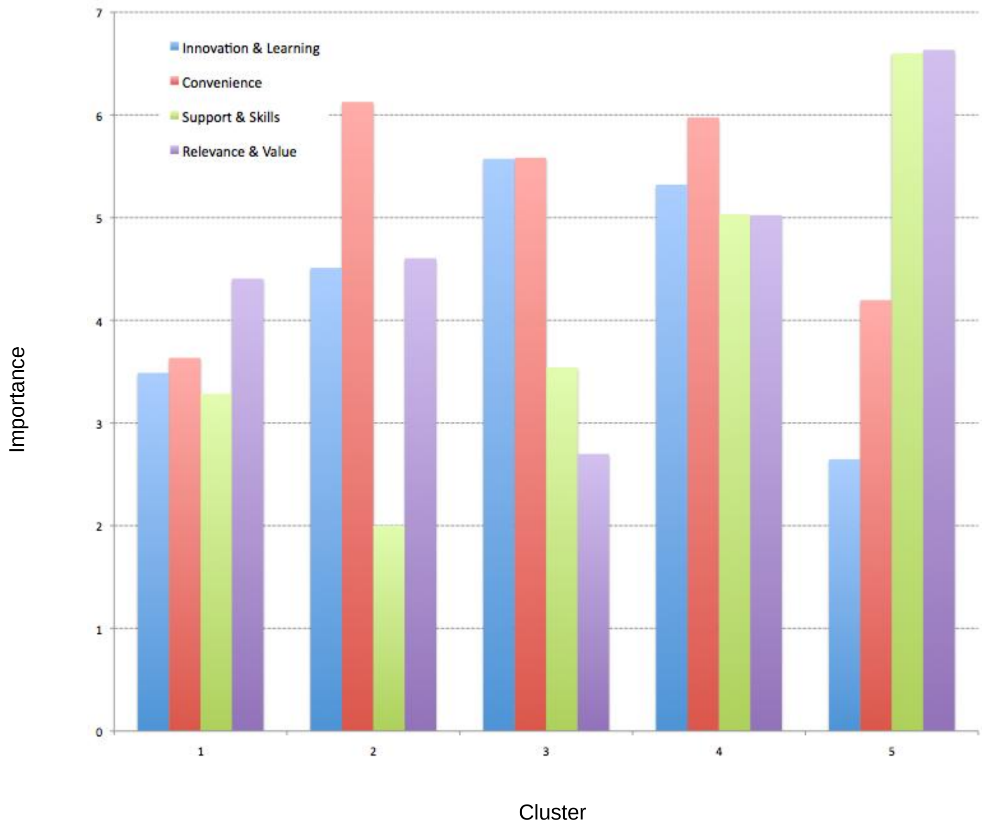

Figure 1: Staff 'profiles' reflecting reasons for using or not using technology in teaching

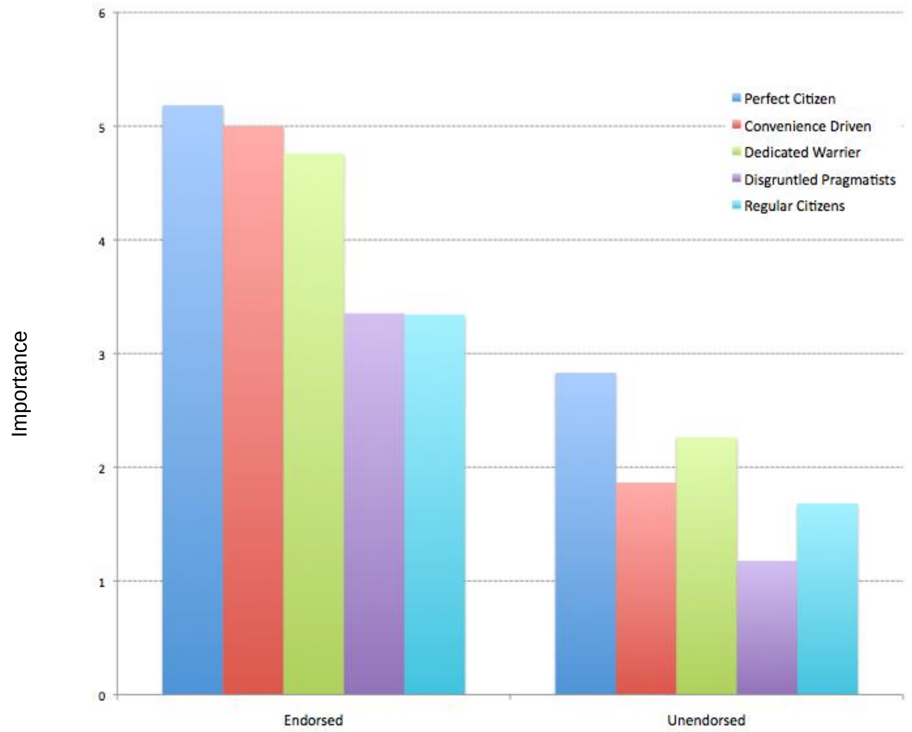

Figure 2: Mean scores for endorsed and unendorsed technology use for each staff profile

Discussion

The aims of this paper were to determine the degree to which academic staff at a university relied on university-based and non-university-based technologies in their subjects and courses, and to determine whether patterns or profiles of university staff could be established when it came to the drivers and inhibitors associated with their technology use. The findings from this investigation show that there was only widespread use – above 80% of staff reported using them – of three technologies: LMS subject sites, LMS announcements and Presentation Software. These represent very mainstream technologies that are most commonly associated with the one-way transmission or broadcast of information; and as such are closely aligned with more instructivist pedagogies. While we acknowledge that presentation software can be used in large and small group settings in a variety of ways, and that the software itself is agnostic when it comes to learning design, we still maintain that presentation software is typically associate with didactic presentation (see Bower, Hedberg & Kuswara (2009) for a perspective on this).

Beyond these core technologies, the next most obvious technology being employed by staff – and presumably consumed by students – was audio-visual material: university based lecture recordings and non-university based videos available from sites such as YouTube. Again it is not possible to make judgments about the learning design of the broader context in which these technologies are used, however, the value that students see in lecture capture technologies is well established as being associated with assisting them to revise, take notes and translate unfamiliar spoken words and phrases if their first language is not English (see Gosper, Green, McNeill, Phillips, Preston and Woo (2008)). And Bower et al (2009) suggests that video is “a particularly effective means of representing procedural information” (p. 1159). The point is that traditionally neither technology has been strongly associated with higher-order conceptual or metacognitive learning processes (see Bower et al, 2009), and both are more often associated with the transmission and transfer of information.

The next band of technologies used by staff – used by between 20% and 50% of staff – are all university-based technologies: LMS Assignment Submission, LMS Grade Centre, Turnitin, LMS Discussion Boards, Readings Online, LMS Group Tools and LMS Community Sites. Towards the top of this list are technologies that are broadly used for the management and administration of learning and teaching through electronic means: that is, tools that are used to support the management of assignment submission, the distribution of electronic resources, and the maintenance of academic integrity. Towards the bottom of the list are tools that often associated with social constructivist pedagogies that involve interaction, discussion and peer-based collaboration.

What is clear when the data in Table 2 and 3 are compared is that staff in this institution are relying more heavily on learning technologies endorsed by the University as opposed those external to it. The trend highlighted in the introduction to this paper for universities to use external sources and resources for supporting the use of learning technologies does not seem to be particularly manifest in the data presented in this paper. Put simply, in a context where there was not particularly high use of either university- *or* non-university-based technologies, there was clearly less use of external unendorsed technologies. The interesting caveat to this is in the area of Blogs and Wikis. There was commensurate (low) use of these tools through university based system and external providers. This finding may be a harbinger of things to come as staff seek tools, resources, systems, functionality and support that may not be necessarily supported by their institutional systems. This, of course, raises questions for institutional policy makers about service delivery and costs associated with providing university-based learning technology systems and solutions.

What is also clear is that the promise of emerging Web 2.0 – wikis, blogs, podcasting, social networking, file-sharing, social bookmarking – is still yet to be realized on a wide scale in this institution. This is perhaps not surprising given recent research that has tempered the commentaries and hype associated with the introduction of Web 2.0 technologies. The data from this investigation suggest innovative learning designs that harness emerging technologies are being used by a small subset of staff: between 5% and 15%. This result, coupled with the other findings of this investigation reported above, are consistent with recent reviews that have noted the lack of transformation brought about by the introduction of technology in higher education (see Selwyn, 2007; Blin & Munro, 2008; Conole, 2004). For example, Blin and Munro (2008) argue "Although technology is now common place in most higher education institutions – most institutions have invested in a virtual learning environment (VLE) and employ staff dedicated to supporting e-learning – there is little evidence of significant impact on teaching practices and current implementations are accused of being focused on improving administration and replicating behaviourist, content-driven models." (p. 475).

It is important to reflect on the findings of this investigation, and the discussions of them presented above, and acknowledge that to a great extent an individual academic's use of learning technologies is driven by the needs and demands of his or her local curriculum context and broader university policies. For example, at the university in which this investigation was conducted there is a requirement that all subjects have a 'web presence', as defined by the existence of an LMS subject site. This requirement would clearly influence and account for the high use of subject sites by staff. Discussion boards, on the other hand, are not mandatory or actively encouraged as they are at other universities (e.g. Charles Sturt University) and this policy difference is likely to reflect differences in the degree to which these technologies are used in these institutions (see Uys, Dalgarno, Carlson, Tinkler & Crampton, under review).

A cluster analysis of the reasons why staff choose to use or not to use technology in their teaching and learning revealed five distinct profiles of academic staff. These profiles are interesting in and of themselves, but importantly they show that different members of the academic community can be differentially characterized using the reasons they cite for engaging or not engaging with learning technologies. As such, the profiles have clear implications for universities in the area of technology training, academic support and professional development. The kind of support and professional development opportunities that *Perfect Citizens* might find beneficial would likely be different from the types of support and professional development that *Dedicated Warriors* or *Disgruntled Pragmatists* would find useful. Moreover, by using the type of profiling explored in this paper, academic developers could identify groups of academic staff who are concerned about their own learning technology skills, or the degree of support they feel is available when they use learning technologies, and tailor professional development programs for these individuals accordingly. Similarly, conversations could be started with academic staff who are concerned about the relevance of learning technologies in their disciplines or for their students.

In our final exploratory analysis we established a significant relationship between the five academic staff profiles and the degree to which staff used both endorsed and unendorsed technologies. The most interesting aspect of this finding was the similarity between *Disgruntled Pragmatists* and *Regular Citizens* when it came to using endorsed learning technologies; both used these technologies significantly less than the other three groups. It would seem that if higher education institutions were interested in fostering the adoption of learning technologies, attending to the drivers and facilitators as perceived by these two groups – which are quite different – would be a good place to start. A fruitful line of future research would be to consider whether the 'reason for use' profiles established in this study vary systematically with additional variables such as discipline area or years of teaching.

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Using game-based inquiry learning to meet the changing directions of science education

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This paper presents the results of a study designed to develop pre-service teachers' skills and pedagogical understanding of how game-based learning can be used in a classroom. The study used a technological pedagogical content knowledge (TPACK) conceptual model. 18 pre-service science teachers participated in the study that used *Death in Rome*, a point and click inquiry-based game to learn how to teach scientific inquiry. In the workshop the participants were required to complete several activities using game-based learning that included the evaluation of a range of online games and virtual worlds. Participants were required to complete pre-and post-tests. The results of the pre-and post-tests indicate that there was a significant shift in pre-service teachers' attitudes towards game-based learning as a result of the workshop. Overall, this study showed a positive change in attitudes towards game-based learning in science education.

Keywords: Pre-service teachers, inquiry, game-based learning, TPACK, pedagogy

Introduction

There is a growing body of research on the integration of information and communication technologies (ICTs) into pre-service teacher training programs and the varying degrees of success of these initiatives (Hu & Fyfe, 2010). Numerous studies, such as Phelps et al. (2011) and BECTA's (2004) literature review, have confirmed that a teacher's attitude towards technology has a significant impact upon a teacher's decision to use ICT. The importance of pre-service teacher training that focuses on the development of novice teachers' skills in using ICTs is garnering increasing attention mainly due to the apparent limitations of graduate skills in using ICTs appropriately (Galstaun, Kennedy-Clark, & Hu, 2011; Lee, 1997; Markauskaite, Goodwin, Reid, & Reimann, 2006) It is often assumed that during pre-service training that students will develop ICT literacy skills, yet, many novice teachers enter the classroom not having developed systematic and sufficient ICT skills

(Markauskaite, et al., 2006). In terms of teacher training programs, there are numerous recommendations aimed at developing long-lasting skills and positive attitudes towards technology enhanced learning. Firstly, teachers need well-designed, hands on tutorials and discussion in order to develop their skills (Lee, 1997). These sessions need to be developed with the specific needs of the teachers in mind rather than generic skills development. Lawless and Pellegrino (2007) indicate that discipline based training is more effective, so having training for science teachers separate from English teachers may result in more customised and, consequently, more usable skills. Webb and Cox (2004), support this premise stating that by blending ICT with subject area expertise teachers can plan to maximise and explain the affordances of a technology to students more readily. In response, students are more likely to be motivated and engaged in the learning activities and are able to make the most of the use of ICT. While these studies have all focused on classroom teachers, pre-service teachers also need the same exposure to ICTs during the duration of their degrees. This study was designed to develop both skills in using game-based learning and in the evaluation of resources within the context of a secondary science education degree program.

This paper presents the findings of a study that integrated game-based learning into a pre-service teacher unit of study. The study was set in the context of an inquiry unit of work and used a technological pedagogical content knowledge (TPACK) conceptual model. TPACK is aimed at moving teachers beyond "technocentric" strategies that focus on the technology rather than the learning (Harris, Mishra, & Koehler, 2009). TPACK emphasises the importance of developing both integrated and interdependent understanding of the four core elements of TPACK: technology, pedagogy, content and context. Since Mishra and Koehler (2006) articulated the concept of technological pedagogical content knowledge, also known as technology, pedagogy and content knowledge, there has been an emerging body of literature reiterating the importance of TPACK in pre-service teacher training. TPACK was deemed an appropriate framework to adopt in this study due to the flexibility of the framework. According to Harris et al. (2009), the parsimonious nature of TPACK is a result of the diverse range of content areas, ICTs and teaching contexts. They explain that professional development using a TPACK framework needs to be flexible and inclusive enough to account for a range of contexts, teaching philosophies and styles. As acknowledged by Mishra and Koehler (2006), some simple learning-technology-by-design experiences would not fully prepare teachers to use ICT effectively. It is perhaps more appropriate to regard the pre-service teachers' experiences with the workshop as building a foundation of a beginning repertoire of ICT skills. The research questions to be answered in this study are: What are a pre-service teacher's attitudes to the use of game-based learning in scientific inquiry? And What is the impact of TPACK on a pre-service teacher's self-reported confidence and competence in using ICT in a classroom?

Technological Pedagogical Content Knowledge (TPACK)

There is a substantial amount of literature regarding the need for teachers to use a combination of different knowledge types when in the classroom. These knowledge types are presented as falling under the broad headings of Content, Pedagogy and Technology (Graham, 2011). These individual knowledge types have been combined to form a string of acronyms representing new knowledge, such as PCK (pedagogical content knowledge), TPK (technical pedagogical knowledge) and TPCK (technical pedagogical content knowledge) (Graham, 2011). The TPACK framework combines the four core components, technology, pedagogy and content knowledge and context. The result being seven combinations of these components, such as pedagogical knowledge, content knowledge and technical knowledge. TPACK emphasizes a teacher's understanding of how technologies can be used effectively as a pedagogical tool (Koehler & Mishra, 2009). Koehler and Mishra (2009) explain that technologies have their own characteristics, affordances and limitations, which may make them more suitable to certain tasks. Moreover, Markauskaite (2007) found in her research with pre-service teachers and ICT literacy that being able to plan to use and evaluate different forms of ICT is as important as having the capabilities to implement the ICT. TPACK is a complex interplay of three bodies of knowledge: (1) pedagogical content knowledge (Shulman, 1986), (2) technological content knowledge (knowing what kind of technology tools are available for teaching what), and (3) technology pedagogical knowledge (able to choose an ICT tool based on its affordances to address a particular teaching/learning need) (Schmidt et al., 2009). To develop TPACK, teachers not only need to know how to use a computer and its associated software applications, but also be aware of the strategies to incorporate ICT tools to enhance student understanding of a particular subject's content. Using a TPACK approach has, in preliminary studies, been shown to improve a pre-service teacher's confidence and skills in the productive use of ICT (Galstaun, et al., 2011; Hu & Fyfe, 2010).

Game-based learning

The term game-based learning is often used simultaneously with terms such as “serious” games, educational games and virtual learning environments. However, before moving into more detail it is worthwhile to clarify exactly what these terms means so as to distinguish between the point and click games and the virtual worlds that the pre-service teachers accessed in this study. Game-based learning is the use of a computer-based game, also called a video game, in an educational context (Watson, Mong, & Harris, 2011). Game-based learning can incorporate commercial off-the-shelf (COTS) games that are used in education such as *Civilization III*® (Squire, 2004). Game-based learning can also be the use of single player point and click games or the use of mobile device applications, such as iPhone “apps” that are developed for learning contexts. Game-based learning also incorporates the use of multi-user virtual environments (MUVEs) such as *Quest Atlantis* (Barab et al., 2009; Barab, Thomas, Dodge, Carteaux, & Tuzun, 2005). The main distinction between a virtual world and a scenario-based virtual world is that a virtual world often mimics “real” life in that lectures, meetings, classrooms are all held within the virtual space - virtual worlds are popular in distance education and are often hosted in places, such as *Second Life* (Gregory et al., 2010). A scenario or narrative-based virtual world is based on a story or narrative and information is built into the environment, where students take on the role of a character and interact with elements of the story using game-based elements such as point scores (Barab, et al., 2009). As they are proving to be an effective means of attracting and gaining students’ attention, games, virtual worlds and virtual realities have been touted to be one of the technologies to watch over the next five years by the Australia–New Zealand Horizon Report (2009). This changing direction and changing demand combined with teachers’ interest in ICT and increased access to ICT as a result of the Digital Education Revolution in Australia were motivating factors in this study into the use of game-based learning.

Research Design

The study was set in the context of a core science curriculum unit. In this unit of study, students were either completing a Master of Teaching or a Bachelor of Secondary Education combined degree majoring in science. The two-hour workshop focused on the integration of game-based learning into inquiry learning. The workshop applied the following TPACK principles (1) learning tasks are problem-centred, (2) skills are developed via learning-technology-by-design approach, (3) design tasks are accomplished collaboratively, and (4) learners are encouraged to engage in reflective practice. Table 1 provides an explanation of these principles.

Table 1: TPACK and Related Activities

TPACK Three Bodies of Knowledge	Activities
Pedagogical content knowledge	Design activities that support how they would use *Death in Rome* in a science inquiry lesson. Identification of year group syllabus area and context.
Technological content knowledge	Evaluation of a range of online game and virtual environments. Evaluate for usability and effectiveness of software.
Technology pedagogical knowledge	In groups explore the affordances of the allocated online games and how they address a particular teaching/learning need.

The development of TPACK aims at equipping pre-service teachers with the knowledge and skills that will enable them to utilize ICT tools to mitigate some of the problems that students face when learning complex or difficult topics that are often challenging for teachers to teach and for students learn. This study presents the findings of this two-hour workshop. However, as the participants were self-reporting it is difficult to gain a full or more detailed understanding of the full impact of TPACK as a framework or whether the pre-service teachers would, in fact, use ICT in a classroom.

Participants

18 students participated in the workshop (11 females and seven males) with an average age of 24.4 yrs and a standard deviation of 5.52. These students were all majoring in science education and 10 were post-graduates and 8 were undergraduates. None of the participants had worked as a paid classroom teacher and they had all completed at least one in-school practicum.

Materials

The materials for this study included *Death in Rome*. *Death in Rome*, is a point and click adventure game hosted by the BBC website (http://www.bbc.co.uk/history/ancient/romans/launch_gms_deathrome.shtml). The game is set in 80AD in Ostia river port, Rome. In this game, students have to find and evaluate evidence in order to support a hypothesis on how Tiberius Claudius Eutychus died. They were also provided with workshop handouts that provided information on the background of game-based learning and virtual worlds and the TPACK conceptual model.

Procedure

The workshop on game-based learning was arranged for week 4 of Semester 1, 2011. In week 3, students were emailed both the workshop materials and the pre-test. They were asked via email to complete the pre-test and to print out the materials for the workshop. This study used both pre- and posts-test surveys, hereafter referred to as pre- and post- tests. The pre- and post-test had 14 questions. The first five questions were five-point Likert style questions and were adapted from an instrument used by Hu and Fyfe (2010) in their study using a cohort of pre-service teachers. Questions six to 14 were open-ended questions that were used to assess attitudes and were based on an instrument used in a previous study by Kennedy-Clark (2011).

As students arrived at the workshop they were asked to submit the pre-test, 17 pre-tests were collected. The pre-service teachers participated in a discussion on computer games and virtual worlds; identified who played games; discussed what types of ICTs they had used in their in-school professional experience; and identified problems that the pre-service teachers had encountered during their professional experience. The class discussed inquiry learning and what inquiry learning meant in science. The pre-service teachers were introduced to TPACK and how pedagogy, technology and content could be integrated in classroom situations.

The students, in groups of two or three, completed the online BBC UK historical inquiry activity *Death in Rome.* The lesson was modelled for the pre-service teachers in that they were given the role of the student. In this game, students have to find and evaluate evidence in order to support a hypothesis on how Tiberius Claudius Eutychus died (Figure 1). This game gave the pre-service teachers access to artefacts in Tiberius's house, on his body, modern scientific views, the views of historians and the accounts of historical sources, such as a slave and a Roman trader. The pre-service teachers could not put forward a cause of death until they had accessed several pieces of evidence or consulted with sources. Moreover, they could not confirm a hypothesis unless they selected three pieces of evidence. Ultimately, Tiberius died from malaria, but the pre-service teachers could not confirm this without investigating the evidence thoroughly. They accessed the game twice, swapping groups between games so that the pre-service teachers were paired up with new group members.

Figure 1: Screen shot from Death in Rome

The purpose of swapping the groups was to draw on the expertise of the groups that successfully completed the activity, and was based on expert novice differences and communities of learners (Lave & Wenger, 1991). Using a think, pair, share strategy the group discussed issues such as where, how, why they would use this activity; the strengths and weaknesses of the tool; and connections to the NSW state high school science syllabus for Years 7-10. The influence and importance of modelling in pre-service teacher preparedness has been demonstrated in similar studies. For example, Gill and Dalgarno (2008) in their investigation into pre-service teacher preparedness to use ITC found that the pre-service teachers saw modelling of the use of ICTs in lectures as a good way to learn how to use the ICT.

Students were then allocated three websites to critically analyze from a list of 20 websites that the group self-identified as science education resources. These were all 'educational' science websites and were either games or virtual worlds, for example, *NASA*, *The Jason Project*, *Whyville*, and *Quest Atlantis*. The pre-service teachers were provided with scaffolding for the critical analysis and as a group discussed and reflected upon the sites. They ranked them for their potential usefulness and usability in the class and whether they, as teachers, would use that site. This critical analysis was based on the TPACK framework. In the critical analysis pre-service teachers reflected on and discussed the scenarios and types of technology; the skills needed to masterfully use the technology; how they would use the technology in a classroom; and the relevance to a Syllabus curriculum area. They were also asked to advise their peers as to whether or not their sites would be useful to visit. A list of the three best sites was created for the group. Students were then asked to complete the post-tests, and 18 post-tests were received.

Data Analysis

Content analysis was used for the analysis of the data to make replicable and valid inferences from the data to their context of using game-based inquiry learning in the teaching of science (Krippendorff, 1980). Four contextual areas emerged allowing for a single category construction. Area 1 centered on TPACK, Area 2 on current game use and preferred games, Area 3 covered knowledge of education games and Area 4 addressed the use of educational games in a classroom context. The data were then coded using five themes that emerged from the data. These themes were gender, game use, current understanding of games and virtual worlds, potential use of games and virtual worlds used for education, and the educational challenges of using games and virtual worlds in teaching science education. Many of the participants supplied multiple responses to a question, and these responses were taken into consideration, and, consequently, *n* is not always 18.

Results

The results of this study showed that there were significant shifts in the negative responses in the pre-test towards positive responses in the post-tests. Students' responses showed shifts from the contextual areas listed, namely, knowledge pre-service teachers' current use of games and their choice of preferred games, current knowledge of educational games for classroom use, and the use of educational games in education.

Area 1 – TPACK

The first contextual area of TPACK contained the first five questions in the pre-and post-tests used a five-point Likert scale to rate the pre-service teachers' confidence or belief in their ability to integrate ICT into a classroom using the TPACK framework. The tests measured prospective teachers' technological knowledge (TK), technological pedagogical knowledge (TPK), Technology Pedagogy and Content Knowledge (TPACK) and pre-service teachers' evaluation of the workshop. The effect size was measured using Cohen's *d* and used a pooled standard deviation. The most significant effect was the change in strong disagreement with a *d* of -0.9, the negative effect indicates that these students' that had previously shown strong disagreement in the pre-test shifted towards agreement. Moreover, a medium effect size of 0.5 was recorded for agreement, meaning that more students were showing agreement. There was no effect in the strong agreement category and only small effect sizes were recorded for neutral (-0.3) and disagree (-0.2) respectively. Overall, the results of the pre- and post-tests do signify a positive change and this is consistent with the findings of Hu and Fyfe (2010)

There is a clear indication that the pre-service teachers involved in this study showed increased confidence in selecting, evaluating and using ICT (Table 3). For example, in question 3 that asked students on their ability to use strategies that combine curriculum content, ICT tools and teaching approaches, in the pre-test 52.9% agreed while in the post-test 83.3% agreed that they had this capability, showing that more students felt that they had strategies for using ICT in the post-test than in the pre-test. However, in question 4, which related to leadership, the post-test showed a decrease in confidence. This is not surprising as the pre-service teachers have only had one or two in-school professional experiences; it is unlikely that they will feel confident in providing leadership on ICTs. The responses to the first five questions showed an increased confidence in pre-service teachers' knowledge to select appropriate resources and use of resources. That is, through using a TPACK framework the pre-service teachers believe that they can use the technology effectively as a teaching tool and that their selected resource will work in a classroom.

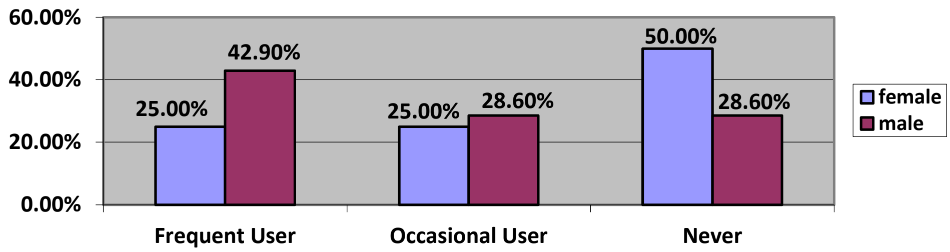

Figure 2: Pre-service teachers' current game use and gender

Area 2 - Current game use and preferred games

In the pre- and post-tests, questions 6 and 7 asked students about their current game use and what types of games they played. As with studies 1 and 2, the participants' use of computer games was analyzed and the results of this study indicate that the males (42.9%, n=3) were more likely to be frequent computer game players than the females (25%, n=10) (Figure 2). The study also showed that females were more likely to never play games (50%) in comparison to males (28.6%). This is consistent with the findings of similar studies on gender and game use (Upitis, 2001). The most common games played by males were first person shooters (FPS,) role playing games (RPG) and sports games and females played phone apps, such as *Bejewelled, Angry Birds* and *Tetris*. A Chi-square test showed that there is no statistically significant association between gender and game play frequency (χ^2=7.744, p=.021). Nearly all of the frequent and occasional game players indicated that they played more during university holidays and on the weekends. The findings of gender, game use and types of games played are consistent with other studies using a similar cohort in that males play more RPGs and FPS (Kennedy-Clark, 2011). However, the most noticeable difference in comparison to similar studies was the increase in females and males playing iPhone game "apps". Although there were still more frequent male players, the difference was no longer significant. This is perhaps a reflection of the increase of phones with game applications as females were still more likely to play games on their mobile phones. However, there is a marked difference between phone applications and online role-playing games in terms of the nature of play. Consequently, the term "game" in this sense needs to differentiate between single and short instance games, such as *Angry Birds* and ongoing role-playing games such as *Warcraft.*

Area 3 – Current knowledge of educational games

Questions 8, 9 and 10 centred on the participants current knowledge of educational games and virtual worlds. In question 8, the participants were asked to define the term educational computer game. Students were asked to choose the best characteristic of the game from a list provided. The most frequent response in both the pre- and post-tests characterized educational computer games as games designed or used for learning and content (47.1%, *n*=8; 42.9%, *n*=9). Other responses included games to teach concepts (11.7%, *n*=2; 4.8%, *n*=1) and skills (5.9%, *n*=1; 9.5%, *n*=2). There were no significant changes between the pre- and post-tests (Table 3) Note that in the table, multiple answers were given by the participants. Consequently, *n* is calculated as the number of responses and not the number of participants.

Table 3: Educational Game Characteristics

Educational Games Characteristics			
Pre-Test	**%**	**Post Test**	**%**
Learning and content	47.1%	Learning and content	42.9%
Concepts	11.7%	Skills	9.5%
Brain training	5.9%	Interactive	9.5%
Engaging	5.9%	Fun	9.5%
Mathletics	11.7%	Concepts	4.8%
Skills	5.9%	TPACK	4.8%
Curriculum area	5.9%	Activities	4 .8%
Not relevant	5.6%	NASA/BBC	4.8%
		Mathletics	4.8%
n=17		*n*=21	

Table 4: Pre-service teachers understanding of a virtual world

Virtual World Characteristics			
Pre-Test	**%**	**Post Test**	**%**

Computer-generated world	27.8%	Simulates real life	35%
Simulates real life	27.8%	Immersive	20%
ICT resource	16.7%	Interactive	15%
Avatar, character representation	11.1%	Online, multiplayer	15%
Limited	11.1%	Avatar, character representation	5%
Fantasy	5.6%	Computer-generated world	5%
		Useless	5%
n=18		*n*=20	

In question 9, participants were asked to define a virtual world. Again, students were given a list of characteristics to choose from. The results of the pre- and post-test are shown in Table 4. The most frequent responses in the pre-test included a computer-generated world (27.8%, *n*=5) and simulates real life (27.8%, *n*=5) in the post test this shifted to simulates real life (35%, *n*=7) and immersive (20%, *n*=5). When compared to Bainbridge's (2007, p. 472) definition that a virtual world is "an electronic environment that visually mimics complex physical spaces, where people can interact with each other and with virtual objects, and where people are represented by a virtual character". The post-test responses indicate that the participants had a better understanding of the characteristics of a virtual world, such as interaction, multiplayer and immersive. The response of "useless" was explained as nothing beats real life.

In question 10, participants were asked to provide examples of virtual worlds that they were familiar with, and the results show that of the 14 participants that responded to the question in the pre-test that 71.4% (n=10) of participants knew of or were familiar with *World or Warcraft* and 35.7% (n=5) *The Sims.* Other virtual worlds that were mentioned included *Virtual Singapura* and *Second Life.* In the post-test, participants added virtual worlds that they had evaluated, such as *Quest Atlantis* and *Whyville.* Knowledge of these two virtual worlds was consistent with previous studies indicating that in terms of game play and knowledge of educational computer games and virtual worlds, that the participants in the studies were fairly consistent (Kennedy-Clark, 2011).

Area 4 - Use of educational games

The open-ended questions 11 to 14 focused on the use of educational games in education. The analysis of the pre- and post-tests indicated that students' perceptions of educational games changed as a result of the workshop and showed a positive shift towards using technology in the classroom. In question 11, students were asked how they might use games in an educational setting. The student responses are presented as characteristics in Table 5. As with other results, *n* is representative of the number of characteristics and not the number of participants.

In question 12, pre–service teachers were asked what they perceived to be the benefits of using educational games in the science classroom, and question 13 asked students what they felt were the possible problems or issues that may arise. The results have been presented together in Table 5. It is evident from the results that the pre-service teachers in both the pre- and post-tests saw the value of using educational games in their ability to teach concepts (18.2%, *n*=4; 17.2%, *n*=5) and to engage learners (18.2%, *n*=4; 27.6%, *n*=8). Other benefits included visualization (13.6%; *n*=3; 6.9%, *n*=2) and interactivity (9.1%, *n*=2; 6.9%, *n*=3). The main shift in the concerns about the use of game-based learning in education is evident in the results of question 13. In the pre-test, fun, but no learning (18%, *n*=4) was the main concern, but in the post-test this had shifted to technical issues (37.1%, *n*=13). This may actually be a beneficial change. Many of the pre-service teachers were naïve in regards to the integration of ICTs into a classroom. This heightened concern about the technical issues is in alignment with classroom teachers concerns about ICTs raised in studies, such as BECTA's Review of *The Research on Barriers to the Uptake of ICT by Teachers* (2004), and shows a more realistic appraisal of using ICT.

Table 5: Pre-service teachers views on the potential advantages, benefits, problems and issues of using educational games in a classroom setting

Perceived Benefits			
Pre-Test	**%**	**Post test**	**%**
Concepts application	18.2%	Engagement	27.6%
Engagement	18.2%	Concepts application	17.2%
Visualization	13.6%	Motivating	10.3%
Context	9.1%	Modern relevance	10.3%
Safety/simulation	9.1%	Visualization	6.9%
Interactivity	9.1%	Interactivity	6.9%
Problem solving	4.5%	Complex systems	6.9%
Revision	4.5%	Collaboration	3.4%
Enjoyment	4.5%	Inquiry	3.4%
Learning styles	4.5%	Problem solving	3.4%
Literacy	4.5%	Revision	3.4%
		Safety/simulation	3.4%
		Literacy	3.4%
n	22	*n*	29
Perceived Problems			
Pre-Test	**%**	**Post test**	**%**
Fun, but no learning	18%	Technical issues	37.1%
Lack of ICT skills	18%	Off-task/distracted	25.7%
Off-task/distracted	18%	Fun, but no learning	8.6%
Technical issues	16%	Un-reliable/not specific content	8.6%
Un-reliable/not specific content	16%	Time consuming	5.7%
Perpetuate misconceptions	8%	Cyber safety	5.7%
Time consuming	8%	Perpetuate misconceptions	2.9%
Cyber safety	8%	Lack of ICT skills	2.9%
Parental concern	4%	Plagiarism	2.9%
Plagiarism	4%		
n	25	*n*	35

In regards to question 14 the pre-service teachers were asked if they, as teachers, would use educational games and virtual worlds in their classrooms. In the pre-test, of the 13 students that responded to the question, 61.5% (*n*=8) indicated that they would use games in the class for reasons that included:

> *Yes, I see the benefit in teaching through educational games. The advantages outweigh the disadvantages but mostly as a tool for revision.*
>
> *Yes, games make the learning experience more enjoyable and interactive for the students, they can relate and engage greater due to the technology being a prominent aspect in most students' everyday lives.*

The remaining five students (38.5%) were uncertain of whether they would use games in the classroom.

In the post-test, of the 15 students that responded to the question 86.7% (*n*=13) indicated that they would use computer games in the classroom. Their explanations indicated that they are critical of the ICT resources and that the resource would need to deliver content and be reliable, for example:

> *Yes, but I would have to ensure that all the educational goals are met and they can be easily accessed by all students.*
>
> *Yes, given proper scaffolding and relevance to classroom material.*

Yes, only appropriate games which tie in closely to curriculum content and pedagogical orientation.

Yes, I find games very useful. I have used puzzles, wheel of fortune and I have made chemistry bingo. They combine skills such as teamwork, communication etc. with content knowledge

Yes, I would use it as an alternative way to cover content, but not the only way.

The students' responses to this question and their intention to use the games is based on the educational value and learning affordance of the tool. This suggests that by allowing students to evaluate and report to the class on their group's ICT resources was developing essential skills in critically evaluating a source on the basis of criteria such as content, ease of use, time constraints and technical limitations. These responses indicate that the pre-service teachers were considering how ICT can be used in context. This may also show a move away from teaching the tool to teaching with the tool to using ICT meaningfully (Figg & McCartney, 2010).Of the remaining two students, one was unsure of whether they would use games depending on the quality of the resource and the other indicated that they would not use games as they were too distracting and time consuming. This student in the pre-test would have used computer games in class. When questioned as to what changed their views, one student's response indicated that several of the examples given in the introduction to the workshop had made her cautious of using ICT in the future.

Discussion

The study showed that a pre-service teacher's attitudes to the use of game-based learning in scientific inquiry were mainly positive as a result of a one-off workshop. The pre-service teachers indicated in the post-test that engagement and visualisation were the main learning affordances of using game-based learning in classrooms, which is consistent with other studies on these technologies (Barab, et al., 2005; Ketelhut, Clarke, & Nelson, 2010). There was a significant difference between the pre-and post-tests in the barriers that might be faced by a teacher using game-based learning in a classroom. In the post-test, the pre-service teachers were more concerned about technical problems rather than the learning outcomes, which is consistent with several studies on teachers attitudes towards using ICT in classrooms (Urhahne, Schanze, Bell, Mansfield, & Holmes, 2010; Webb & Cox, 2004). When designing this study several key points raised in the literature were considered. The session was designed to encourage hands on involvement and discussion in order to develop pre-service teachers' skills in using game-based learning. The focus of the session was on the skills needed for pre-service teachers rather than developing generic computer skills. Furthermore, the workshop was discipline-based and focused on inquiry learning, which is considered to be more effective than a generic skills workshop (Lawless & Pellegrino, 2007). As stated by Webb and Cox (2004) blending ICT with subject area expertise can make students more engaged in the learning activities while making the most of the use of a technology. In this study, the pre-service teachers were motivated by the array of possibilities for bringing game-based learning into the classroom. These considerations are aligned with the TPACK concept model that focuses on technology, pedagogy and content knowledge within a particular learning context (Figg & McCartney, 2010; Mishra & Koehler, 2006). The TPACK conceptual model seemed to be an effective framework. Koehler and Mishra (2009) explain that TPACK emphasizes a teacher's understanding of how technologies can be used effectively as a pedagogical tool, and in this study students had the opportunity to evaluate a range of games and virtual worlds and generate a list of resources that they believed could be used to provide a content rich experience in a pedagogically sound manner. The pre-service teachers identified the characteristics, affordances, and limitations, which may make them more suitable to certain tasks. This is consistent with the research of Koehler and Mishra (2009).

Conclusions

This study showed that there was overall positive change in attitudes of pre-service teachers towards games-based learning in science education. Though there was significant shifts in pre-service teachers' negative responses in the pre-test to positive responses in the post-test responses, the study has some limitations that need to be taken into consideration. The first significant limitation is that this was a one-off study. A longitudinal study that follows pre-service teachers into the classroom once they have graduated will provide a more realistic understanding of the use of ICT in the classroom. Factors such as school efficacy and pre-service teacher attitudes have a more resounding impact on a novice teacher than a brief interlude with a game-based learning workshop (Choy, Wong, & Gao, 2008; Phelps, et al., 2011; Webb & Cox, 2004). Furthermore, the school environment will have a greater influence over pre-service teachers than their university training. A second limitation is that although as a TPACK conceptual model was used to design course materials, it needs to be considered that at what level the TPACK framework influenced the results. This has not been addressed in this paper. There was a significant change between the pre-and the post-tests in favour of game-based learning, but the pre-and post-tests did not demonstrate how TPACK may have influenced the outcome of this study. Moreover, this study did not consider all of the permutations of the TPACK elements. Another limitation was that although the workshop was a one-off, the pre-service teachers would not have had the opportunity to develop sufficient competence to use computer-games in education effectively. Further studies need to be undertaken to gain a better understanding of how novice teachers use ICTs, such as computer games and virtual worlds, when they are in the classroom. Research also needs to be undertaken to provide a better understanding not only of the TPACK conceptual model, but also of how TPACK may influence a pre-service teacher's design of activities and approaches to embedding ICT into a classroom.

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Paper, Rock, Shotgun? Moving immersive online games from *DE*structive to *CON*structive

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This poster looks at the taxonomy of game development tools mapped against games-based learning theories in order to suggest the most promising directions to take in online educational software design

Keywords: games-based learning, discovery learning, game theory, constructivism.

Introduction

The genesis and development of online games has brought about an interesting transition in what motivates children and adults to invest their time in immersive environments over the last 20 years. As ever, the key ingredients are mastery of a skill of some kind, and curiosity about the narrative suggested by the setting and contents and where it will all lead; arguably the preferable ingredients for e-learning development where discovery and games-based learning approaches are used.

When online immersive 3D games are re-purposed for educational use, ideally they bring with them most of the elements of the original game that made it engaging for users in the first place. There is increasing evidence that learning based on games is having a major influence on educational delivery. EDUCAUSE's 2009 Horizon report states that "Experience with and affinity for games as learning tools is an increasingly universal characteristic among those entering higher education and the workforce" (Johnson et al. 2009).

In this poster a taxonomy of game development tools is mapped against games-based learning theory in the context of four game development environments. What emerges can suggest promising directions to take in online educational software design.

Changing the motivation

Graphic games that give users a first person POV have been around since the early 1990s, providing them with an immersive visual experience that is frequently designed with the object of shooting anything that moves in the 3D landscape. The first-person-shooter (FPS) genre produced titles such as *Castle Wolfenstein*, *Doom* and *Quake* - all highly popular examples of the online interactive game approach. Narratives in these FPS games tend to be basic and repetitive as the gameplay itself is the main determinant of engagement. Conflict is built into the interaction from the very first frame and the obligatory back-story usually adds little to the player's basic motivation as surviving attacks from programmed opponents quickly becomes the main issue. Ironically, the 3D graphic user interface (GUI) that these games employ was initially an add-on feature of text-based "Adventure"-style games that relied solely on text descriptors and branched-decision narrative structures to further the story-line. GUIs merely replaced typed navigation instructions such as "enter room" with mouse movements or clicks. With the development of game platforms such as the FPS tiles described above, mastery of levels supplanted the narrative aspects of such games, previously inherent in the text. For many users an animated graphic exposition of violence will always trump a text description in a setting where the main motivation is to destroy opponents, mainly because there are only so many ways you can use text to describe the act of shooting a monster before it becomes a little too repetitive. On another level, the speed of interaction between characters in a graphics-driven virtual world usually generates an emotional response that text could never match.

Given the challenge of exploiting the motivational power behind FPS online games some educational game developers have recently begun to tap into the power of these networked games to provide educators with alternative forms of immersive learning environments that don't depend on scripted violence to provide the motivation to explore a virtual world. Platinum Arts Sandbox (PAS) is one such environment that had its genesis in a Quake engine, normally used to create Death Match arenas for online combatants. The PAS development team decided to make the engine used to build virtual environments more suitable for use by children and adolescents by removing weapons, explosives and other violent aspects of combat-based games. Educational game developers have used PAS to build non-violent worlds where the main motivation is the completion of a pre-defined quest. They include reconstructions of archaeology sites, side-scrolling games and quests based on a generic "save the princess" model. The construction environment is simple enough to encourage adolescents to build complex, detailed worlds.

In the Minecraft development environment the main driver is discovery learning. Users need to learn how to use raw materials to construct specific artefacts such as bricks and wooden planks that can then be used for building structures and virtual inhabitants. The emphasis here is on collaborative learning as the game's website supports a large worldwide community, including 10.5 million registered users who exchange advice and resources on a daily basis.

Apart from the proscriptions on tools used for violent interaction, both adolescent learners and educational game developers now have the tools to build learning environments that are motivating, challenging and capable of producing achievable learning goals.

Current developments in immersive 3D games used for educational purposes

This poster will compare four online 3D development environments and how they have been used for various learning tasks, using elements of Game Theory, discovery learning and learning by design approaches:

- Platinum Arts Sandbox
- Minecraft
- OpenSim, and
- Second Life

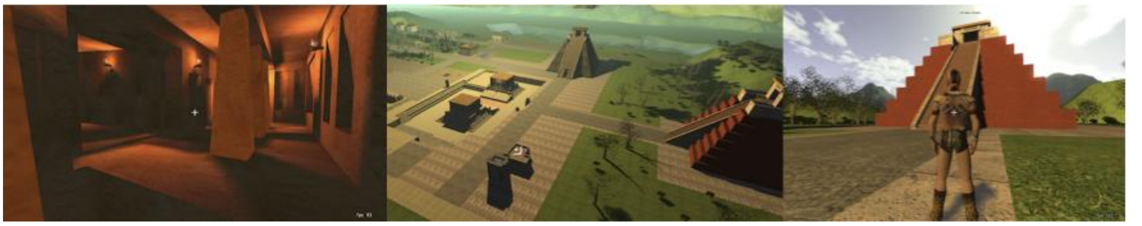

Figure 1: Screenshots from two archaeological online games developed using PAS

Platinum Arts Sandbox, as described above, offers users all the graphic power of an FPS game with violent artefacts removed. The development of two online archaeological games "The Search for 18 Rabbit" (Kerr 2011) and "The Tomb of Memi" (Leong 2011) using this environment is compared with a collaborative learning environment built using the networked game *Minecraft*. Finally, the potential to motivate learners provided by these online tools is compared with the proprietary world of *Second Life*, and its open-source equivalent *OpenSim*.

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Preserving our Past with Toys of the Future

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This paper presents the initial outcomes of a key scoping study undertaken to explore the role of augmented reality and motion detecting technologies in the context of Intangible Cultural Heritage (ICH) for museums related environments. Initial prototypes are in the form of an interactive infrared camera based application for children to engage with an Aboriginal puppet. This scoping study is unique, as it tries to combine two extremes: the curation of historical intangible artifacts and their preservation through digital intervention. Heritage related intangible content is always restricted because of its non-physical nature and can never be fully embed in an environment like museums and related exhibitions. This paper explores alternative opportunities for knowledge transfer of ICH content that manifest with playfulness in order to elicit a deeper understanding of such intangible cultural artifacts. This study is complementary to multiple disciplines including heritage preservation, museum technologies and emerging interaction design.

Keywords: Heritage Preservation, Museum Technologies and Augmented/Mixed Reality

Introduction

The term heritage refers to things that are inherited from the past. It refers to tangible artifacts such as natural resources and man-made items or intangible artifacts such as customs and ancestral practices. Heritage also defines a culture through the identification of a community with their language, ecosystem, traditions, genetics and general way of life. Cultural heritage helps a community define its current and past identities for itself as well as others (Zhang, 2010). It has a tremendous power to elicit a sense of belonging in a community. Heritage and its preservation are also important for the local economy (Bowitz & Ibenholt, 2009). Heritage sites, museums and exhibitions generate employment opportunities and provide financial help for communities. Watson (2010) also acknowledges that songs are the most important carrier for cultural elements from one generation to the other. As songs are traditionally poorly documented when other communities colonized these regions, the dominant culture cannot easily integrate the indigenous heritage and related oral culture with their own. Hence, the original oral traditions and local cultural creativity decline to sub-dominance as is seen in African and Caribbean regions.

Communities display their heritage through customs and objects from their past. The predominant forms of displaying such artifacts are museum spaces. The form of museum design has changed over time to protect and enhance intangible cultural heritage (ICH) and to provide diversified experiences from the user's point of view (Y. Shi, Hao, & Sun, 2008). New media and emerging technologies have the potential to move heritage preservation beyond static displays, capturing in cinematic or narrative forms and revitalize the intangible aspects (Yehuda, 2008). New and emerging technologies are utterly transforming two main activities central to the process of re-creating and understanding the past, (a) digital recording and analysis of scientific data and (b) the communication of new insights and understandings about the past to the widest possible audience through interactive applications (Silberman, N. 2004).

Augmented reality (AR) and gestural interaction are contemporary emerging technology that may breathe new life into museum displays through their bodily involvement and potential to preserve intangible content and educate future generations. This interesting use of technology in a museum motivates visitors to engage in challenging learning situations. Research has found that technology-mediated narrative and the interactive, situated, collaborative problem solving affordances of AR are highly engaging (Dunleavy, Dede, & Mitchell, 2008). In this regard, the concept of mixed reality based user interactions for heritage representation becomes one of the central interests for the design and evaluation of the future of museum exhibits.

There are two overarching factors that justify this scoping study:

a) Lack of interesting content related to ICH and its awareness for visitors to museums (Lee 2004);
b) Lack of purposefulness for the use of emerging technologies, especially AR, in order to engage and provide knowledge transfer opportunities to museum visitors.

In this article, we will present a scoping study in the context of ICH, museum exhibits and emerging technologies. We will discuss emerging user interactions, which involved a number of digital tools and methods to form cohesive, immersive and engaging interactions, which are essential for the design and evaluation of the future museum displays. In addition, a virtual AR prototype will be presented that leverages the kinesthetic value of the Xbox Kinect, "Aboriginal Dance for Kids", currently under development for examining the knowledge transfer, engagement and provision of authentic learning environments in relation to the curation of ICH in museums.

Background

One can enjoy the dances and music from the past, however, participation and learning from these performances are challenging in nature. Therefore, amazing festive events with dances and gatherings are choreographed in the museums; yet audiences are not interacting and most importantly learning from these events. In addition, producers of these tangible presentations in museums are only the transmitters of cultural information. They transform messages, stories and happenings from the past in a linear (non-interactive) fashion and do not provide freedom for the audience to interact with the content. Visitors to a museum, in these *one-way* scenarios, are the non-immersive, non-engaging players and cannot contribute; only acting as passive spectators.

The use of simulation games produces real-life situations with a deeper understanding of the subject matter (Boocock & Schild 1968), (Pan, et al 2006), (Huang, Rauch, & Liaw 2010). Embodied and gestural based game devices with AR, have the potential to breathe new life into museum. The use of these technologies in the context of ICH not only provides tremendous showcasing opportunities but also guarantees the spontaneous, undirected learning experiences for people of all ages (Tanenbaum & Bizzocchi, 2009).

However, there are some challenges facing these exhibits. While new technologies have complemented museum related installations and representations of the past they are somewhat limited in showcasing objects with their related processes and contexts (Kalay, 2008). Visitors are experiencing the ubiquitous use of new technologies in museums around the world however this approach has created a challenging situation where more objects and artifacts are seen rather than examined in historical context (Lee, 2004).

In today's museums, visitors experience both linear and non-linear interactions. Linear interactions are ones where visitors receive information and they do not have choices to stop, start and skip the information. In contrast, non-linear interfaces are those where visitors have full autonomy to select, run and execute the information. While linear displays attract users with the extravagance of visuals and multimedia, non-linear interaction, such as touch screens and interactive displays, invite them to challenge their mental abilities and to retrieve information. The ultimate goal is to allow users to understand the application content and goals in an easy and natural manner (Ganotto, Mainetti, & Paolini, 2008).

While tangible historical objects such as artworks, photographs and items from archaeological digs have always made up the majority of museum exhibits, the presentation of intangible content has been limited and restricted to two dimensional art depictions and/or animations and video. Kinaesthetic interaction with intangible content such as music and performances including dance is essential for knowledge transfer, future dissemination and the passing on of such *wisdom* to others. Without these opportunities, traditions and customs of cultural significance vanish. This is evident from the limited knowledge of the intangible heritage of lost civilizations such as ancient Greek music (West, 1994) and the Chinese indigenous musical performance named "kunqu" (Wong, 2009).

Types of ICH

There are numerous manifestations of ICH. In this section, we will discuss some significant types that could better be preserved through emerging technologies.

Oral Traditions, Expressions and Language
When a society makes a certain major decision to segregate themselves from another society, a distinctiveness of a certain culture is formed (Arizpe, 2004). Oral tradition, community's expression and particular language are built based on differences and uniqueness.

Memories
Memories plays an important role in the development of human culture and inter related socio-interactions. (Gandhi & Gandhi 2009) relates how memories can heal the bitter past and bring various ethnic group together.

Music and Performing Arts
Like organized ideas transform into arts and design, organized sound turns into music. Music is important in human civilization and playing a pivotal role in categorizing communities. The evolution of music over the period of time could help to categorize and study human as well as animals of some breeds (FITCH, 2005)

Practices, Rituals and Festive Events
Clavir (2002), who study Aboriginal and non-Aboriginal culture argues that cultural preservation can only be achieved through maintenance and perpetuation of the values, beliefs, and related activities of a culture. Preservation of context and associated activities are also important (Simpson 2009).

Traditional Craftsmanship
Various ritualized actions from different cultures and ethnicities were responsible of giving form to associate or related objects. A strong relationship between rituals to its physical spaces could easily be noticed (Conan 2009). For example, a Chinese garden and Chinese theatrical performance 'kanqu' where the wealthy people build a stage near the water pound in the garden. This structure for performers is necessity and is later converted to a design element of the garden.

Emerging Museums

A more engaging and immersive experience for museum visitors is critical (Marianna Adams, Jessica Luke, & Theano Moussouri, 2004). When visitors have control over the exploration of ideas and concepts, their experiences become more meaningful. Interactive components within the museum's installation provide these kinds of experiences. Clarity of purpose, design factors, social engagement and learning are some of the key factors important in acquiring this experience. For that reason, the changing paradigm in heritage related asset representation is rapidly shifting from tangible to intangible; from visible to invisible.

One example is the collection of stories at the Amsterdam Historical Museum and the accompanying exhibition "East" (Alivizatou 2004). The oral histories exhibited represent the first virtual objects in the collection of the museum. Similar goals to preserve ICH and the sufficient portraying of theatrical events have seen museums record theatrical performances to include them as part of their collection (Alivizatou 2004). Moreover, museum exhibits are also transforming content and displays from non-interactive to interactive and linear to non-linear (Leinhardt & Crowley 2002). As museums are seriously challenged by the increasing number of available online information they must adopt more interactive information retrieval systems on their premises. For example, *Pockets Full of Memories* which was exhibited on the main floor of the Centre Pompidou National Museum of Modern Art, Paris (Legrady, 2002), was an interactive installation in which visitors could contribute visual and descriptive information to the digital archive about a particular object in their possession. This information is embodied within an interactive kiosk and the relevant information is made available online after their visit.

Diminishing indigenous songs and languages from all cultures of the world are just some of the existing challenges for preservationists. The use of emerging technologies could successfully provide meaningful, entertaining and endless leaning opportunities. For example, the top 10 languages (of approximately 6,700) are spoken by 40% of the earth's population, and the top 20 are spoken by half of the people on Earth. 96% of the human population speaks just 4%. According to Dalby, a language dies every two weeks (Dalby 2002). Marett and Barwick (2003), in this context, also talk about the endangerment of indigenous Australian songs and languages and mention the active collaboration among the experts, performers and relevant communities is required to revitalization and awareness of music, which is a deeply valued part of Australian cultural heritage. While putting emphasis on the preservation of indigenous songs and language, their article also mentions the current localized existence of indigenous and endangered musical culture in Australia. Today, due to historic and other reasons, such oral history fails to be passed down to the next generation. It requires an urgent need protection. However, with the modernization of the society, ethnic traditional cultural has suffered a severe impact with fewer and fewer festivals and folk song/lore events being held by ethnic groups each year. In Australia, some of the events have closed due to the retirement of elders and lacking of younger successors (Hong & Ling, n.d). Just because such ICH is registered with the Australian National Intangible Cultural Heritage List doesn't mean the details, context and nuances of such performances are retained for future generations. Diminishing indigenous songs and languages are some existing challenges for preservationists. Just as today's kinesthetic interactive computer games on the motion sensitive Xbox Kinect, Nintendo Wii and Playstation Move are recording, preserving and providing virtual game-based learning activities for today's contemporary hip-hop and break dancing, the strategic use of these same technologies may provide and essential tool for conserving traditional customs, dance, music and language that could not otherwise be fully appreciated unless bodily experienced.

Augmented Reality (AR) together with emerging technologies may provide the mechanism to revitalize ICH within museums. To date, there has been little research performed investigating the need for the purposeful use of new media specifically in museum exhibits. However, as related research shows benefits in the uses of AR in teaching, learning and collaborative settings with findings relating psychomotor skills with wearable AR (Jayfus D, 2008), it's a natural progression to apply this pedagogy, referred to as *Augmented Learning*, to ICH. Furthermore, mobile AR systems are increasingly being tested in rich content environments, as they can enable visualization of 'unseen' valuable and complex 3D content as well as provide added edutainment-value in today's cultural heritage sites (Papagiannakis, Singh & Magnenat 2008).

Augmented Learning

Augmented Learning (AL) is a pedagogy whereby the real world is adapted with props and contextual information to provide an immersive and authentic learning environment for students while sustaining student-student and teacher-student social interaction. Where once props were as simple as paper, pencil and costumes, today the renewed domain is tightly coupled with technology due to the endless possibilities emerging media provide to adapt learning situations to student needs. Although an emerging issue for education, action research is needed to ensure optimal use of AL in a variety of contexts. Augmented Learning environments provide unique, hitherto impossible, opportunities to change the nature of learning and teaching experiences. First, AL environments enhance interactivity with content and processes through simulations and role plays (Oblinger, 2004). Moreover, they support interpersonal interactivity (with individuals or groups of individuals) while immersed within another activity (Rosenbloom, 2004). Second, AL environments are able to deliver rich conceptual resources for reasoning about and thoughtfully acting in playful spaces, and thus can more easily become highly engaged in the subject matter (Roschelle & Pea, 2002). Third, AL environments facilitate students to build their own activity and experiences and to take control of their own learning (Meiguins, de Souza Junior, de Brito Garcia, & Gonclaves, 2004). In this way AL, much more than 'traditional' learning environments (digital non-augmented learning environments included) and could support individual differences in students' learning styles, physical abilities, intelligence levels, and background knowledge.

AR combines real and virtual, interactivity in real-time and operates in three dimensions. In other words, it is a promising field developed on the basis of Virtual Reality (VR), which superimposes computer generated virtual information onto the surrounding real environments to augment user's perception in real-time and interactively (Su, Kang, & Tang, 2008). Figure 1 shows the use of AR and related technologies such as Head Mounted Displays (HMD) to superimpose multiple layers of information. In addition to virtual objects, more information related to touch, smell and taste could also be embedded or augmented to produce richer experiences (Yu, Jin, Luo, Lai, & Huang, 2010).

Figure 1: User wears a head mounted device (HMD) and views the 3D version of the story while exploring the contents of the story by unfolding the magic cube (Pan, Cheok, H. Yang, Zhu, & J. Shi, 2006).

Augmented Learning in todays Museums

There are many research-oriented efforts to bring augmented reality learning to its fullest intervention in the context of cultural heritage. For example, the ARCHEOGUIDE systems (Gleue & Dähne, 2001, Vlahakis et al., 2001) that provides on-sight personalized cultural guides. These guides, based on position and orientation in the cultural site, help visitors as a virtual assistant and provide AR based reconstructions of ancient ruins. Figure 2 shows ARCHEOGUIDE systems and user's point of view together with the augmented view of the Hera temple in ancient Greece.

Figure 2: Mobile unit's main module in backpack and ARCHEOGUID system.

There are also many tourism based AR applications for example the augmented binocular (Fritz, Susperregui, & Linaza, 2005). This is a coin operated binocular system found on hills and tourist palaces. This AR based binocular offers an overview over the buildings and streets of an area, natural and cultural sites as well as the chance to zoom tourist assets close to the spectator. Other systems, which use mobile devices together integrate with freely available Google 3D models to augment the vision by placing virtual objects with historical significance in situ over live vision of the real world (Honkamaa, Siltanen, Jäppinen, Woodward, & Korkalo, 2007).

AR improves existing static and non-interactive real-world artifacts and multimedia presentations, by heightening visitors' understanding and appreciation of cultural heritage. Many museums have already integrated AR into their educational offerings. While handheld devices are flooding the market, AR related applications are available for consumers to emerge themself into augmented realism. Figure 3 shows an iPhone application (Streetmuseum, 2010) developed for the Museum of London to see the old London (Zhang, 2010). The application uses GPS coordinates system and lets you see about 200 historical images from different parts of London.

Figur3: An augmented reality based iPhone application created by the Museum of London that allows users to browse historical photographs in various parts of the city.

Unfortunately while there are numerous AR installations in museums they do not focus on ICH and offer little interactive learning experiences in addition to requiring time passive user involvement. These systems, for cultural presentations, do not offer the full potential of AL through immersive and engaging experiences. Furthermore, these installations continue to rely on conventional methods of presenting tangible heritage related representations from the past (East County Magazine, 4 April 2011). Systems like ARCHEOGUIDE reconstruct the physical past reality however ICH is not addressed.

A Prototype Immersive ICH Application for Children

For our own research, based on the importance of ICH in the Australian Aboriginal culture, including body paints, dance movements and sound, we have created a prototype application "Aboriginal Dance for Kids". The application targets children in a heritage related environment in order to create awareness about indigenous dance movements and body paints. Figure 4 shows a child synchronized and playing with an Aboriginal puppet. The application is based on the infrared camera embedded in Microsoft Kinect device and various patches on Quartz Composer. Quartz Composer (QC) is a node-based visual programming language provided as part of the Xcode development environment on Mac OS X for processing and rendering graphical data. A screen based Aboriginal puppet appears and moves accordingly as person moves in front of the camera. The background plate behind the puppet is not live footage; it is also an animated images based on a QC patch. The application calibrates the user in front of the camera together with the skeleton and the puppet. Afterward, the user can control and move the puppet around. An aboriginal song is also accompanied during the calibrated period of the application.

Figure 4: "Aboriginal Dance for Kids" an application for the awareness of Aboriginal's dance, body paints and their inseparable association with the environment.

The first purpose of this scoping study was to acquire knowledge about ICH and emerging haptic/motion-detecting technologies. Second, as museums should be attracting young minds, our goal was to integrate the above two variants together and develop a playful application for children. The initial impact of this application is favorable and shows promising results, particularly on the motivational level for the young. At this initial stage, the primary objectives of this prototype are: a) to determine the overall effectiveness of the prototype with children in the context of ICH; and b) to identify important perceptual and technical additions/adds-on that will help in providing recommendations for the development of a concluding application. Subsequently, during the design finalization phase, we will be able to evaluate the qualitative and quantitative learning outcomes for the visitors at a cultural sight or museum.

To date, we have trialed the interface with 15 children between the ages of 6 and 12 (9 female, 6 male). The prototype was placed in a heritage related environment in Qatar and the children encouraged interacting with it. Qualitative observations were gathered with respect to the children's engagement and playfulness while using the system. It was noted that the majority of the children felt comfortable using the prototype and found the content enjoyable. During the testing it was discovered that the puppet's range of movement is too limited as it is currently a 2D object and only responds to up/down and left/right movements. Children became frustrated when they were expecting to see the puppet rotating but could not. Future versions of the prototype will require a 3D avatar to be integrated in order to extend functionality to the full range of human motion.

Sound, visuals and active physical involvement/interaction constantly engage with the participants providing a considerable amount of emersion into the augmented realism. Consequently, with the assistance of the final application, we will be able to collect some empirical data related to children's motivational engagement and learning outcomes in the context of this type of presentation of ICH.

Summary

Although there have been many technological based representations of cultural assets in museums, these installations only represent and visualize the physical objects and environments. It seems the representation of a culture has been transformed into elements of a showcase. The challenge therefore is to construct immersive and meaningful experiences by leveraging current emerging gaming technologies. It is quite possible that the ubiquitous natures of these devices could provide a wide range of heritage representations in a unique and impactful manner. Our study has identified the use of augmented learning in the preservation of ICH as a gap in the research, adaption and deployment of such technology. In 2007, AR was listed as one of the ten most exciting emerging technologies, which are most likely to alter industries and the fields of applied research (Jonietz 2007). Moreover, in 2010, it is also listed as a key educational technology with a time-to-adoption in the next four to five years (Johnson et al 2010). Therefore, it is imperative to create mind-engaging applications and challenging pedagogical contents in heritage related exhibitions so they not only expose users to the past but also enjoy the limited time they spend inside the museum. These interventions may help in culminating new patterns of curation and understanding of ICH and might have the potential to revitalize, and preserve the culture in ways not yet realized.

Cultural tourism is an important and fast developing industry. There are over 40,000 museums worldwide; it is a major segment of cultural tourism market (Hsieh, 2011). While museums are multiplying in numbers, they are also facing challenges such as active participatory learning opportunities for youngster. Visitors inside the museum should not only be entertained but also learn the importance of intangible cultural heritage at conscious and sub-conscious levels. Since AL and AR are not currently being used for best possible pedagogical purpose in museums, visitors inside the museum are not engaging with the subject matter. Furthermore, emerging technologies such as haptic and motion detecting technologies are not widely used to enhance the impact of ICH related learning opportunities due to the lack of technical skills and an understanding of their conceivable benefits by museums and heritage preservation organizations.

It is assumed this study and the resulting prototype will be a point of departure for the meaningful and playful activities for future visitors to museums. The application is attracting interest from children and demonstrating that the emerging interactive technologies and ICH content is crucial for today's museum. The application provides physical participation and entertaining feedback that immerses museum visitors within the ICH content in a truly unique way. The puppet inside our prototype, which shows Aboriginal body paints also, helps in creating awareness about the indigenous body arts providing an authentic learning environment.

It is expected that engaging visitors with emerging technologies inside a museum will have meaningful results to engage the mind and body in subject matter that has been traditionally two dimensional and passive.

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An evidence based approach to evaluation: A case study of the Positive Partnerships web space

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The Positive Partnerships is an Australian Government initiative that is designed to provide information and professional development for Australian parents, carers and school staff working with school aged students with autism, using a combination of face to face and online delivery. This paper investigates first, how the website can present research-based interventions in a field marked by “bad science, risky medicine and the search for a cure” (Offit, 2008). Second, the paper offers suggestions for website evaluation. Maintaining a clear focus on the purpose of the site, and judiciously selecting among readily available online evaluation tools, are central to success. Triangulation, representativeness, independence and other key safeguards can also shore up the validity of website appraisals. The paper concludes by describing nine different complementary ways that the Positive Partnerships website has been evaluated, and briefly sketches a sample of the findings. Suggestions for future research are provided.

Keywords: autism; e-learning; evidence-based; teacher professional development; evaluation.

Introduction

It has been estimated (Center for Disease Control, 2009) that one in 110 people has autism, an information-processing disorder which is marked by repetitive and restricted behaviours and impairments in communication and socialisation (American Psychiatric Association, 2000). Autism is a complex and puzzling disorder that has attracted a plethora of interventions with greater or lesser (including non-existent) degrees of evidence. A casual visitor to Google will find that the word “autism” yields 79,000,000 results in less than a second, and “autism websites” yields 8,890,000 results in the same time span. With so many sites to choose from, how can parents, professionals, students and the general public know which ones to trust? Conversely, from the perspective of the website creators, questions arise as to what principles should be adhered to during site construction, and how the website should be evaluated to ensure it fulfils its intended purpose.

This paper traces the history of the *Positive Partnerships* website (http://www.autismtraining.com.au) to illustrate some of the challenges and possible solutions facing the creators of a web space that is customised for a particular population. In keeping with the theme of evidence-based practice, two issues will be discussed. *First, what procedures were used to ensure integrity of the site content, particularly in terms of their research basis? Second, what evidence was gathered to determine whether the web space was successfully fulfilling its* *intended purpose?*

Using evidence-based website content: Issues for practitioners

Begun in 2008, the *Positive Partnerships* website has been operating under a four year $23 million funding arrangement with the Department of Education Employment and Workplace Relations as part of the Australian Government's *Helping Children with Autism* package. The website is designed to complement a series of face to face workshops and information sessions for school staff, parents and carers to assist them to meet the needs of school aged students with autism.

Evidence based content on the site is important because autism intervention is a contested area (Offit, 2008). Controversies arise partly because two affected individuals are rarely alike. The diversity of autism expression makes it difficult to use the research gold standard of randomised control designs which require participant groups to be matched on all relevant characteristics apart from the intervention, which only the experimental group receives. Without a control group, the possibility that observed improvements over time are simply due to maturation rather than the intervention, cannot be ruled out. For instance, interventions that could potentially be included in the website range from the use of speech therapy, applied behaviour analysis and visual supports through to weighted vests, hyperbaric chambers, and swimming with dolphins. Whilst some of these appear extreme, there is nevertheless the possibility of false negative errors. That is, *effective practices could be wrongly excluded simply because sufficient supporting evidence has yet to become available*. This dilemma is particularly resonant in autism research, where we know that best results are obtained when intervention occurs early in the person's life. As graphically described by Szatmari, (1999) many parents of newly diagnosed children are desperate for the latest cure, and they may feel that waiting for appropriate evidence from the "research establishment" robs their child of the opportunity to improve at a time when (s)he may have been most receptive to treatment. For their part, researchers know that recommending only those interventions that have garnered sufficient support is likely to curtail the speed of progress. They also know that marking time is contrary to the researcher's role of creating *" ... new knowledge and/or the use of existing knowledge in a new and creative way so as to generate new concepts, methodologies and understandings"* (DIISR, 2011, p 7).

The tension between innovation and following promising new leads on the one hand, and relying on evidence based practice so as to avoid a disappointing failed intervention on the other, can be partly reconciled by first appreciating that evidence is not an all-or-none concept. Instead, evidence for particular practices can be envisaged as lying on a continuum. In the United States for example, federal laws distinguish between the following three levels of evidence in the education of students with disabilities:

- Research based practice, which includes action research documenting circumscribed programs with limited generality to other individuals or contexts
- Scientifically based research that is systematic, replicated, and had undergone a peer review process
- Evidence based practice, which is quantitative, demonstrates cause and effect, and has sufficient magnitude.

At one end of autism research are the studies with robust designs that include features such as randomised controls, repeated measures, well replicated findings, triangulation, and adequate reliability. The three US levels of evidence tend to cluster at this high end of the continuum. At the other end are poorly documented single instances that may include beguiling treatments that hold the promise of a cure. In the latter cases, parents may not care about lack of evidence – so how should the researcher proceed, if they are concerned to keep up with the latest developments whilst simultaneously minimising possible parental disappointment?

The solution to content integrity adopted by *Positive Partnerships* has been not to dictate which interventions should be taken on board, but instead, to help the parents and teachers make informed choices based on the available research. A series of fact sheets has been produced which include information about evidence based practice. The website gives prominence to approaches underpinned by sound research but does not give blanket recommendations for specific named treatments. Instead it provides tenets of good practice and provides guidelines so parents and teachers can make their own decisions. This strategy is consistent with general principles of collaboration, individualisation and parent /teacher empowerment, and recognises the importance of first hand knowledge of the child, so that approaches can be tailored to individual circumstances.

Evidence to inform website evaluations

Important as evidence-based content may be, it should not be the sole criterion used to judge a website. This brings us to the second issue addressed by the current paper. Good websites are marked by high participant engagement, with content that is not only accurate, but accessible and easy to find, supported by a seamless integration of technology, pedagogy and content (Hodes, Foster, Pritz & Kelly, 2010). All website owners should evaluate their online content and processes, and determine how well these align with the original reasons for establishing the site. This is easier said than done. If processes and/or metrics are misapplied they can provide a misleading picture of the value of a site. The remainder of this paper uses the *Positive Partnerships* experience to illustrate some of the decisions, challenges, data collection and analyses that were undertaken to evaluate the website and provide an evidence base for future autism e-learning.

The *Positive Partnerships* web space was established in response to a government tender, so the first and most obvious step for the website evaluation was to ensure that it conformed to the funding requirements. The general brief was to develop and maintain an engaging, interactive and user-friendly project web space that facilitated the online workshops and e-learning opportunities for parents, carers and school staff and thereby promote "autism friendly" schools and productive home-school partnerships. The vision for the web space was that it would be instrumental not only in helping to create a pool of knowledgeable parents and school staff, but that it would also facilitate networking between professional development participants, thereby sustaining an autism community of practice. Thus, the web space was more than a content repository, although the provision of evidence-based and nationally consistent content was obviously important. The web space would also have administrative functions (such as enabling online registration for workshops and providing reporting statistics); pedagogical imperatives (such as allowing self-paced learning and significant choice); and access requirements, since the autism initiative was nation-wide. Clearly these were complex requirements which illustrate a recurrent theme in this paper: the views of stakeholders, including reference groups as well as the participants themselves, are critical.

Although there is a wealth of information about website evaluation, it has to be used selectively. For example, it is possible to calculate usage levels by using the Google Page Rank, an easily accessible measure from zero to ten that is based on the number of incoming links from other websites. The greater the number of websites that put a link to a given website, the greater the page ranking for that site. Apart from the fact that the metric can be manipulated, the measure reflects not how potential participants value the website, but how other websites value it. Even when the focus turns to participants rather than sites, other freely available statistics can be skewed to an oversimplified marketing orientation. A common tactic is to compare the number of visits to the site relative to all other sites, and use this to place a monetary value on the site. However the *Positive Partnerships* web space is not designed for advertising or revenue raising, nor does it target the general public although anyone is free to visit the site. It is designed primarily for parents and teachers of school aged children with autism, who value the site differently because of their close personal involvement. These examples illustrate again the importance of each web space customising its reporting statistics to comprehensively survey the views of the users it is designed to serve.

The above example also points to the dangers of relying exclusively on a small data set. Chiou and Perng (2010) surveyed the literature from 1995 to 2006, and extracted the following research methodologies in website appraisals: survey (42%); think-aloud experiment (23%); content analysis (17%); case study (10%); automatic evaluation (5%); and concept development (3%). Accordingly, the Positive Partnerships project has employed an array of methods to collect quantitative and qualitative data about its web space. Consideration has been given to the following safeguards (Kervin, Vialle, Herrington, & Okely, 2006):

- Collecting a variety of data types (qualitative as well as quantitative)
- Ensuring that not all the evaluation is collected online, in order not to limit the voices of those in rural and remote locations or those with accessibility issues
- Triangulating the data by collecting it from different sources and using different methods,
- Collecting data from the greatest number of participants as possible to increase confidence in the representativeness of the data

- Constructing a comprehensive user profile, to determine if the web space provides equitable services for people with differing experience, professional status, or geographic locations
- Designing continuous automatic data collection, to analyse trends over time
- Creating the web space according to leading practice principles and testing these against the subjective experiences of participants
- Ensuring that the evaluations not only are independent, but are also perceived as such. The web space has been periodically provided with internal formative evaluations from individuals at arm's length from the project, to maximise impartiality. This was complemented by an independent summative evaluation at the end of the second year of delivery to measure the effectiveness, appropriateness and efficiency of the Project.

With the above safeguards in mind, the *Positive Partnerships* project has relied on nine major sources of evaluative data. These are outlined below, along with a brief summary of our findings and lessons learnt.

1. **User statistics**. A range of statistics is collected automatically as each participant logs on. These statistics enable evaluation of usage levels in terms of total logins, unique logins and duration), user locations/backgrounds, and the content accessed. These have proved to be extremely useful for planning. The website currently attracts 150-200 visits each week and at the time of writing has about 13,500 active users. Online activity, not surprisingly, is linked to the face to face workshops.

2. **Think aloud protocol** for attendees at face-to-face workshops. To determine the user friendliness of the site, volunteers with a range of computer competence and access performed typical tasks on the Positive Partnership site and their comments were recorded and later, acted upon. We found that participants wanted a search button; that some files were slow to upload; that some participants were confused by computer terminology such as "online learning portal"; and that they all appreciated time-saving features such as being automatically redirected to resume an activity at the point where they had left off.

3. **Module review questions**. Participants complete a short series of open and closed-answer questions to assess their learning of module content. Even though approximately three quarters of respondents did not attend the face to face workshops, they still rated the modules favourably, indicating that they were successful stand-alone activities.

4. **Module 1 quiz**. To bring participants to a more comparable level of entry knowledge for the first face to face workshop, they were required to complete a module and associated quiz before the workshop in order to assess their level of learning. The quiz is compulsory for teachers attending the face to face workshops who wish to have their learning credited towards a postgraduate qualification. Gathering statistics on the quiz right from the outset led to adjustments such as the removal of an ambiguous item, thereby eliminating a possible source of disappointment at an early stage.

5. **Public evaluation** of the online Learning platform. Everyone is invited to complete an online survey, in order to better understand the views of all users, including people who have not attended any of the face-to-face workshops /information sessions, but who could benefit from the "Positive Partnerships" site. This evaluation includes both objective and open ended questions and has been extremely useful in gauging people's views of the site particularly regarding the usefulness of content, participants' understanding and engagement, their preferred site features, and suggestions for improvement.

6. **Public online feedback**. A feedback tool is provided to enable participants to provide online feedback at any stage about content, faults, and new enhancements. This averages only about 100

responses per year. The most common response category concerns faults, with the majority of these falling in the technology domain and particularly speed of access.

7. **Pluralistic walk-through**. This is one of the few evaluation tools that does not use participant feedback. It involves a formal internal audit of the development and affordances of the web space to evaluate it against an exhaustive list of the DEEWR requirements for the web space. It has proved to be a transparent tool that allows a quick evaluation of whether the project is "on track".

8. **Discussion Board analysis.** Teachers and school staff, and parents/carers can log on to a discussions tool to share experiences. We found the Discussions tool generated a large amount of text: 1830 pages in the first few months. Not only did these require moderation, but the evaluation had to be managed strategically. The responses generated were therefore subjected to a content analysis using Leximancer, a data mining software tool that also displayed data visually within seconds on a concept map. It was found that "student" was the most salient theme, highly connected with the concept "autism", which was consistent with high content validity. There was also a high emphasis on practical strategies to address students' needs, supporting the value of the site.

9. **Independent summative evaluation.** The external evaluator was able to enrich the data collection via the use of focus groups, submissions, case studies, surveys and other consultations, and recommended that additional funding be provided to continue the project.

Concluding comments

This paper has firstly attempted to resolve issues associated with the provision of evidence-based content in the contested area of autism intervention. Secondly it has suggested several guiding principles and pointed to the importance of using complementary methods to try to obtain a comprehensive picture of any website, over and above a mere index of participant satisfaction.

Several caveats are in order. The participants' access to the website was linked to their participation in face to face sessions, so it is difficult to unambiguously attribute any improvements in knowledge to the website or the face to face sessions. A second aspect of website evaluation that deserves mention is the use of direct versus indirect measures of success. The Positive Partnerships project was designed to improve the educational outcomes of students with autism, by assisting their parents, carers and teachers to become better informed and competent in meeting their needs. Largely through analysis of the module review questions, quiz, public evaluation, and discussion board, it has been possible to conclude that the participants' knowledge and confidence has increased. The data also confirmed that participants also perceived better outcomes for their students. Nevertheless, until direct observations of student outcomes are made by researchers, the possibility exists that teachers' perceptions of their students' progress were coloured by their expectations. Verifying the impact of the Positive Partnerships initiative on students with autism remains a tantalising possibility for future research.

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Modeling pre-service teachers' technological pedagogical content knowledge (TPACK) perceptions: The influence of demographic factors and TPACK constructs

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The TPACK framework comprises seven constructs that describe teachers' technology integration expertise. These TPACK constructs address a theoretical void in the area of educational technology and have been widely adopted by colleges of education for the planning of teacher technology integration courses. This study first describes Singapore pre-service teachers' TPACK perceptions with respect to these seven constructs. Using a stepwise regression model, this study then analyzes the relative impact of age, gender, and TPACK constructs on the TPACK perceptions of pre-service teachers. It was found that TPACK constructs had significant impact on pre-service teachers' TPACK perceptions whereas the demographic variables of age and gender were not signficant. Among the TPACK constructs, only technological pedagogical knowledge and technological content knowledge were found to be significant predictors of TPACK. The implications of these findings on the design of pre-service teacher ICT courses are discussed.

Keywords: Technological pedagogical content knowledge, TPACK, teacher ICT education.

Introduction

Technological Pedagogical Content Knowledge (TPACK) is a theoretical construct formulated by Mishra and Koehler (2006) to characterize teachers' expertise with respect to the integration of information and communication tools (ICT) into teaching and learning activities. It is anchored upon the notion that teachers need to combine the three knowledge sources of technological knowledge, pedagogical knowledge and content knowledge when integrating ICT. In doing so, they develop four other kinds of ICT integration knowledge namely technological pedagogical knowledge, technological content knowledge, pedagogical content knowledge, and technological pedagogical content knowledge. The unique contribution of Mishra and Koehler's TPACK framework is the specification of these seven TPACK constructs which addressed the lack of theoretical specification for the teachers' body of ICT integration expertise in the field of educational technology (Koehler & Mishra, 2008).

This framework has since been widely adopted for the planning of teacher ICT education (Cox & Graham, 2009; Thompson & Mishra, 2007) and used as a theoretical underpinning for the development of surveys to measure teachers' TPACK perceptions. This is because TPACK surveys assess the various categories of teacher ICT integration knowledge which has not been addressed in established technology integration surveys as these tend to focus on teacher attitudes towards technology adoption (Christensen & Knezek, 2002). TPACK surveys serve to inform teacher educators about pre-service teachers' information gaps with respect to ICT integration. Quantitative results from TPACK surveys can also be used to establish statistical models that explain the factors affecting pre-service teachers' TPACK. Examples of such factors would be age and gender, which have traditionally influenced teachers' attitudes towards computer use (e.g. Markauskaite, 2006; Teo, 2008). There is also evidence that teachers' overall TPACK perceptions are influenced by TPACK constructs such as pedagogical knowledge and technological pedagogical knowledge (Chai, Koh, & Tsai, 2010; Chai, Koh, Tsai, & Tan, 2011). By understanding the relative influences of these different factors, teacher educators can better support ICT program design and evaluation. However, such kinds of studies have not often been carried out as many TPACK surveys are still in the process of construct validation (see Graham et al., 2009; Schmidt et al., 2009).
This study therefore seeks to first describe the TPACK perceptions of Singapore pre-service teachers through a TPACK for Meaningful Learning survey that was validated in a prior study by Chai, Koh, and Tsai (in-press). It then describes the factors affecting pre-service teachers' TPACK through a regression model that incorporates age, gender, and TPACK constructs as independent variables. Implications for the design of teacher ICT programs are then discussed.

Literature review and research questions

The TPACK framework

Shulman (1986) posited that teachers possess a special form of expertise for teaching that is derived from the combination of both their content knowledge and pedagogical knoweldge. He termed this unique form of teacher know-how as pedagogical content knowledge (PCK), describing it as teachers' expertise for teaching particular subject matter. Mishra and Koehler (2006) extended Shulman's work by adding technological knowledge to content knowledge and pedagogical knowledge, proposing that the term technological pedagogical content knowledge be similarly used to represent teachers' expertise for technology integration, that is, to characterize how they make "intelligent pedagogical uses of technology" (Koehler, Mishra, & Yahya, 2007, p. 741). Technological pedagogical content knowledge was initially given the acronymn of TPCK which was later changed to TPACK to emphasize the integrated use of Technology, Pedagogy And Content Knowledge for effective technology integration (Thompson & Mishra, 2007). The TPACK framework, as depicted by Mishra and Koeher (2006) is shown in Figure 1.

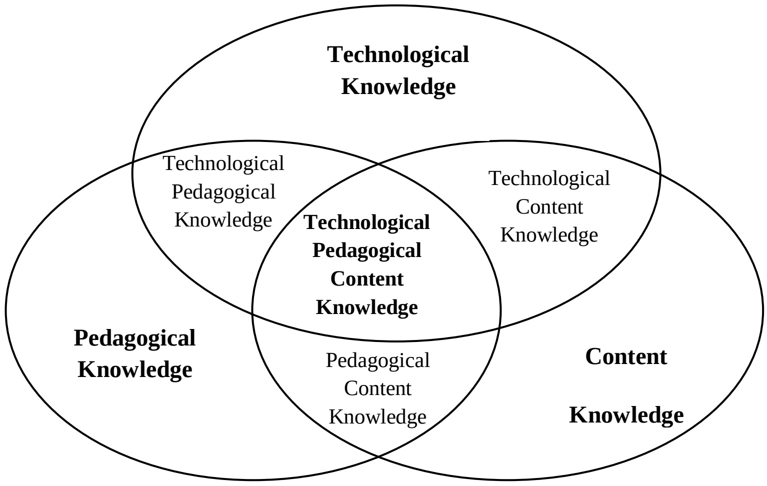

Figure 1: The TPACK Framework, as depicted by Mishra and Koehler (2006), pg 1025

The seven TPACK constructs are defined as follows:

35. Technological Knowledge (TK) – knowledge of technology tools.
36. Pedagogical Knowledge (PK) – knowledge of teaching methods.
37. Content Knowledge (CK) – knowledge of subject matter.
38. Technological Pedagogical Knowledge (TPK) – knowledge of using technology to implement teaching methods.
39. Technological Content Knowledge (TCK) – knowledge of subject matter representation with technology.
40. Pedagogical Content Knowledge (PCK) – knowledge of teaching methods with respect to subject matter content.
41. Technological Pedagogical Content Knowledge (TPACK) - knowledge of using technology to implement constructivist teaching methods for different types of subject matter content.

Factors affecting pre-service teachers' TPACK

Demographic factors

A factor that could influence teachers' TPACK perceptions is gender. Teacher attitude studies found that male teachers tend to be more confident of their ability to use computers than female teachers (Markauskaite, 2006; Tsai, 2008). The results of a large sample TPACK survey that was administered on 1,185 Singapore pre-service teachers by Koh, Chai, and Tsai (2010) were somewhat similar. This study found that male teachers rated themselves more highly on TK and CK. The effects on TPACK could not be assessed in the study because an exploratory factor analysis could not isolate the TPACK survey items as a factor.

Teo (2008) found that Singapore pre-service teachers' attitude for computer use were influenced by their age. This corresponded with studies of in-service teachers that have mostly found older teachers to be less confident with using computers (Yaghi, 2001). Similarly, Lee and Tsai (2010) studied Taiwanese in-service teachers' TPACK perceptions for using web-based technology and found the older teachers to be less confident. However, for pre-service teachers, Koh et al. (2010) found the negative correlation between age and TK to be weak. The authors conjectured that age may be a factor more pertinent for in-service teachers, which needs to be further explored.

The influence of TPACK constructs – TK, PK, CK, TPK, TCK, and PCK

There is some evidence that TPACK constructs could impact teachers' TPACK perceptions. Chai et al. (2010) found strong correlations between TK, PK, CK and TPACK. When examining the structural relations among TPACK constructs, Chai et al. (2011) found that PK and TPK had the strongest effects on pre-service teachers' TPACK. Nevertheless, these studies did not examine the influence of TPACK constructs in tandem with demographic variables. Furthermore, not all the seven TPACK constructs were included in these studies. For example, Chai et al. (2010) did not consider the intermediary constructs of TPK, TCK, and PCK while the TPACK survey used in Chai et al. (2011) could only establish construct validation all the seven TPACK constructs. Therefore, the structural model in the study did not include the construct of TCK.

Finding a suitable TPACK survey for statistical modeling

From the above review, it can be seen that a challenge faced when attempting to model TPACK relationships is the lack of TPACK surveys that have construct validity for the seven TPACK constructs as theorized by Mishra and Koehler (2006). The earliest general TPACK survey was Schmidt et al's (2009) Survey of Preservice Teachers' Knowledge of Teaching and Technology that was administered on 124 pre-service teachers in the USA. A limitation of this study is that construct validation through exploratory or confirmatory factor analysis was not reported. Besides Schmidt et al.'s TPACK survey, Graham et al. (2009) also developed a content-specific survey for TPACK in Science survey that is based on McCory's (2008) eight pedagogical uses of ICT for Science teaching. However, this survey was pilot-tested with 15 teachers in the USA, a sample size that was inadequate for statistical construct validation. On the other hand, several studies reported difficulties with TPACK construct validation. For example, Archambault and Barnett's (2010) exploratory factor analysis of a TPACK survey for online teaching found that the items for CK, PK and PCK loaded as one factor whereas the items for TPK, TCK, and TPCK loaded as another. These findings were similar to Koh et al. (2010). Lee and Tsai (2010) were able to isolate the factors of TK, TPK, TCK and TPACK, but found that the PK and PCK items had loaded as a factor. Some forms of statistical modeling through regression analysis or structural equation modeling have been carried out by Chai et al. (2010, 2011). As described above, the TPACK framework theorized by Mishra and Koehler (2006) could only be modeled partially because of challenges faced with construct validation.

A recent work by the Chai, Koh, and Tsai (in-press) reported that better construct validation for TPACK surveys could be obtained in two ways; firstly, by focusing the PK and TPK items on specific pedagogies and secondly, adding a stem "Without using technology…" into the PCK items to differentiate the applications of content knowledge within and outside a technological context. When these modifications were incorporated into Schmidt et al's (2009) survey, the seven TPACK constructs were successfully extracted through exploratory factor analysis of survey results from 214 Singapore pre-service teachers (Chai et al., in-press). Such kinds of validated TPACK surveys can address the issues associated with the comprehensive modeling of TPACK relationships as described above. These surveys can therefore be used in this study to facilitate the statistical modeling of factors affecting teachers' TPACK.

Research questions

Given the above review, this study seeks to use a validated TPACK survey to facilitate the development of a statistical model that incorporates the seven TPACK constructs theorized by Mishra and Koehler (2006). This statistical model also seeks to incorporate pertinent demographic factors such as age and gender so that a comprehensive model of pre-service teachers' TPACK perceptions could be examined. The following research question will be addressed in this study:

What is the impact of demographic factors (age and gender) and TPACK constructs (TK, PK, CK, TPK, TCK, and PCK) on Singapore pre-service teachers' TPACK perceptions?

Methodology

Study participants

The study participants were 350 pre-service Singapore teachers who were attending a compulsory ICT module during August semester of 2010. These teachers were also in the first semester of their teacher training programme. The TPACK for Meaningful Learning Survey used by Chai et al. (in-press) was administered to these pre-service teachers at the beginning of the semester through a web-based URL that was sent through their course tutors. Participation in the survey was voluntary and was not associated with any course activity or assignments. A total of 214 teachers responded to the survey, constituting a response rate of 61.14%. The survey respondents were largely female teachers (n=149, 69.6%). The mean age of the study participants were 26.61 years (SD=5.00).

TPACK Survey

The TPACK for Meaningful Learning Survey validated in Chai et al. (in press) for pre-service teachers was used in this study. This 30-item survey was adapted from Schmidt et al.'s (2009) survey that was based on the seven TPACK constructs theorized by Mishra and Koehler (2006). Chai et al. (in press) used Jonassen, Howland, Mara, and Crismond's (2008) five dimensions of meaningful learning with ICT as a theoretical basis for designing the PK and TPK items of this survey. These dimensions are based on the use of ICT to support constructivist learning, and purport that meaningful learning occurs through learning activities that support students to learn through authentic problems, intentionality of learning goals, knowledge construction, active learning, and collaborative learning. These dimensions support the notions of student self-directedness and collaborative learning, which are also the focus of Singapore's third IT Masterplan for education (Teo & Ting, 2009), which are relevant for the target group of study. In Singapore, pre-service teachers are trained to teach at least two subjects which are known as "Curriculum Subject 1" and "Curriculum Subject 2". Therefore, minor changes were made to Schmidt et al.'s items for CK, PCK, TCK, and TPACK to incorporate these two subject areas. Each item on the survey was rated on a seven-point Likert-type scale where 1 - Strongly Disagree, 2 - Disagree, 3 - Slightly Disagree, 4 – Neither agree nor disagree, 5 - Slightly Agree, 6 - Agree, and 7 - Strongly Agree.

Data analysis

The research question was analyzed by first checking for the internal reliability of the survey and its constructs through the computation of the Cronbach alpha. After establishing internal reliability, the construct validity of the survey instrument was examined through exploratory factor analysis. The possible relationships between TPACK constructs and age were then examined through Pearson correlation whereas the possible relationship between gender and TPACK constructs were examined through independent sample t-tests. After establishing the relevance of these variables, stepwise multiple regression analysis was carried out by specifying the TPACK constructs and the pertinent demographic factors as independent variables and TPACK as the dependent variable.

Results

Internal reliability and construct validity of survey

A Cronbach alpha of 0.95 was obtained for the TPACK for Meaningful Learning scale, indicating adequate internal reliability. Exploratory factor analysis yielded eight factors and explained 71.47% of the total variance. The CK items were split between Curriculum Subject 1 and Curriculum Subject 2. These factors were re-named as CK-1 and CK-2 (See Table 1). This is to be expected since these Singapore pre-service teachers were being prepared to teach two curriculum subjects, and may have perceived their CK for these two subjects as being distinct. A similar factor structure was also obtained by Chai et al. (in press) with Singapore pre-service teachers. All the other six TPACK constructs were derived as distinct factors with factor loadings of at least 0.50 (e.g. Fish & Dane, 2000). Two items, TCK2 and TCK4, were cross-loaded with TPACK items and removed from the analysis as per the guidelines of Bentler (1990). Adequate internal reliability was derived on all the eight factors derived from the exploratory factor analysis as their Cronbach alphas were all above 0.80: TK (α=0.87), PK (α=0.93), CK-1 (α=0.84), CK-2 (α=0.86), PCK (α=0.87), TPK (α=0.92), TCK (α=0.91), and TPACK (α=0.94). Therefore, sufficient internal reliability and construct validity for the survey was established. A regression model incorporating all the TPACK constructs postulated by Mishra and Koehler (2006) could therefore be examined with these survey results.

Pre-service teachers' TPACK perceptions

From Table 1, it can be seen that the pre-service teachers rated themselves above five on a seven-point scale for TK, PK, and CK-1, indicating a fairly high level of confidence for these TPACK areas. In terms of CK, they were less confident about their CK-2 (M=4.83) which is to be expected as Curriculum Subject 1 was their main area of concentration for teaching. Notably, their ratings for the intermediate forms of TPACK knowledge, that is, PCK, TCK, and TPK, were all below five. Among these, the pre-service teachers were most confident about TPK (M=4.72) but least confident about TCK (M=4.41). On the other hand, their TPACK perceptions were quite equitable with their perceptions of TPK (M=4.76).

Table 1: Factor loadings from exploratory factor analysis

Items	Factor Loadings
Factor 1 – Technological Knowledge (TK, M=5.10, SD=0.91) TK1 - I have the technical skills to use computers effectively.	.80
TK2 - I can learn technology easily.	.84
TK3 - I know how to solve my own technical problems when using technology.	.73
TK4 - I keep up with important new technologies	.62
TK5 - I am able to create web pages.	.67
TK6 - I am able to use social media (e.g. Blog, Wiki, Facebook).	.64
Factor 2 – Pedagogical Knowledge (PK, M=5.01, SD=0.86) PK1 - I am able to stretch my students' thinking by creating challenging tasks for them.	.65
PK2 - I am able to guide my students to adopt appropriate learning strategies.	.73
PK3 - I am able to help my students to monitor their own learning.	.79
PK4 - I am able to help my students to reflect on their learning strategies.	.82
PK5 - I am able to plan group activities for my students.	.70
PK6 - I am able to guide my students to discuss effectively during group work.	.74
Factor 3 – Content Knowledge-1 (CK-1, M=5.13, SD=1.09) CK-11 - I have sufficient knowledge about my first teaching subject (CS1)	.80
CK-12 - I can think about the content of my first teaching subject (CS1) like a subject matter expert.	.74
CK-13 - I am able to develop deeper understanding about the content of my first teaching subject (CS1).	.54
Factor 4 – Content Knowledge-2 (CK-2, M=4.83, SD=1.06) CK-21 - I have sufficient knowledge about my first teaching subject (CS1)	.79
CK-22 - I can think about the content of my first teaching subject (CS1) like a subject matter expert.	.87
CK-23 - I am able to develop deeper understanding about the content of my first teaching subject (CS1).	.58
Factor 5 – Technological Pedagogical Knowledge (TPK, M=4.72, SD=1.01) TPK1- I am able to use technology to introduce my students to real world scenarios.	.50
TPK2 - I am able to facilitate my students to use technology to find more information on their own.	.62
TPK3 - I am able to facilitate my students to use technology to plan and monitor their own learning.	.60
TPK4 - I am able to facilitate my students to use technology to construct different forms of knowledge representation.	.57
Factor 6 – Technological Content Knowledge (TCK, M=4.41, SD=1.13) TCK1- I know about the technologies that I have to use for the research of content of first teaching subject (CS1).	.68
TCK2- I can use appropriate technologies (e.g. multimedia resources, simulation) to represent the content of my first teaching subject (CS1).	Dropped
TCK3 - I know about the technologies that I have to use for the research of content of my second teaching subject (CS2).	.72
TCK4 - I can use appropriate technologies (e.g. multimedia resources, simulation) to represent the content of my second teaching subject (CS2).	Dropped
Factor 7 – Pedagogical Content Knowledge (PCK, M=4.62, SD=1.18) PCK1 - Without using technology, I know how to select effective teaching approaches to guide student thinking and learning in my first teaching subject (CS1).	.56
PCK2 - Without using technology, I can help my students to understand the content knowledge of my first teaching subject (CS1) through various ways.	.69
PCK3 - Without using technology, I know how to select effective teaching approaches to guide student thinking and learning in my second teaching subject (CS2).	.85
PCK4 - Without using technology, I can help my students to understand the content knowledge of second teaching subject (CS2) through various ways.	.89
Factor 8 – Technological Pedagogical Content Knowledge (TPACK, M=4.76, SD=1.01) TPACK1- I can teach lessons that appropriately combine my CS1, technologies and teaching approaches.	.75
TPACK2 - I can select technologies to use in my classroom that enhance what I teach, how I teach and what students learn.	.77
TPACK3 - I can use strategies that combine content, technologies and teaching approaches that I learned about in my coursework in my classroom.	.82
TPACK4 - I can provide leadership in helping others to coordinate the use of content, technologies and teaching approaches at my school and/or district.	.80
TPACK5 - I can provide leadership in helping others to coordinate the use of content, technologies and teaching approaches at my school and/or district.	.70

Relationships between TPACK perceptions and age

The inter-correlations between age and TPACK constructs were examined to derive a preliminary understanding of their possible relationships before the implementation of regression analysis (see Table 2). Age was found to have significant but small negative correlations with PK, TK, and TPK. CK-1 and CK-2 had positive moderate correlation with each other. CK-1 had positive correlations with PK, TCK, PCK, and TPACK while CK-2 had similar correlations with all these constructs except for PCK. All the TPACK constructs were positively correlated with each other. Only the correlation between TK and PCK was not significant. Strong positive correlations were found between TPK, TCK, and TPACK as these were above the 0.60 recommended by Fraenkel and Wallen (2003). TK also had moderate positive correlations with TPK, TCK, and TPACK that were close to 0.60. The other correlations between TPACK constructs were comparatively weaker. These results suggest the possibility that the relationships between TPACK constructs could have stronger influences on teachers' TPACK perceptions as compared to age during the regression analysis.

Table 2 – Correlations between Age and TPACK constructs

	Age	CK-1	CK-2	PK	TK	TPK	TCK	PCK	TPACK
Age	1	.02	-.07	-.15*	-.18*	-.16*	-.07	-.02	-.09
CK-1		1	.53**	.54**	.18**	.26**	.47**	.39**	.39**
CK-2			1	.41**	.23**	.19**	.39**	.15*	.34**
PK				1	.28**	.57**	.53**	.34**	.55**
TK					1	.53**	.38**	.06	.44**
TPK						1	.53**	.31**	.68**
TCK							1	.29**	.65**
PCK								1	.26**
TPACK									1

* $p< 0.05$ ** $p<0.01$

TPACK perceptions by gender

No significant gender differences were found across all the eight TPACK factors derived through exploratory factor analysis. Therefore, the variable of gender was not considered in the subsequent regression analysis.

Regression model

Stepwise regression of the models was statistically significant. Between models 2 and 3, the addition of CK-2 increased the R^2 values marginally from 0.58 to 0.59. Therefore, it can be seen that among the independent variables, pre-service teachers' TPACK perceptions were primarily influenced by TPK and TCK. These two variables explained 58% of the total model variance whereas age and the other independent variables were not significant. Between TPK and TCK, TPK had a stronger influence in pre-service teachers' TPACK perceptions, as indicated by the beta values for Models 2 and 3.

Table 3 – Stepwise regression models

Model	Predictors	B	Std. Error	Beta	Significance	R^2
1	(Constant)	1.54	.24		***	0.45
	TPK	.68	.05	.68	***	
2	(Constant)	.94	.23			0.58
	TPK	.47	.05	.47	***	
	TCK	.36	.05	.40	***	
3	(Constant)	.60	.27		*	0.59
	TPK	.48	.05	.47	***	
	TCK	.32	.05	.36	***	
	CK-2	.10	.05	.11	***	

*p<0.05   *** p<0.0001

Discussion

This study attempted to examine how age, gender, and the TPACK constructs of TK, PK, CK, TPK, TCK, and PCK affected pre-service teachers' perceptions of TPACK through stepwise multiple regression. Gender was dropped from the regression model as a preliminary analysis with independent sample t-tests found no significant differences between male and female teachers with respect to the TPACK constructs. The subsequent regression analysis found TPK and TCK to be predominantly the two significant predictors of TPACK. The following are possible explanations for these results:

Gender differences

In published studies, gender differences between teachers were apparent when comparisons were made of their confidence for using computers (see Markauskaite 2006). In this study, however, there were no significant differences between pre-service teachers' TPACK by gender. A reason for these findings could be that TPACK assesses teachers' perceptions of different ICT integration expertise. Teachers' attitudes with respect to computer use could impact their TPACK perceptions but these are not necessarily similar. Therefore, the gender differences associated with teachers' computer attitudes may not be totally applicable when studying teachers' TPACK perceptions. In a large scale TPACK study of Singapore pre-service teachers, Koh et al. (2010) also found the significant gender differences associated with TPACK constructs to have small effect sizes. North and Noyes (2002) suggested that the prevalence of computers in schools could provide both males and females with equal opportunities for computer use, thereby equalizing their perceived differences with respect to computer use. Therefore, the impact of gender differences on TPACK may become less significant with future cohorts of pre-service teachers.

Age

The results of this study were consistent with Koh et al. (2010) who found the correlations between age and TPACK constructs to be almost negligible. Age also did not emerge as a significant predictor in the regression model. One explanation for these findings could be that TPACK describes teachers' pedagogical expertise with respect to technology integration. The pre-service teachers in this study were all undertaking their first semester of teacher education studies during the semester of data collection. Regardless of their age, these pre-service teachers have yet to attend sufficient methods courses and were also inexperienced in terms of actual teaching practices. In comparison, TPACK studies of in-service teachers found larger negative correlations between teachers' age and TPACK perceptions (e.g. Lee & Tsai, 2010). As compared to pre-service teachers, the teaching experiences of in-service teachers differ according to their school environment. Across time, this could result in them having different ICT integration experiences, which may influence their TPACK perceptions. Therefore, age may not be a factor that significantly impacts pre-service teachers' TPACK perceptions, which is also a conclusion of Koh et al. (2010).

TPACK constructs

The study results show that the TPACK perceptions of pre-service teachers tend to be influenced more strongly by TPACK constructs rather than the demographic variables of age and gender. An earlier study by Chai et al. (2010) found that TK, PK, and CK were all significant predictors of TPACK, with PK being the most influential. In this regression model, when the intermediate constructs of TPK, TCK, and PCK were considered, only TPK and TCK emerged as the significant predictors of pre-service teachers' TPACK. Mishra and Koehler (2006) premised that teachers' ICT integration expertise was to be found in the intermediate constructs of TPK, TCK, PCK, and TPACK. This is because these constructs embody the different connections that teachers can formulate by combining TK, PK, and CK. The results of this study support this postulation as they suggest that the effects of the intermediate constructs to be more important than those of TK, PK, and CK alone.

Mishra and Koehler (2006) postulated that teachers' ICT integration knowledge was embodied in seven constructs. In this study, however, the constructs of TK, PK, CK, and PCK did not have any significant influence on TPACK. One explanation for these findings could be the pre-service teachers' relative inexperience with the school curriculum as they have yet to be fully exposed to the methods courses where the PCK associated with the teaching of their curriculum subjects are being covered. Therefore, they have yet to appreciate this as a body of knowledge to be considered when integrating ICT. On the other hand, emergence of TPK and TCK as significant predictors of TPACK showed the pre-service teachers recognizing the need to consider technology in tandem with pedagogy and content during ICT integration. However, at this point of their teacher training, they may not have the sufficient exposure to teaching practices to make tight connections between the TPACK constructs. This premise can be supported by the findings of Chai et al. (2010) who constructed regression models analyzing how TPACK constructs predicted pre-service teachers' TPACK perceptions before and after they attended an ICT course. The post-course model showed higher R^2 values, indicating that the pre-service teachers were better able to make linkages between the TPACK constructs and TPACK after ICT training. Therefore, the pre-service teachers in this study may need to gain further knowledge through ICT integration and methods courses before they could be able to appreciate the contributions of TK, PK, CK, and PCK.

The study results are somewhat consistent with Chai et al.'s (2011) structural equation analysis which found TPK to have the largest influence on TPACK among TK, PK, and CK. Chai et al. (2011) were not able to incorporate TCK into their structural equation model because of construct validation issues but this study contributes further insights, showing that pre-service teachers did not perceive TCK to be as important as TPK for shaping their TPACK. In a qualitative study of how pre-service teachers approached the learning of new ICT tools, Koh and Divaharan (2011) also found that they focused mostly on issues associated with TPK and were less able to consider content integration. One possible explanation could be that these pre-service teachers were unlike in-service teachers who need to grapple with curriculum requirements and student difficulties with content representations on a daily basis. The importance of content issues may not feature as prominently as the pedagogical uses of ICT at this point of their teacher training.

Implications for pre-service teacher ICT development

The results of this study suggest the following implications for the design of pre-service teacher ICT courses:

- Age and gender differences may not be a priority for pre-service teachers – Pre-service teachers' TPACK perceptions did not differ by gender. Neither did age impact their TPACK perceptions. Therefore, curriculum differentiation specifically for age and gender differences may be more pertinent for in-service rather than pre-service teachers. Nevertheless, the influences of age and gender need to be further monitored to determine their relevance.
- Focus on TPK and TCK – Pre-service teachers largely placed importance on the impact of TPK and TCK on their TPACK. In ICT courses, conscious modeling of the pedagogical uses of technology and content representations with technology should be emphasized to strengthen the contributions of these elements to TPACK.
- Help pre-service teachers foster the "missing" TPACK linkages – According to Mishra and Koehler (2006), the complete body of ICT integration expertise comprises of seven constructs. This study suggests that pre-service teachers have yet to appreciate the impact that TK, PK, CK, and PCK has on TPACK. ICT course need to provide opportunities for the creation of these linkages. An approach to be considered would be Koh and Divaharan's (2011) TPACK-Developing Instructional Model which proposes the integrated use of tutor modeling, vicarious observation, self-paced exploration, critique of ICT integrated lessons, and hands-on ICT integration design experiences to develop these aspects of pre-service teachers' TPACK. An instructional system that supports pre-service teachers to engage in design activities helps them to develop TPACK (Koehler et al., 2007). This is because such a system provides them with opportunities to connect the PK, CK, and PCK learnt in methods courses to their ICT courses.

Future directions

Several areas of future research can be considered to better understand the TPACK perceptions of pre-service teachers. Firstly, this study needs to be replicated with more cohorts of teachers, both within and outside Singapore. The current sample of teachers is not representative of pre-service teachers in general and further validation of the regression model derived in this study is still needed, especially to determine if age and gender effects are pertinent. Secondly, longitudinal studies are needed to track the TPACK development of cohorts of pre-service teachers across time. This is because this study was conducted with pre-service teachers who were doing their first semester of teacher education. The regression model therefore captured the factors affecting the pre-service teachers' TPACK perceptions as they entered teacher education but not in other stages of their teacher education journey. Thirdly, similar studies with in-service teachers are needed. A comparison of the regression models for pre-service and in-service teachers could better highlight the different knowledge gaps and development needs of each group in this study. This aspect was not covered in this study as it focused on pre-service teachers. Finally, statistical techniques such as structural equation modeling can be applied to better understand the role of TPK, TCK, and PCK as moderating variables of TPACK. In this study, the use of multiple linear regression analysis only allowed the researchers to understand the linear relationships between age, the TPACK constructs, and TPACK. Yet, the correlation analysis in Table 2 showed significant correlations among the TPACK constructs which may not have been sufficiently captured in the regression model of this study. Structural equation modeling allows the simultaneous analysis of moderating and intervening variables (Hair, Black, Babin, Anderson, & Tatham, 2010) which may better capture the dynamics of these relationships. This may also enhance the R^2 of the current regression model through a more sophisticated mapping of TPACK framework relationships.

Conclusion

This study attempted to develop a comprehensive regression model of pre-service teachers' TPACK perceptions that examines the impact of demographic variables and the TPACK constructs. Such kinds of modeling provide teacher educators with insights about the relative impacts of factors affecting teachers' perceptions of ICT integration expertise. More comprehensive statistical models of teachers' TPACK perceptions need to be developed to better understand the complex phenomenon of teacher ICT integration knowledge development. This is an important area warranting further consideration in future research.

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Using collaborative peer feedback and supervision to support doctoral research at a distance

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This paper documents a collaborative peer-support and supervision model with peers and supervisors provide critical feedback to doctoral thesis proposals within an online learning community in a New Zealand university. A content analysis was conducted on 26 online presentations from 10 EdD proposals to investigate the nature and types of feedback provided by a group of 10 students and 10 supervisors engaged in this collaborative learning and supervision process. Six students were also interviewed. Findings from this study show that the online feedback process was helpful in supporting revisions of thesis proposals, and was a valuable component of this new approach to thesis supervision.

Keywords: online learning, doctoral supervision, online learning community

Introduction

It is well known that the attrition rates of doctoral programmes in many countries are very high. For example, the completion rate of PhD students enrolling in New Zealand universities after five years of enrolment (2002-2006) was only around 30%, and the withdrawal rate in the same period was as high as 25% (C. Stoddart, personal communication, September 17, 2008). In Canada, while the completion rate of PhD programmes is higher, at around 50%, it takes 7-9 years for the successful students to complete their studies (Elgar, 2003). While there are a number of factors contributing to these high attrition rates, intellectual isolation has been cited as one of the major factors or even the prime contributing factor (Hortsmanshof & Conrad, 2003; Lovitts & Nelson, 2000; Manathunga, 2005). For example, a recent large-scale survey of more than 600 PhD students in Finland (Pyhalto, Stubb, & Lonka, 2009) reported that almost 30% of its respondents felt that they were not part of a scholarly community. Doctoral students' experiences in the thesis research process often shown to be "mentally and emotionally challenging", and that "participation in academic communities is fundamental to the transformation of graduate students into professionals" (Hadjioannou, Shelton, Fu, & Dhanarattigannon, 2007, p.161). Lovitts and Nelson (2000) point out that a key to successfully competing a doctorate is to encourage and support a sense of community among doctoral students. Recently there has been an increasing interest, particularly in Australia and UK, to develop alternate models of research supervision to reduce attrition rates and completion time (Samara, 2006). For example, strategies of supporting research students working within a learning community or using group supervisors have been proposed in the literature (Conrad, 2003; Pearson, 2000).

There is some evidence in the literature that providing peer support and feedback is effective in supporting graduate students' thesis research. For example, in Hadjioannou et al.'s (2007) study, they described how four students had formed into a community to support each other, mentored by a professor. Members of this face-to-face community met regularly and shared their writing and readings, and their research. This study found that the student-led community was not only helpful in providing emotional support to overcome isolation, but academically, it was also invaluable in helping the participants to improve their academic writing, and to peer-review their thesis proposals, as a sense of trust had been developed in the community to allow sharing of constructive criticisms. Shacham and Od-Cohen (2009) have documented a study surveying 25 PhD graduates on the learning characteristics of their communities of practice, established in a doctoral programme to provide academic and emotional support. Their study showed that studying in a cohort facilitated doctoral students to share and critique each other's ideas. In this community there were group consultations and students had opportunities to share their research, including their conceptual frameworks and methodologies. Again, students in this community valued the peer support and feedback provided. The limited research conducted in peer support at doctoral level thesis research are primarily qualitative studies (e.g., Lim, Dannels, & Watkins, 2008; Wisker, Robinson & Shacham, 2007), very little research has been conducted to investigate how communities of practice can be used to support doctoral students' thesis research work at a distance using quantitative or mixed methods.

A collaborative peer-support and supervision model designed to provide academic support for distance doctoral students has been implemented in a research-intensive university in New Zealand since 2008. In this Doctor of Education (EdD) programme, distance students collaborate with their peers and supervisors during course work, preparation of thesis proposal, and undertaking thesis research within a learning community. This paper documents the collaborative peer-support and supervision process of the first cohort of students during their preparation of thesis proposals (in the second year of the programme) when students and supervisors were engaged in regular group dialogues via computer-mediated communication. This paper will focus specifically on the feedback process and investigate the following questions:

42. What is the nature of the feedback provided by the students and supervisors in this model?
43. What types of feedback are conducive to assisting students in revising their thesis proposals?
44. Are there any differences between feedback provided by students and supervisors?
45. How do students see their role as proposal reviewers?

Description of the EdD programme

The EdD programme in this study is delivered flexibly as a part-time/full-time, cohort-based, online distance programme supported by integral on-campus intensive residential schools. Students are expected to complete the programme in five to six years of part-time study. This programme has three components:

- *Course work*. Students undertake an intensive 12 months of part-time course work, focusing on the relationship between research and practice, and also on advanced research methodologies. The course work is equivalent to one and a half semesters of full time study.

- *Thesis.* Students spend the following six to nine months to developing a thesis proposal. These proposals are then examined at a public symposium by two internal and one overseas examiners. Once approved, students can proceed with their research.

- *Research to Practice Portfolio*. As a professional doctorate, students are also required to produce an evidence portfolio to demonstrate that their research is indeed related to practice. This portfolio includes a reflective journal, evidence of conference presentations/publications, and artifacts generated from their research.

In this community-based model, students work as a cohort and collaborate intensely during the course work and thesis proposal preparation stages. They meet regularly in ten online conferences (each lasts for two weeks) as a group during the course work stage and in five conferences during the development of their thesis proposals in the second year of the programme. During the thesis proposal development stage, in addition to having to meet with their supervisors on a one-to-one basis (either face-to-face or by telephone, Skype, email), students meet with their supervisors as a group in an online discussion conference to support each other. Depending on class size, the cohort may be divided into groups of five students. Each group consisting of a moderator (a professorial staff member), one to two senior supervisors, two to three junior supervisors, and five to six students. Structured online meetings are regularly held in the learning community for students to share ideas, discuss issues, and critique each other's work. Students present their draft proposal in three online conferences. Since the primary supervisors are also members of the group, each group will have about ten participants. In each online conference, every student has to present a draft of certain parts of his/her proposal (e.g., methodology), which is critiqued by a designated student discussant and a supervisor discussant. Other members of the group (both students and supervisors) are also asked to contribute feedback. Students thus are exposed to a wider range of expertise and the online community also provides them the opportunity to learn how to critique scholarly work. In this model, students are encouraged to co-construct knowledge and are enculturated to become a member of the academic research community. Moodle (Modular Object-Orientated Dynamic Learning Environment), an open source e-learning platform was used as the discussion platform. Moodle is designed to foster online learning communities based on social constructivist pedagogy principles, and can provide the flexibility to quickly and easily adapt to the needs of the students.

Pedagogical strategies

The pedagogical strategies implemented in this online EdD programme are derived primarily from social constructivist beliefs and socio-cultural approaches to learning, where learning is conceptualized as an active process, with the learner actively constructing knowledge in a community of practice (De Laat & Lally, 2003; Lai, Pratt, Anderson, & Stigter, 2005; Lave & Wenger, 1991; Vygotsky, 1978). There are two strategies in this model that are particularly relevant to this paper and they are briefly discussed as follows.

Computer-supported collaborative learning

One important strategy of this peer-supported doctoral research model is that students are engaged in collaborative learning and co-construction of knowledge with their peers and supervisors right from the course work stage (Lai, 2009). During the second year of the programme when students prepare their thesis proposals, in addition to working with their supervisors on a one-to-one basis, students will also support each other by providing feedback during the online presentations. Feedback from their own supervisors as well as from their peers is also provided during the online discussions. Conventionally, supervision in the humanities disciplines is primarily based on an apprenticeship model, with a "master" supervisor (sometimes supported by a co-supervisor, or a committee) working closely with an "apprentice" student, conducted in closed doors, with little input from other students or faculty members, but in this model, supervision is conceptualised as a collaborative process and is no longer treated as a private business conducted between a student and his/her supervisor. Because the group collaborates by means of computer-mediated communication, feedback is contributed to a public space and the process of negotiation of meaning and understanding is recorded permanently. The online conferences thus help increase accountability and provide a milestone for the students to achieve. For less experienced supervisors, this will also be an opportunity for them to learn from the senior supervisors in the group.

Distributed expertise

This collaborative peer-support and supervision model is based on the belief that both students and supervisors are able to provide useful and informed feedback to the presenters, even though they may not be experts in the topic that the presenter is researching. The value of peer-feedback is well documented in the literature (Hattie & Timperley, 2007), although there is little research on how best it can be used in an online distance programme to support doctoral research. It is recognised that students in this programme come with a wealth of practitioner knowledge and they have a lot to contribute to the learning community. Their expertise can be more effectively facilitated through participating in "leader-scholar communities" (Olson & Clark, 2009) where students can see how experts work with knowledge and solve problems, and also have the opportunity to act as experts, rather than directly acquiring knowledge from the experts (Hakkarainen, Palonen, Paavola, & Lehtinen, 2004). In this model, students are seen as "expert novices" with rich professional background, and since the supervisors have expertise in different fields of studies (but all in education), specializing in different methodologies, students now have a wider exposure to professional and research expertise. In this learning community, students are treated as equal partners and assume a critical reviewer's role.

Method

Content analysis

To evaluate the value of using this collaborative model to assist students' development of their thesis proposals, a content analysis was conducted on all the online presentations presented in 2009. The cohort of students in this year was divided into two groups (a total of 10 students and 10 supervisors) during the proposal preparation stage. While students and supervisors primarily worked in their own group, it was not uncommon for them to contribute feedback to the other group. In this evaluation there were three rounds of presentations and in total 26 presentations were included in the analysis (for various reasons four students only presented twice). The presentations were run within a two-week period, in February, March, and May 2009, and the proposals were examined in July. The presenters normally posted their proposals to their group a week before the discussion started, and they moderated their own conferences.

The online presentations were analysed using a feedback model adapted from Nelson and Schunn (2009). In Nelson and Schunn's model, a number of cognitive and affective feedback features are included as factors affecting understanding and performance. In the present study, seven types of feedback are included in the coding scheme (refer Table 1). Following Nelson and Schunn (2009), an idea unit is used as the unit of analysis. An idea unit is a feedback unit segmented from a conference posting consisting of a single idea directly related to the proposal (e.g., a research question, a data collection method etc.) as "contiguous comments referring to a single topic" (Nelson & Schunn, 2009, p. 386). It could be a sentence, several sentences, a paragraph, or a whole posting. The responses provided by the presenters are similarly segmented into response units, and coded in four response types (refer Table 2). Again, these response units are ideas units, responding to a single feedback idea contributed by the discussants. Each feedback/response unit is coded once.

All the postings contributed by the students and supervisors were initially reviewed to exclude those postings which did not contain any feedback or response directly related to the proposal (e.g., postings used to manage the presentation). Then feedback and response units were segmented and coded by the author, using two coding schemes (refer Tables 1 and 2). Two presentations were randomly selected and coded independently by another researcher and there was a 92.3% agreement between the two coders. Using Scott's pi formula, and based on Potter & Levine-Donnerstein's (1999) formula to compute the percentage of agreement expected by chance, the intercoder reliability coefficient was 0.91. Coding discrepancies were resolved by discussion between the two coders.

Coding scheme
Tables 1 and 2 summarise the coding categories used to analyse the nature and types of the feedback and responses contributed by the participants.

Table 1: Coding scheme of feedback provided by students and supervisors

Category	Examples
Asking questions for clarifications but no specific suggestions/solutions are provided **(Clarification - CL)**	"Have you thought about…" "What do you mean by…"
Raising a specific problem/issue but no specific solutions/suggestions for revision are provided **(Problem - PR)**	"I also found your 'Research Methodology' paragraph confusing…" "What I am concerned…if you are only using the interviews…to address questions 2 and 3, you may not be getting enough data"
Raising a specific problem/issue and suggesting a specific solution or providing a suggestion/idea to assist the presenter to move forward **(Solution - SO)**	"You need to link your strong statement…" "Another idea would be to have children create stories about these issues and have them react to the stores".
Making a general comment **(Comment - GC)**	"My main concern…was that methodological nuts and bolts did not precede or swamp what is important here…" "I realize that your work is likely to show that we have to be sensitive to cultural influences…that really seems to be at the heart of what you propose to investigate"
Providing an explanation of a concept or a resource related to the topic of study **(Resource - RE)**	"The following references…might be useful to you" "Some non-sampling errors and other possible design weakness in the Kochenderfe-Ladd and Pelletier (2008) questionnaire for you to consider…"
Confirming/agreeing/empathizing with the points raised by the presenter or other participants **(Confirmation - CO)**	"Have to agree with your last comment…" "Thanks for the clarification…I also agree with you…"
Praising the work done by the presenter **(Praise - PA)**	"Your proposal looks good to me…" "This is looking like a really exciting and useful project…"

Table 2: Coding scheme of responses provide by the presenters

Category	Examples
The presenter has considered the suggestions/solutions provided by the discussant and certain action has been or will be taken **(Change - R-C)**	"May be I need to think about this a bit more…" "You distinguishing between attainment/achievement and the wider process of education is very helpful…" "I probably need to explore the emerging…literature…to see what methods other researchers have used…"
The presenter explains/clarifies/answers the questions raised by the discussants **(Explanation - R-E)**	"This interests me for several reasons…" "No current NZ research has used the CLES survey to investigate…"
The presenter provides some general comments on the issues raised by the discussants, but these are not specific responses **(Comment - R-G)**	"Sorry about the references, I do have them…" "I don't know the answer to this…"
The presenter responses with further questions or seeks help from the discussants **(Question - R-Q)**	"At the risk of embarrassing myself can you just clarify for me what you meant by…" "When you say I have 'enough of a sample'…do you mean…"

Interviews

In addition, students and supervisors were invited to participate in telephone interviews after the completion of the last conference. Six students were interviewed; two from Group A and four from Group B. Six supervisors were also interviewed. Findings from the student interviews are also reported in this paper.

Findings

Amount of feedback and responses

As can be seen from Table 3, on average each presenter received 2.6 feedback postings from 2.23 students and 5.23 postings from 3.23 supervisors per presentation (a total of 7.46 postings received). The supervisors contributed twice as many postings as students, and more supervisors participated in each presentation than students. On average each presenter contributed four response postings per presentation. Presenters thus received almost twice the amount of postings that she/he had posted. The average length per posting was between 200 and 300 words. As reported elsewhere (Lai, 2010), students participated very actively in this learning community.

Table 3: Amount and length of feedback and responses per presentation

	Average number of postings	Average number of words	Average number of feedback/response unit
Contributed by students	2.6	239	7.9
Contributed by supervisors	5.2	210	14.1
Contributed by presenter	4.0	293	10.0

Types of feedback and response

Students and supervisors contributed a total of 204 feedback postings. 573 feedback units were segmented (206 units contributed by students, in 68 postings; 367 by supervisors in 136 postings) from these postings. There were a total of 261 response units, 95 of them were responses to students' feedback units, and 166 to supervisors' feedback units.

As can be seen from Table 4, students have provided more feedback in clarification (CL) (40% of the total feedback units) whereas supervisors provided more feedback on solutions (SO) (44% of the total feedback units). It is interesting to note that the supervisors have provided relatively more praises to the presenters than the student discussants (8.2% versus 5.8%). A t-test on the number of feedback units provided by students and supervisors was conducted on each feedback type. Statistically significant effects were found on problem (PR), $t=2.080$, $p<0.05$; solutions (SO), $t=5.670$, $p<0.001$; and praise (PA), $t=3.411$, $p<0.005$).

Table 4: Types of feedback units per presentation

	CL	PR	SO	GC	RE	CO	PA	Total
Contributed by students	3.2	1.3	1.6	0.6	0.4	0.4	0.5	7.9
Contributed by supervisors	2.2	2.2	6.2	0.9	0.4	1.0	1.2	14.1

In terms of responses, the presenters provided more responses to supervisors' feedback than to their fellow students' feedback (6.38 units versus 3.65 units per presentation, respectively). However, it should be noted that since the supervisors had provided more feedback units to the presenters, proportionally speaking there was little difference in the amount of responses between these two groups (46% response to student feedback versus 45% to supervisor feedback, refer Tables 4 & 5).

As can be seen from Table 5, almost two-third (64%) of the responses to students' feedback were explanations (R-E), and only 25% were revisions (R-C). In contrast, when responding to supervisor's feedback, only 46% of the responses were explanations (R-E) and 37% were about revision (R-C). A t-test on the number of response units responding to students' and supervisors' feedback was conducted on each response type. It was found that the presenters have made significantly more changes on their proposals, based on the supervisors' rather than on their peers' feedback ($t=3.203$, $p<0.005$). Also, the presenters have asked significantly more follow-up questions based on the supervisors' feedback, rather than on their peers' feedback ($t=3.578$, $p<0.005$).

Table 5: Types of responses units contributed by the presenter per presentation

	Change R-C)	Explanation (R-E)	Comment R-G)	Question (R-Q)	Total
Responding to student feedback	0.9	2.3	0.3	0.1	3.7
Responding to supervisor feedback	2.4	2.9	0.3	0.8	6.4

Relationship between feedback and revision

A major objective of this evaluation is to investigate the helpfulness of the feedback provided to the presenters. One indicator of helpfulness is the extent in which the presenters have revised their proposals based on the feedback received from the online discussions. As can be seen from Table 6, the presenters had responded to about one-third (32%) of the ideas provided by the student discussants by making changes to their proposals. In contrast, proportionally speaking they made fewer changes to the ideas provided by the supervisors (28%). However, as supervisors had suggested a much larger number of problems (PR) and solutions (SO) to the presenters, in absolute terms the changes made to the proposals due to the supervisors' feedback were much larger (refer Table 5). It is a concern that over two-third of the ideas provided by the group, particularly those provided by the supervisors, had not been responded to. Perhaps in these online discussions, there might be a problem of information overload. As commented by one of the supervisors in his response to a presenter, "A lot of good points here, but I fear if I were in your shoes, I'd be confused right now". To take advantage of this review process, the primary supervisor may have to take an active role in advising the presenter how to sort out feedback generated from the discussions.

Table 6: Relationship between feedback and responses units

	Problem (PR)	Solution (SO)	PR + SO	Response – Change (R-C)	R-C/PR + SO
Student feedback	33	41	74	24	32%
Supervisor feedback	57	162	219	61	28%
Total	90	203	293	85	29%

It is important to know what types of feedback are more conducive to making revisions. A correlation analysis was conducted to identify relationships between feedback and response features. As can be seen from Table 7, there is a moderate level of positive correlation between solutions (SO) provided by students, and changes (R-C) made to the proposals, as well as follow-up questions asked (R-Q). It should be noted that problem (PR) was not significantly correlated to change (R-C). It seems that to assist their peers to revise their thesis proposals, providing suggestions or solutions would be more effective than just by pointing out problems. However, with feedback provided by supervisors, PR (but not SO) was positively correlated to change (R-C), showing that students would be more likely to revise their proposals even though no concrete solutions were provided, if the feedback came from the supervisors (refer Table 8). This shows that students didn't treat all feedback as equal value.

Clarification (CL) questions were also positively correlated with explanations (R-E) provided to both students and supervisors (Tables 7 & 8), thus perhaps indicating that the presenters were more likely to clarify their understanding of the concepts and design of their projects if more clarification questions were asked.

Table 7: Correlations between student feedback features and responses features

	Response - Change	Response - Explanation	Response - Comment	Response - Question
Clarification	0.19	0.45*	0.14	-0.02
Problem	0.03	0.07	-0.12	0.12
Solution	0.67**	0.30	0.15	0.55**
Comment	-0.23	0.03	0.21	-0.05
Resource	0.10	-0.14	0.14	-0.19
Confirmation	-0.01	-0.42*	0.22	0.04
Praise	-0.19	-0.14	-0.16	0.02

** correlation is significant at the 0.01 level
* correlation is significant at the 0.05 level

Table 8: Correlations between supervisor feedback features and student responses features

	Response - Change	Response - Explanation	Response - Comment	Response - Question
Clarification	-0.27	0.51**	-0.20	0.17
Problem	0.43*	-0.125	0.65**	-0.05
Solution	0.08	-0.30	0.37	0.22
Comment	0.39	0.05	0.28	0.35
Resource	0.07	0.04	-0.27	-0.25
Confirmation	0.52**	-0.05	0.31	0.19
Praise	-0.10	-0.23	0.21	0.12

** correlation is significant at the 0.01 level
* correlation is significant at the 0.05 level

The role of the peer reviewer

Students and a few of the less experienced supervisors were very cautious about providing feedback. They did not seem to be too confident about their role as a critical reviewer, as can be seen from the following comments:

> "I am not going to be of much help to you…" (Student)
>
> "I can't comment intelligently on the various instruments and technical aspects of methodology…but I can add the following procedural comments…I don't know much about a lot of the tools that you have mentioned…I will leave those comments to the experts among us." (Supervisor)

When the students were interviewed similar comments were expressed, for example:

> "I think students felt a bit constrained about giving feedback…because I think they thought the academics would know more about this subject matter…may be a lack of confidence about offering feedback..."

Supervisors supporting one another

The online conferences in this EdD programme are open forums where the students were treated as equal participants as supervisors. Supervisors could critique each other's ideas and suggestions and students could critique their ideas as well. One example was a discussion of the sample size and preferred response rates needed in a proposal where several supervisors were engaged in the discussion.

> *Supervisor discussant:* You [referring to the presenter] should state here why you have chosen to approach 1000, and why 40% is your 'preferred' response rate.

The presenter replied that she had discussed it with her primary supervisor. The primary supervisor then responded:

> *Primary supervisor:* Not sure I understand your calculation. The response rate refers to the sample…Without going into details of how to calculate the required sample size (Supervisor A, Supervisor B, or Supervisor C might want to have a go), I would say you need no more than 350 as your sample size…

Here the primary supervisor invited three other supervisors to provide further ideas about this issue. Supervisor A responded in detail of how to calculate the sample size.

> *Supervisor A:* What you need is more on the order of 200, and you could probably live with 100 if necessary…

Another example was a discussion of whether rural schools should be included in the sample of a proposal. The presenter was seeking advice from the group, "I am looking for advice from our experts here". Altogether seven postings were contributed (including two from the presenter) and three supervisors (two from Group A and one from Group B) offered a number of suggestions to resolve this issue.

Value of the feedback

For the designers of this EdD programme, it is important to know whether the collaborative peer-support model has added any value to the supervision process. Would students rather just work with their own supervisors? From the content analysis and the interviews, it seems overall the students were rather positive about the feedback they valued the process. The following excerpt is an example:

> *Student discussant A:* Ignore all of this if I am on the wrong track…
> *Student discussant B:* These thoughts from the top of my head – may be complete nonsense…
> *Presenter:* No way!...I know how valuable this process is…if I can answer the questions – then I can have confidence in my questions, if I can't, what you are offering me is other opportunities to strengthen my study…and I do need to go check those self-directed learning scales and to potentially operationalise what is SDL [self-directed learning]"

A supervisor agreed with the presenter's comment:

> *Supervisor:* "Good discussion here – and the value, as you say, is in the way this shapes/forces further thinking and clarification."

His comment was supported by another presenter:

> *Presenter:* "I'm beginning to realize that the value of this type of forum, while partly about assisting us to design a competent study, is also about us developing a design that works for us individually. Hearing how different people would approach the same research question is very valuable for me."

From the students interviews it seems that this feedback exercise was useful to the majority of the students, in particular when students have to defend their presentations, as can be seen from the following comments:

> The best was defending things when you critiqued each others, and people would ask you questions about your writings and things like that, just how to make yourself clear, which is a good practice…it has been useful…
>
> I certainly have constructed a lot deeper knowledge than I would have around my area that I'm working on…
>
> I've learned a lot about other people's research…the content but also it's given me some ideas that I might be able to apply to my own situation.

Students also saw benefits when they served as a discussant. The following comment is an example:

> …I particularly looked at a questionnaire that somebody was proposing to use or adapt as part of their thesis research…I gave some high level comments about some non-sampling errors that I'd spotted in the questionnaire…and in going through that process it was useful to refresh my memory on principals of questionnaire design…

However, it should be noted that students didn't treat all feedback as equal value, as different kinds of feedback were provided by the discussants (refer Table 7), as can be seen form the following interview comment:

> On the specific methodological questions…it has been more the specialist staff comments because…we feel relatively inadequate in commenting in detail…in terms of feedback from classmates, it's been more a global level rather than specific ways of testing hypotheses

Discussion

Findings in this study show that this collaborative peer-support and supervision model has facilitated the doctoral research process, particularly during the research proposal development stage. Feedback from the peers and supervisors was considered carefully and positively and the presenters used the discussions to clarify their understanding and improve their proposals. While clarification questions did help the presenters to clarify and sharpen their understanding of the concepts and design of their projects, it was mostly the problems identified and solutions proposed by the discussants that led to revisions. The success of this model depends very much on the willingness of the students and supervisors to participate actively in the discussion process. From the comments in the discussion postings and in the interviews conducted afterwards, it is clear that most of the students highly valued this collaborative process. Students benefited in different ways from the feedback process, and some benefited more than the others. The value of the online presentations and discussions was well summarized by a student:

> "…rather than just having a conversation with your supervisor, it's forced us all to be more involved in critiquing each other's developing work…it's helped because there's been more feedback from a wider range of people…that the comments that one person makes are visible to the whole group, and so…sparks ideas and thoughts from a wider pool of people."

All ten presenters subsequently had their proposals approved in the July confirmation symposium.

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Support and promotion of mobile learning strategies

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The Mobile Learning Project at The Chinese University of Hong Kong (CUHK) started in 2010 as an initiative to promote mobile learning (mLearning) among teachers at the university. The paper describes the strategies employed by the project in supporting the promotion of a range of mobile learning activities at the university, and reviews factors in relation to challenges and success.

Keywords: mobile learning, mobile learning strategies, mobile learning promotion

Promotion of mobile learning to teachers

Mobile technology has been advancing at great speed over recent years. Nowadays, mobile devices that are priced at middle-level of the market, such as mobile phones and light-weight notebook computers, are often equipped with internet-connection tools (e.g. Wi-Fi or GPRS). Modern mobile devices do not only enable users to perform work-based activities such as opening/editing Word documents, Excel spreadsheets and PowerPoint slides, but also engage them in various leisure activities, such as communicating with other people via channels that generate immediate responses (e.g. voice/ video phone call, mobile MSN), web-surfing, uploading and downloading of information, eBooks and film-watching (Holdener, 2008).

Mobile devices outperform desktop computers in terms of portability. The ‘potentiality’ (Georgiev, Georgieva & Smrikarov, 2004) of using mobile devices as a device for learning ‘anytime, anywhere’ is significant. Some even argue that learning anytime anywhere is the more natural way to learn: “learning has always been mobile: we all learn as we go about our lives, with inherent dynamism and personal mobility” (Low & O’Connell, 2006; p.2). Mobile learning has attraction the attention of many practitioners. Ho and Ali (2008), for example, made an effort in establishing the right environment for mobile learning in Singapore. They regarded such establishment to be a nearly-necessary task as “one of the nation’s most important educational goals is to produce students adequately prepared for life and work in the 21st century” (p. 6). Besides, in Taiwan, Wu and Chao (2008) envisaged that future mobile learning activities are likely to be incorporated into learning activities, which require a higher degree of interactivity, such as online tests and exercises, and mobile communications.

It is our belief that teachers should play an active role in facilitating this potentially new environment of teaching and learning. Mobile learning should not merely be a tool for self-learning, but instead it can be used to facilitate fundamental changes in various aspects of the teaching and learning environment. Yet, it is challenging to promote the adoption of mLearning strategies among teachers. In fact, the adoption of new technologies at universities has always been regarded as challenging. Rogers (2003) proposed a five-stage adoption model, which illustrates the process of adoption or acceptance of technology overtime. One of the key features of this model is that adoption of any innovations does not happen automatically. At an initial stage, only a small portion of "innovators" would be willing to try out a new technology. Much has to be done to spread the message about new technologies across. The considerations involved in facilitating mLearning thus should not be underestimated (Keegan, 2002). While supporting units of teaching at universities are still at times struggling with the promotion of eLearning strategies to teachers, the promotion of the even more advanced mLearning ideas to teachers should be planned and administered skillfully.

Mobile learning project

There have been individual efforts at The Chinese University of Hong Kong (CUHK) in testing and using scattered mLearning strategies: for example, eBooks (as reported in Lam, Lam & McNaught, 2008), and SMS quizzes (as reported in Clarke, Keing, Lam & McNaught, 2008). However, practices of these strategies are yet not available in large-scale. The Mobile Learning Project at CUHK was devised in 2010 to take up the challenge in promoting mLearning to all teachers. The paper describes the strategies employed by the project in supporting the promotion of a range of mobile learning activities at the university, and reviews factors in relation to challenges and success.

The project explored potential mobile learning strategies that teachers would find immediately useful at the university. Usefulness was judged with respect to three criteria: 1) whether the strategy requires minimum level of technical knowledge, 2) whether the strategy requires hardware and software that are likely to be owned by students now or soon, 3) whether the strategy has the potential to bring upon more effective learning. As a result of this exploration, the project has identified the following mobile learning strategies:

eBooks: The project offered strategies that allow teachers to easily convert learning materials into eBooks, multimedia resources or interactive exercises that can be used on a variety of mobile devices. The project provided support in areas of the following: 1) provided suggestion on how eBooks can be used to enhance teaching and learning particularly in blended learning context, 2) offered training to teachers so that they can handle conversion of eBooks on their own, and 3) provided support in conversion once teachers sent us the materials in the correctWord format.

QR codes: QR codes are two-dimensional bar codes that can be read or decoded on many mobile devices with a built-in camera. Once the code is accessed, it allows users to read text, link to a web page, dial a phone number, or text messages, etc. The technology is not new in the business world, but we regard that it actually can also be used for teaching and learning. For example, QR codes can be adopted in learning to display printed materials such as lecture notes, descriptions of exhibits in a museum, or labels of equipment in a science laboratory. The project provided the following support: 1) provided suggestions to teachers on how this technology can be used in various teaching and learning contexts, 2) offered training to teachers so that they could handle the creation of QR codes on their own, and 3) created QR codes for teachers if necessary.

Classroom communication such as web-based 'Clickers': Mobile technology may be used to facilitate interactions in a classroom. The concept is in fact similar to the traditional tool 'clickers' – teacher asks a question and each of the students then has the chance to key in their responses on a 'clicker' keypad device. The difference now is students input answers via their own mobile devices. Moreover, the new web-based system is capable of handling sophisticated questions and feedback better than that of traditional clickers because mobile devices allow for both input and display of text. The project supported teachers in using a web-based 'clicker' solution called ResponseWare.

Mobile learning management system (LMS): Typical LMS user interfaces are difficult to be viewed and used in a mobile device because monitors in mobiles tend to be small in size. The project tested the feasibility of adopting the Moodle Mobile solution over the past year.

To disseminate the above mobile learning strategies, the project developed a website called Mobile Learning @ CUHK (http://www.cuhk.edu.hk/mlearning). Teachers are able to get ideas and tips on how to integrate mobile devices into their teaching on the ‘I teach’ section of the site. The ‘I learn’ section, on the other hand, assists students at CUHK to make better use of the mobile technology as a tool for learning. The ‘Mobile CUHK life’ section provides teachers and students important and handy information of the University such as shuttle bus time table, campus maps and current events of the University. The project also actively disseminated ideas and services through workshops and expositions. About 10 workshops were held last year in which 6 of them attempted to promote mLearning among teachers at CUHK whereas the rest of 4 targeted among visitors from mainland China. The project team took part and presented a poster at the Teaching and Learning Innovation Expo 2010 on 22 October 2010 (http://www.cuhk.edu.hk/elearning/expo).

Evaluation/ reflection

eBook: The service to create eBooks was used by teachers from various disciplines such as Chinese Medicine, Law, Physiology, and Biochemistry. The project created at least thirty eBooks for teachers of a group of more than ten. The most difficult part of creating eBooks was to identify teachers who had copyright-free materials and were willing to share these materials via converting them into eBooks with the project team. Some of these eBooks were full-length reference materials such as medical dictionaries/ glossaries, while some were simply teachers’ notes. Very few of the teachers we served at the end were committed to acquire the skill to create eBooks for themselves. Teachers did not seem to be motivated to learn the procedures in developing their own eBooks; instead, they would value a care-free eBook creation service.

Classroom communication system: The project supported five teachers in using web-based ‘clickers’ in real classes. They were from the Faculty of Mechanical Automation Engineering, Business and Pharmacy. The challenges to adopt web-based ‘clickers’ included the issues of both hardware and the soft skills. For the former, the majority of students did not have mobile devices that could readily enable them to go online. More interestingly, even though some of them had the right hardware, many of them lacked the habit of using these devices to surf the Internet within the campus of CUHK. As a result, the project team paid substantial effort in teaching students how to switch on the Wi-Fi on their mobiles and then to connect these mobiles to the campus Wi-Fi when the web-based ‘clicker’ was first introduced to each class. Teachers were often even less skilled than the students in operating mobile devices – they could not help students with resolving technical problems. The project team realized that the service should not be limited to training teachers how to use web-based ‘clickers’ (i.e. creating questions on the ppts, and the operations of the questioning sessions), but to provide support and training to both teachers and students.

QR Codes: The QR codes service has been incorporated into part of the Green Education Project (http://www.greeneducationcuhk.net/) - QR codes were added to name plates of trees in the campus. The Green Education Project spent years in building an online website, which contained descriptions, pictures and audio supplementary in relation to individual trees at CUHK. All they had to do was to merely affixing those QR codes with corresponding urls of their website. The QR codes lead students to rich information about a particular tree on the Green Education Project website when students take a photo of (and decode) the QR codes with their mobile phones right on the spot. The use of QR codes in the Green Education Project was reported in a number of local newspapers. Please refer to the following links for more information:

a. http://www.singtao.com/yesterday/edu/1006go02.html
b. http://hk.apple.nextmedia.com/template/apple/art_main.php?iss_id=20101006&sec_id=4104&subsec_id=11867&art_id=14524012
c. http://the-sun.on.cc/cnt/news/20101006/00407_080.html
d. http://hk.news.yahoo.com/article/101005/4/kker.html
e. http://orientaldaily.on.cc/cnt/news/20101006/00176_016.html
f. http://www.mingpaotor.com/htm/News/20101006/HK-gfa1.htm
g. http://www.cuhk.edu.hk/cpr/pressrelease/101005c.htm

Mobile Moodle: One teacher from the School of Law piloted the Mobile Moodle system in distributing academic materials. The record of web logs revealed that out of approximately 200 students in the course, only about 4 to 5 of them regularly downloaded materials with their mobile phones via Mobile Moodle. It was quite obvious that students were not yet ready to use this technology. More trials are needed. More support and promotion will be given to teachers and students in the later pilot runs.

The mLearning @ CUHK website: Access logs of the project website were collected and evaluated with the help of Google Analytics which was installed as early as the website was first launched (ten months ago). The total number of visits was around 1800 whereas the number of visits to individual page was close to 8000. The number of access climbed in November and December 2010 when many of the services provided by the website became fully available. According to the analysis of IP addresses, the majority of the visitors were from Hong Kong (85%) whereas we also attracted audience from the US (6%), UK (2%), China (1%) and other places in South East Asia. The analysis revealed that a considerable number of visitors accessed the site via mobile devices – 12.7% of the total number of page visits was generated through a mobile device. Among those who visited the site with mobile devices (224 in total), most of them were users of Apple products (iPhone, iTouch and iPad) whereas less than 40 of them were users of Andriod and SymbianOS. The analysis of the log data also revealed a number of interesting site viewing patterns. Firstly, we noticed that teachers were interested in learning about the details of a number of mobile learning strategies. In particular, strategies which involved QR codes and eBooks had attracted the biggest number of visits. Secondly, many of the visitors viewed the handy information about the University on the site. Such access was particularly high when they were using mobile devices.

Conclusion and future direction

The paper reports strategies that the Mobile Learning Project employed to promote and support a range of mobile learning activities for teachers at CUHK. The various mLearning strategies have attracted substantial attention from a diverse number of users. Considerable growth was recorded in the number of requests made by teachers for support in the adoption of web-based ‘clickers’ as well as that of eBooks. All in all, the experience ascertained that the project is on the right track as at least some of the teachers (early adopters) do see the benefits in incorporating this latest mobile technology in teaching and learning.

However, we are aware of the fact that these needs now are more or less restrained to a small portion of pioneering teachers. We had the following reflections upon our experiences in promoting mLearning to teachers in the hope that the understanding would improve our services in the future. Firstly, teachers in general were not technically capable to implement mLearning strategy on their own, especially in the start-up stage. The project attempted to transfer various technologies to pioneering teachers and yet failed in many instances. For example, none of the teachers for whom we have created eBooks were at the end able to (or willing to?) convert plain texts into eBook all by themselves. In the case of using web-based ‘clickers’, many of our teachers failed to learn quickly the process to create the special ppts that have the interactive questions integrated. The project team had to provide these teachers with one-to-one trainings as well as frequent phone consultations before teachers were able to create all the materials on their own. Continuous support thus was a key success factor.

In addition, many students were not ready to use their mobile devices for learning. Some of them did not have the appropriate hardware as the project team had expected. To the surprise of the project team, many of the students were not able to use the more advanced functions of their devices even though they possessed a better piece of equipment. Students’ motivation to change was not high too – for example, instead of feeling the urge to learn more about accessing campus Wi-Fi via mobile phones, they opted out for other means. Some students would ask teachers to provide the traditional ‘clicker’ keypads. We regard that increasing the degree of readiness among students in adopting mobile technology may be a new objective in the next phase of the project.

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Classroom communication on mobile phones – first experiences with web-based ‘clicker’ system

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Thanks to the advancement in technology, web-based classroom response system is available in leveraging mobile phones to perform function in similar to that of traditional ‘clickers. Mobile phones can be used to enrich communication in classroom. Teachers do not need to hand over the clicker devices to students anymore. Individual students can respond to teachers’ questions right on their mobile devices. The paper reports two pilot cases in which teachers at two universities in Hong Kong adopted the web-based classroom response system. The primary objective of the study was to evaluate the feasibility of such practice in real classroom situation. However, the results have not been all promising. The success of web-based classroom response system was dependent on the possession of high-end mobile devices and skills to maneuver these devices.

Keywords: Clicker, mobile phone, interaction, audience response, student response

Classroom interactions

The use of clickers enhances teaching and learning in a classroom through enriching ‘interaction’. Moore (1993) suggested that there were three types of interactions, namely: learner-content interaction, learner-instructor interaction and learner-learner interaction. The interaction between learners and instructors is of particular importance. Chickering and Gamson (1987) suggested that good practice of teaching should contained seven components in which one of them was about 'giving prompt feedback' as students need to know what they have learnt and what can be improved. Besides, Lizzio, Wilson and Simons (2002) mentioned that an interactive learning environment should possess both the element of "giving (clear and useful explanation, helpful feedback) and seeking (interest in students' opinions and difficulties) of information" (p. 40).

Conventional practice of questioning in class allows only a limited number of students to answer a question. It is unlikely to attain a high level of interactivity between teachers and students. Furthermore, such practice does not result in meaningful interaction because some students may not be willing to respond (e.g. due to shyness) or they may simply respond by following the majority (Ayu, Taylor & Mantoro, 2009; Mula & Kavanagh, 2009). Therefore, teachers are not able to know the number of students who have actually got the answer right, and that who have got the answer wrong. In other words, teachers are unable to track individual responses (Ayu, Taylor & Mantoro, 2009) and subsequently, offer additional support to students, who are less academically capable.

A typical clicker is a small device with number keypad similar in size to that of a small TV remote control. It is equipped with a radio signal emitter, which transmits signals generated from the device to a dedicated signal receiver. The receiver is connected to a personal computer, which is installed with dedicated software. The combination of an emitter, a receiver and a computer permits answers to be input into the number pad, gathered at the receiver and then displayed via an output device (e.g. a projector screen). Apart from displaying results collected from the emitter, a large projector screen is often used to display questions in classrooms. This set of equipment is also collectively known as Audience Response Systems (ARS). The application of this system is not limited to the education field. For example, it can also be found in TV game shows such as "Who wants to be a Millionaire" in which the audience is asked to cast their vote via a number pad lying on the handle of their seats. ARS has been extensively adopted in other fields, which evolved in various appellations including: Personal Response Systems (PRS), Classroom Response System (CRS), and Student Response Systems (SRS), etc (Mula and Kavanagh, 2009). Clicker in classrooms allows students to give responses without disclosing these responses to the rest of class, therefore, it is expected that students will be more willing to answer questions in class. As a result, teachers will be able to collect responses from the whole class (Freeman, Bell, Comerton,-Forde, Pickering & Blayney, 2007). Subsequently, teachers will know how individual students think, and s/he will be able to identify common mistakes that students make, and address these problems immediately in class.

Empirical evidence from past research suggested that the use of clickers could bring along other learning benefits. Mula and Kavanagh (2009) for example reported a study conducted in an Australian university, which involved a cohort of 61 students in using clicker as a learning tool in classroom and another two cohorts of students (59 in total) without clickers. The result showed that most of the students who used clickers (96%) enjoyed the opportunities to answer the questions. Moreover, more than 90% of these students remarked that the quizzes had conducted (using clickers) effectively and had enabled them to understand the course materials; whereas among those who did the same quizzes without clickers, such figure dropped significantly to 60% and 80% respectively. Furthermore, lecturers and tutors reported that students who used clickers were more willing to respond to questions. It was also easier for instructors to identify difficult areas when clickers were used. Similar findings have also been seen in Buskes, Shen and Shallcross (2010). In this case, clickers were handed to about 600 students who took the lectures of an Engineering Systems Design course in an Australian university. 80% of the students in the course agreed that clicker was useful because it allowed them to obtain immediate feedback.

Mobile phones in classroom response system

The actual technology of ARS had undergone significant changes over years, which became how it is today. Juson and Sawada (2002) reported cases in 1960s where knobs, buttons or telephone number pads were adopted as tools for presenting individual answers to a particular question in class. These tools were mounted on the handle of students' seats and were connected to hard-wired response systems. Teachers reviewed these answers by using a voltmeter gauge to record the frequency of each answer in percentage.

With the advancement in wire-less technology in later years, clickers were usually made of either the infra-red or the radio signal technologies, which facilitated communication between clickers and the central unit. However, there were two problems with radio-frequency/ infra-red based clickers, which hampered the adoption of clickers in classrooms (Jones, Marsden & Gruijters, 2006), they were (a) the cost of the clickers; and (b) timely procedures required to distribute and collect clickers to and back from students.

There was recently an alternative approach to collect responses from students: by using mobile phones instead of clickers, which addressed the two problems as mentioned above. If mobile phones were used in replacement of clickers, there would be no need to purchase any specific equipment (Habel, 2011; Maier, 2009) nor to distribute and collect clickers (Banky, 2010; Maier, 2009). Radio or infra-red clickers required teachers to detect the level of batteries as well to identify if there was any problem from time to time whereas clickers in mobile phones do not require any commitment from teachers.

Mobile phone version of clickers usually employs three different strategies to send and receive signals (Ayu, Taylor & Mantoro, 2009): (1) vote by dialing; (2) vote by sending SMS; (3) vote online by accessing to a survey website. That is, students can respond to a question by dialing numbers that corresponds to their answers, sending their answers to the collection unit through the SMS number, or accessing the website and answer the questions as if they were completing an online survey respectively. After that, the software specific to each of these strategies will display students' responses visually, usually in graphs.

There are a number of common solutions available in the market, with each adopting one or more of the above approaches. There are, for example, Votapedia (http://www.urvoting.com/) (Banky, 2010) or Survnvote (http://www.survnvote.net/wiki/Main_Page) (using methods 1 and 3; i.e. dialing and web-based) (Mantoro, Ayu, Habul & Khasanah, 2010) and Poll Everywhere (http://www.polleverywhere.com/) (method 2; i.e. sending SMS) (Tremblay, 2010). Each of these solutions is equipped with a web platform so that teachers could post their questions online and then assign a phone number (Votapedia and Survnvote) or an SMS number (Poll Everywhere) to each answer of a question.

Different from the solutions above, which support either input via phone number or input via SMS, TurningPoint 2008 is an interesting hybrid solution. It makes use of method 3 (i.e. web-based, accessible through mobile devices) and is at the same time capable of reading input from the traditional clicker devices. The software itself is free to be downloaded and adopted. Nevertheless, users are required to buy dedicated online licenses for mobile devices, clickers and the receiver from TurningPoint Technologies in order to use them in class. The system has the ability to perform instant calculation on various responses, and to generate different graphs in reflecting the distribution of these responses. Furthermore, the system is capable of collecting feedback from both clickers and mobile devices simultaneously. Therefore, for students who do not have the right mobile phone for this exercise, they can still participate by using traditional clickers. Moreover, web-based platforms allow students to key in text into the system, and thus responses are not limited to multiple choices but can accommodate word-based answers as well.

There are indications that clickers in mobile phones (in particular the dialing and SMS solutions) can be effective in facilitating classroom communication. Maier (2009) reported a case in which students' responses were collected via the dial method during the course of a lesson under Environmental and Mining Engineering in an Australian university. Besides, Banky (2010) reported another study in relation to clickers via dial in Australia in which 87 students were required to complete quizzes at the end of all lectures. Votapedia was adopted as the tool to summarize results obtained from clickers in mobile phones. Results from this study indicated that 64.4% of the students agreed that participating in Votapedia had encouraged them to attempt those quizzes. On the other hand, the study conducted by Habel (2011) revealed that with the adoption of clickers with Votapedia in a Pre-Enrolment Programme at a university in Australia, students became more attentive to the interaction between instructors and themselves. The adoption of such had helped students to understand teaching better and had encouraged shy students to answer questions and to enjoy the lesson more.

In comparison with web-based clickers, clickers via dial and clickers via SMS are less demanding in terms of hardware and skills. The feasibility of web-based clickers is dependent on whether a mobile phone has access to the web-based interface. Therefore, devices dedicated to clickers exercise should possess an in-built browser, together with web-surfing externalities such as 3G or Wi-Fi connectivity. Besides, users should possess the skill to utilize these externalities in accessing the internet. Few empirical studies so far have focused on web-based classroom response system.

According to a report released in mid-2010 by a research company, which focused on development of mobile networks (Taylor Nelson Sofres Limited, 2010), 48% of the respondents in Hong Kong (561 Hong Kong consumers aged 16–60) owned a smart phone. While the age of average university students fell in between the range of the above, it is a reasonable assumption that the ownership of smart phones by university students can be quite impressive. Free secured Wi-Fi services are available in nearly every classrooms and lecture halls at the two universities in the present study: the City University of Hong Kong (CityU) and The Chinese University of Hong Kong (CUHK) (City University of Hong Kong, 2011; The Chinese University of Hong Kong, 2010). The presence of both hardware in university and that possessed by students made researchers believe that it was possible to adopt web-based mobile phone ARS in real courses at both universities.

Study

The paper reports two cases in which web-based ARS were adopted in both teaching and learning at CityU and CUHK respectively. The support and evaluation was provided by the Mobile Learning Project at CUHK (http://www.cuhk.edu.hk/mlearning), which was an initiative to provide teachers and students with practical guidelines, resources and sustainable technical solutions to various mobile learning strategies.

It was expected that some students were not in possession of the right device for web-based ARS. Therefore, TurningPoint, a hybrid system was adopted in the study to provide an alternative for students to participate in class by enabling reception of responses via traditional clickers.

Cases in the following were contributed by two teachers in two respective courses. Case 1 involved a teacher from Faculty of Commerce in CityU (Teacher A), while the second case was about a teacher from Faculty of Mechanical and Automation Engineering in CUHK (Teacher B). They were teachers who approached the project for mobile learning support and they found the idea of mobile phone clickers relevant to their needs: engaging all students in class activities. They regarded that students' active engagement in tasks is a much more effective way to learn than merely passively listening to teaching in a lecture.

Both teachers were given a brief training on how to use the system and how to prepare questions compatible with PowerPoint slides beforehand. Teacher A used the system to assess the level of understanding among students regularly in class and especially right after difficult concepts were explained. Teacher B adopted the system to conduct short quizzes normally at the end of each lesson. These quizzes served as summaries to assist students in reviewing key points quickly before they left. Clickers in these cases were used for three and four times during the semester respectively.

The primary goal of the study was to evaluate the feasibility of clickers in adopting web-based mobile phone at tertiary institution. The procedure of evaluation consisted of paper surveys with questions arranged in the format of 5-point Likert-scale questions. In addition to these, there was also an open-ended question at the end of the survey to inquire if students have any other comments in relation to the system. The surveys administered in both cases were similar, except that in Case 2 a question was added for students to indicate whether they had used mobile phones or traditional clickers in making responses. Apart from conducting surveys, researchers invited both teachers to participate in a short meeting in which they were asked to comment both the degree of feasibility and usefulness of clickers in mobile phones. Last but not least, while teachers had made valuable comment about the system, Teachers' communications with the researchers during the various stages of planning and using the strategy were also considered as another source of information. As noted, the main purpose of the study was to evaluate the practicality of this new technology at present time in real teaching and learning settings.

Findings

Case 1

Teacher A learnt how to incorporate questions for polling into their PowerPoint slides, and how to start the system for polling with the help of software that accompanied the TurningPoint system in roughly 30 minutes. During the course of training, he remarked the software was user-friendly and yet as he started to really work on his own questions he had forgotten a number of steps already. Teacher A inquired the project for clarifications from time to time. Most queries were done over the phone. Furthermore, he sent the project team his PowerPoint slides so that the team could double check whether everything was done correctly before they were used in classroom.

During his first attempt with clickers in class, teacher A did not bring in any traditional clicker as he presumed that many of his students were in possession of the right device to participate in the session. Even if some of them might not have the appropriate devices, they could share with those who had them and participated the session in pairs or in groups. However, falling short of his expectation, only a few of his students had internet-ready devices. Therefore, he had to cancel the activity.

In response, teacher A brought in traditional clickers in his second attempt with web-based clickers. In addition, one of the project team members was there to provide technical support if needed. However, the session did not start smoothly due to a failure in network: misconnection between the notebook of teacher A and the server of TurningPoint. At the end, the research team member overcame the problem by reinstalling the software. Once the problem was resolved, the teacher created a web-based clicker session for 5 to 6 students who had internet-ready mobile phones, and simultaneously distributed traditional clickers to the rest of class. Nevertheless, 15 to 20 minutes were spent before the session actually began. The delay was due to a lack of knowledge in connecting mobile phones with the campus Wi-Fi. Initially, teacher A inquired students whether they were using 3G phone plans that had a data-transfer component – best allowing unlimited access to the internet. Yet none of his students had such a plan in their mobile phones. Students then were suggested to use the campus Wi-Fi service. Some of the students did not know how to connect their devices to the campus Wi-Fi as they rarely used them during their study at the university. Both the teacher and the project team member had to assist these students one by one in connecting their devices to the Wi-Fi service.

In his third attempt (and the last attempt), the teacher was able to administer the session all by himself. He reported that the whole activity was carried out smoothly. He did not experience any technical problem with the software. On the other hand, students did not require much help from him as they had previous experience in connecting their devices to the website.

The end-of-course questionnaires were administered to evaluate the experience that students had towards the use of clickers in class. The degree of positivity was defined in respect of five themes. Table 1 describes a list of questions, corresponding to each of these themes and their respective mean scores as collected from the questionnaire. 36 of the 61 students responded, and the response rate was 59%. On the basis of a 5-point Likert scale with ‘5’ being ‘strongly agree’, the mean scores ranged from 2.93 to 3.61, which indicated that students were only mildly positive with their experiences in adopting clickers in class. Please note that the results in Case 1 did not distinguish the ratings among students who used mobile phones and those who used traditional clickers.

Table 1: Students' responses in survey (Case 1)

Main themes	Question items	Mean scores (n=36)
Process of use	Participation with clickers increased my interaction with the instructor.	3.89
	Using clickers improves the class participation.	3.64
	Using clickers can keep the students engaged.	3.64
Learning	Using clickers during lectures helps me clarify whether I understand course concepts.	3.69
	I believed I learned more in this class due to the use of the clickers.	3.00
	Using clickers gave me immediate feedback about my understanding of a concept.	3.69
	Using clickers helped me to apply the concepts during class.	3.61
	I do more thinking during clicker sessions than in regular lecture sessions.	3.61
Attitudes	Using clickers increased my feeling of belonging in this course.	3.14
	I enjoyed participation with clickers.	3.50
	Clickers keep me interested in the lecture.	3.39
Overall comments	I would recommend using clickers again in this course.	3.53
	Clickers make class more interesting and fun.	3.56
	I would prefer that my others courses also use clickers.	3.43
Challenges in use	I experience technical problems with the clickers during class.	2.97
	The instructor experienced technical problems with the clickers during class.	3.17

	The instructor used a long period of time to distribute the clicker devices to students during class.	3.14
	It was difficult to see if my clicker was working or not.	3.08

Students agreed that clickers enhanced teacher-students interactions in class (mean = 3.89). Besides, they were mildly positive towards learning benefits attributable to these clicker exercises: more thinking (3.61) and more chances to apply knowledge (3.61). They remarked clicker activities to be enjoyable (3.50) and interesting/fun too (3.56). With regard to technical challenges, students reported that teachers had difficulties in administering clickers in class (3.17). Besides, some of them perceived that it was rather time-consuming for teachers to prepare for these activities (3.14).

Students' answers to the open-ended questions in general showed they were mildly positive towards the adoption of clickers. There were comments such as "a good idea for using the clickers in the class", "interesting", "keep going", and "good for my study". Yet there were negative aspects too. For example, one student talked about the novelty effect of the strategy: "it is great for the first time, but after that, it isn't that great". Another student commented that too much time was spent on preparing the system before the session could begin. Despite its effect in facilitating interaction between teachers and students, the issue of technical problem, in particular, should be addressed probably as it has negatively affected the perceptions of some of the students towards the adoption of this strategy. In addition, in order to foster a more positive feeling towards the strategy among students, it is perhaps necessary to further review the quality of questions asked in the exercise, which in turn, informed students implicitly that these exercises were real learning opportunities rather than something merely for novelty and fun.

Case 2

In consistent with Case 1, teacher B in Case 2 spent approximately 30 minutes to learn from our team the basic operations of the system. During the course of training, she perceived the system to be rather user-friendly. Similar to Case 1, teacher B also sought clarifications from team members of the project regularly in order to prepare questions for her classes. It was quite certain that continual support was needed before teachers could internalize technical skills. As simple and straightforward as it seemed, the results of both cases suggested that the process to master the use of the clicker software required a constant support and training that couldn't be accomplished in a one-off workshop.

The teacher planned to install the clicker software in the lecture room computer. However, during her first use of the clicker system in the classroom, she found that the system worked strangely in the lecture room computer: the web session could not be run and she needed to restart the computer, etc. The research team member who accompanied the teacher thought that it was due to some access right and permission settings of the lecture room computer which were too restrictive. Apart from technical problems, similar to Case 1, only a small number of students were in possession of internet-ready mobile devices, which enabled access to the clicker system. Initially, the teacher expected there should be at least one in every ten student to be in possession of such device and yet only 5 to 6 of them had the right device for the system. Furthermore, students in Case 2 were again unfamiliar with the steps in connecting their devices with the campus Wi-Fi, which later required assistance from both the teacher and the project team member.

In her second attempt, rather than using the desktop computer in the lecture room, teacher B decided to implement the session with her own notebook by installing related programmes beforehand. In addition, she brought in a number of traditional clickers so that more of her students could participate in the clicker session. However, in the absence of technical staff from the project team, the session had to be cancelled due to a failure in connecting her notebook computer with the system. After this lesson, the teacher had to spare extra time with one of the project team members to revisit the lecture room so as to reconfigure her notebook computer in fulfillment with the networking requirement.

The implementation of clickers in last two sessions gave rise to significant improvement. In her last two attempts, there were no problems with connecting her notebook computer with the system at the lecture room. As a strategy to facilitate participation, students who did not have internet-ready mobile phones are invited to work with those who have such devices. Traditional clickers were distributed to groups with no internet-ready mobile phones at all. The teacher had the impression that the students in general enjoyed working on the clicker question in the class. Personally, she regarded that the system could be used more often now she had learnt the gist of it. She also found the clickers helpful in fostering class interactions and she would definitely use clickers in the next term.

With regard to feedback, teacher B believed students to have in general, enjoyed working out problems with clickers in class. She reported to have mastered the steps required to operate clickers in class. In addition, she perceived clickers were helpful in fostering interactions. Therefore, she claimed that she would use the system more often in next term.

A questionnaire in similar to that in Case 1 was administered at the end of course to evaluate the experience that students had towards the use of clickers in class. It was distributed to the 20 group leaders in the course (total class size being 76). 16 students responded to the survey but only 11 of them indicated the response device used. Seven used traditional clickers and four of them used mobile devices as clickers. Table 2 summarizes responses to the survey questions of these two groups of students.

Table 2: Students' responses in survey (Case 2)

		Clicker	**Mobile phone**
Main themes	**Question items**	**Mean scores (n=7)**	**Mean scores (n=4)**
Process of use	Participation with clickers increased my interaction with the instructor.	4	4.25

	Using clickers improves the class participation.	3.57	4.25
	Using clickers can keep the students engaged.	3.71	4
Understanding of lecture content	Using clickers during lectures helps me clarify whether I understand course concepts.	4	4.25
	I believed I learned more in this class due to the use of the clickers.	3.14	3.25
	Using clickers gave me immediate feedback about my understanding of a concept.	3.86	3.75
	Using clickers helped me to apply the concepts during class.	3.57	4
	I do more thinking during clicker sessions than in regular lecture sessions.	3.86	3.5
Attitude	Using clickers increased my feeling of belonging in this course.	3.43	4
	I enjoyed participation with clickers.	3.57	3.75
	Clickers keep me interested in the lecture.	3.71	4
Overall comment	I would recommend using clickers again in this course.	3.86	4.25
	Clickers make class more interesting and fun.	3.86	4
	I would prefer that my others courses also use clickers.	3.57	3.75
Challenges in use	I experience technical problems with the clickers during class.	1.71	2.5

	The instructor experienced technical problems with the clickers during class.	2.57	2.75
	The instructor used a long period of time to distribute the clicker devices to students during class.	2.43	2.75
	It was difficult to see if my clicker was working or not.	2.57	3

The feedback from students in Case 2 was comparable with that in Case 1 in many ways – Both groups were mildly positive towards each of the criteria above. Students in Case 2 reported most positively in two of the criteria: "participation with clickers increased my interaction with the instructor" (4 for traditional clicker users and 4.25 for mobile phone users) and "using clickers during lectures helps me clarify whether I understand course concepts" (also 4 for traditional clicker users and 4.25 for mobile phone users).

It is interesting to note that students who participated via mobile phones tended to report more positively than those participated via traditional clickers (the score from mobile phone users was higher than those from traditional clickers in 12 out of the first 14 items asked in the questionnaire - excluding questions under the theme "challenges in use"). Therefore, it is reasonable to conclude that participation via mobile phones is likely to generate a better learning experience.

However, students who participated via mobile phones also rated more "positively" in questions under the theme "challenges in use". In other words, they perceived mobile phones as more challenging to use in comparison with traditional clickers. Such result was reasonable – as students had to take care of a few more steps (such as connecting to Wi-Fi and getting into the TurningPoint platform) if they were to participate with mobile phones instead of the traditional clickers.

In the open-ended section of the survey, one student disliked the fact that all questions were MC questions: "Why do we have MC questions when there are none in the mid term/ final?" It is a very valid point and it is also exactly where mobile phone has an advantage over traditional clicker as a response device. A greater variety of question types can be asked and richer interaction can be fostered. It is also an area we now think both teachers A and B have not used the new technology to its full advantage.

Discussion

The results of our effort in promoting the use of web-based ARS at CUHK have not been very promising. The use of mobile phones as a classroom response device has found to be more successful if students respond through dialing or SMS, technologies that are less demanding in the type of hardware and in the level of skills to put these technologies in practice. However, the venture in using web-based clickers at CUHK revealed that students do not seem to be ready for this more demanding strategy.

The process to make the strategy feasible involves considerations in areas of the following: compatibility of hardware, attainment of essential skills, change of habits as well as the willingness to change on the sides of both teachers and students.

Hardware-wise, in contrast with the initial inference as deduced from the report of Taylor Nelson Sofres where there was a much higher percentage of smartphone ownership (nearly 50%) among people in Hong Kong, the ownership of mobile phones with web functions remains uncommon (approximately 10%) among students in both cases. Apparently, ownership of these devices may be higher among the people at work but not among students. A higher penetration rate of the better mobile phones may be the first requisite if web-based clickers were to be implemented at university.

Skill-wise, students need to be able to use the more advanced mobile functions. In our case studies, we have seen students who owned a smartphone but yet did not know how to connect to the internet as they had not been using their phones much for that purpose. Moreover, some students did not seem to understand the different connectivity methods (e.g. 3G, GPRS, and Wi-Fi). Students should have the knowledge whether their cellular plan included a sufficiently large data plan or not. Then students should decide whether they can use the cellular plan to get access to the internet or rather they should connect to the Wi-Fi service instead. Apart from connectivity, students should also be familiar with the operations and procedures required for activating the web browser on the mobile device and surfing the web.

Teachers should also possess similar skills for the web-base strategy to work. They have to be prepared that they need to assist students in making the web connection on their mobile phones as well as using the other web functions as it is inevitable that some of the students will not have the habit of using these mobile functions. Other than that, teachers need the skills in operating the web-based ARS. Experiences told us these skills are not difficult to acquire but teachers need regular consultations and support.

Lastly, concerning the motivation to change, it is still a question why students would welcome such a change if the additional trouble in setting up their mobile phones for the tasks does not end up as some better learning experiences. The findings in Case 2 seem to suggest that using mobile phones in itself can be a more satisfying experience (perhaps because of novelty?). However, for the additional effort to be worthwhile in the long run, it is better to make students realize that mobile phone can facilitate much enriched and meaningful class interactions than what the traditional clickers can possibly achieve. More meaningful activity designs are called for.

In comparison with students, it is expected that less effort is needed to encourage the use of clickers among teachers. Mobile phone clicker serves as a more convenient option to traditional clickers as teachers are not required to spend extra in purchasing neither the clickers nor the receiver. Moreover, web-based clickers allow teachers to save the time to inspect respective devices essential to produce responses in class (such as checking the level of battery from time to time). Besides, more time can be saved if students were to respond with their own mobile phones as there is no longer a need to distribute traditional clickers to students in class. It is believed that teachers who are motivated to adopt clickers are more likely to come up with meaningful activities, which result in better learning outcomes.

Conclusion

The paper reports two pilot cases in which the web-based classroom response system were adopted in the course of teaching and learning at two universities in Hong Kong, CityU and CUHK respectively. The success of web-based classroom response system was dependent on the possession of high-end mobile devices and skills to maneuver these devices. The primary objective of this study was to evaluate the feasibility of such practice in real classroom settings.

Rather than adopting a system that was purely web-based, a hybrid system, which allowed reception from both mobile phones and traditional clickers, was adopted to ensure a higher degree of participation among students. In contrary to the initial expectations of the researchers that the majority of university students should be in possession of the right mobile phones for clickers, only a minority of them had these devices. Moreover, many of these students were unaware of the steps to connect their devices to the internet. As for the teachers, they were yet not fully competent in operating the respective devices in the absence of technical staff. All in all, the experience we had informed us that much is still missing before a pure web-based ARS can be feasible in the real context. The missing parts relate to improvement in areas including hardware, skills, habits and motivation.

Regardless whether web-based or traditional clickers were used, however, the present study found that students on the whole welcomed the idea of a student responding system in general. Students appreciated that such a practice promotes teacher-student interaction and enables them to think and apply knowledge in solving problems.

The experiences served well in assisting us to reflect upon the support we need to give teachers in the future in relation to the use of web-based clickers. We now regard that the training of both teachers and students are equally important. Both should acquire basic knowledge of using the mobile devices and using them to connect to the internet. Support should also be continuous rather than one-off. We may also supply a laptop to teachers with the right settings and software installed as to avoid technical problems caused by using classroom computers. Moreover, we may need to explore other possibilities and systems to further enhance the types of interactions: not merely multiple-choices, but text or even images can be exchanged in the classroom.

Lastly, we should be aware of the fact that our study was limited in many aspects. Findings in our two studies were preliminary and indicative but yet revealing. The two cases were small-scale first-time endeavour of the teachers in attempting the new teaching strategy. More exploration is needed before we have a wider picture of issue at hand.

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Negotiating the twin goals of student learning and teacher learning in a professional learning team

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Student learning often forms the key focus of teachers. In professional learning teams (PLTs), teachers engage in collaboration and inquiry with the aim of improving their students' learning. However, teachers who take on the role of facilitating their fellow teachers' learning in PLTs need to simultaneously manage the goals of student learning as well as of teacher learning. This paper discusses issues that teachers face in negotiating the twin goals of student learning and teacher learning in the process of meeting the challenges of technology integration. It argues for a reconceptualisation of professional learning that hinges upon the design of learning tasks offered to teachers in a PLT to help them address issues related to student learning without losing focus of their own professional learning.

Keywords: Teacher learning, professional learning team, professional learning community

Introduction

In order for teacher educators to design learning experiences that foster teacher learning, they need a nuanced appreciation of both the nature of pedagogy (for a teacher's work focuses on student learning) and of andragogy (for a teacher educator's work revolves around an understanding of how teachers learn). The shift of emphasis from off-site professional development approaches to on-site professional development approaches such as teacher learning communities (McLaughlin & Talbert, 2006) means that school teachers are increasingly being put in the position where they help foster the professional learning of their fellow teachers. As such, we broaden our definition of "teacher educator" to include school teachers who take on the responsibility of facilitating the professional learning of fellow teachers.

These teacher educators are in a unique and challenging position of having to simultaneously manage the goals of student learning and of teacher learning. Grossman, Wineburg, and Woolworth (2001) were of the view that learning communities should place equal emphasis on student learning and teacher learning because both form important foci in teacher professional development. Yet, they noted that examples of teachers simultaneously navigating both agenda of student learning and teacher learning were rare even in schools that subscribed to the ideals of learning communities. The literature is also relatively silent on this aspect of teacher professional development. This paper aims to answer the question of how teachers and teacher educators could negotiate the twin goals of student learning and teacher learning while meeting the challenges of technology integration in the curriculum. A brief literature review will first be made of the Professional Learning Team as a form of school-based professional development approach. This will be followed by a discussion of the research methodology and the presentation of our findings. We used two meeting excerpts to illustrate the tensions faced by teachers grappling with time-related issues on the surface and uncover the underlying challenges that teacher educators face with regard to fostering teacher learning in ways that will enhance student learning through the integration of technology. The paper will end with a discussion of how teacher educators may simultaneously negotiate the twin goals of student learning and teacher learning through the appropriate design of learning tasks presented to teachers.

School-based professional development

Teacher educators have debated about how to engage teachers in learning experiences that are powerful enough to transform their pedagogical practice and catalyze school reform (Putnam & Borko, 2000). Traditionally, teachers were sent for workshops for the purpose of improving their pedagogical skills. While such off-site learning experiences have the advantage of being able to remove teachers from the immediate constraints of their classroom situations to engage in the exploration of ideas, they have also been criticised for being too far removed from teachers' day-to-day work to make an impact on their practice, and for falling short of helping teachers situate what they have learnt in their own classrooms or school contexts (McLaughlin & Talbert, 2006; Putnam & Borko, 2000).

The development of on-site or school-based forms of professional development has been called for, based upon beliefs that learning is social in nature and that effective professional development requires teachers to interact and collaborate with one another to improve instruction and student learning (Ball, 1996; Lieberman & Mace, 2008; McLaughlin & Talbert, 2006). One example of school-based professional development approaches is the notion of the *Professional Learning Community* (PLC), an approach which has been described as being "undoubtedly in the ascendant in educational policy and practice (Stoll & Louis, 2007). Table 1 presents a summary of definitions crafted by some of the key authors of PLC literature.

Table 1: Summary of definitions of PLCs provided by key authors

Key Authors	Shirley Hord	Richard DuFour and colleagues	Louise Stoll and colleagues
Definition of "Professional Learning Communities"	One "in which the teachers in a school and its administrators continuously seek and share learning and then act on what they learn. The goal of their actions is to enhance their effectiveness as professionals so that students benefit. This arrangement has also been termed *communities of continuous inquiry and improvement."* (Hord, 1997, p. 1)	"A professional learning community is a group of educators committed to working collaboratively in ongoing processes of collective inquiry and action research in order to achieve better results for the students they serve" (DuFour, DuFour, Eaker, & Many, 2006, p. 14)	"A professional learning community is an inclusive group of people, motivated by a shared learning vision, who support and work with each other, finding ways, inside and outside their immediate community, to enquire on their practice and together learn new and better approaches that will enhance all pupils' learning" (Stoll, Bolam, McMahon, Thomas, Wallace, Greenwood, & Hawkey, 2006, p. 5)

One of the main strategies for fostering schools to be PLCs has to do with the creation of structures such as *Professional Learning Teams* ("PLTs"), defined as mini-communities of teachers from the same department or grade level who work together for the purpose of improving student learning (Sather, 2009). In addition, calls were made for schools to schedule regular common meeting times for teachers within PLTs, with the belief that such arrangements provide opportunities for teacher learning (Lieberman & Mace, 2008; Little, 1999).

A community is professional in nature only because the client forms the primary concern of the members of the community (Grossman et al., 2001). Hence, what teachers in a professional learning community do have an impact on the learning of their clients, that is, their students. This can also be seen in the expected outcomes expressed in the definitions of PLCs provided by key authors through the use of phrases such as "so that students benefit", "to achieve better results for the students they serve", and "new and better approaches that will enhance all pupils' learning" (see Table 1). The improvement of professional practice to impact student learning is only one aspect of teacher professional development. The other aspect lies in viewing teachers as members of a true "learning profession" (Darling-Hammond & Skyes, 1999) and as lifelong learners of their own disciplines (Darling-Hammond & McLaughlin, 1995; Grossman et al., 2001). However, it is a huge challenge for teachers to simultaneously manage the twin goals of focusing on their students' learning as well as paying attention to their own professional learning, especially in the "hurried context" of school (Grossman et al., 2001, p. 952).

Method

Research context

The work presented in this paper forms part of a research from an instrumental case study (Stake, 1995) conducted over a period of one academic year in a neighbourhood Primary school with six grade levels ranging from Primary 1 (P1) through Primary 6 (P6) and catering to children from ages 6 through 12. The school organised its teachers into PLTs with each comprising teachers who either taught the same grade level (in the case of teachers who used the English Language as the medium of instruction for subjects such as English Language, Mathematics, Science, Social Studies, Art, Music, and Physical Education) or the same subject (in the case of the teachers who taught the Mother Tongue Languages i.e. Chinese Language, Malay Language, Tamil Language). Overall, there were a total of nine PLTs in the school comprising six same grade level PLTs (i.e. P1 PLT, P2 PLT, P3 PLT, P4 PLT, P5 PLT, P6 PLT) and three Mother Tongue PLTs (i.e. Chinese Language PLT, Malay Language PLT, and Tamil Language PLT). Each of the six same grade level PLTs met weekly for one hour during its dedicated meeting slot held throughout the year. Out of a total of about 32 weekly meetings scheduled for the year, the school planned on devoting six sessions to discussions on readings taken from a book that focuses upon teaching skills, 12 sessions to lesson studies, leaving the remaining sessions for other forms of professional sharing e.g. sharing of lesson ideas. Each PLT had a Level Manager and Assistant Level Manager who decided on the agenda for each PLT meeting, with input from fellow teachers, and the School Staff Developer who oversaw the professional development of all staff. The first author attended the meetings of the P4 PLT over the course of one academic year in 2010. Field notes were recorded at all meetings, which were also video-recorded. Table 2 presents an overview of the profile of the teachers in the P4 PLT and their key roles in the school and in the PLT. All the names indicated are pseudonyms.

Table 2: Profile of teachers within the Primary 4 PLT

Study of interactions among teachers during meetings

Name	School experience (in years)	Key roles played within school and the Primary 4 PLT
Ms. Woo	28	School Staff Developer overseeing professional development of staff
Soo Kee	20	Advisor to the Level Manager
Noraini	18	-
Fei Yen	12	Facilitator for book discussions
Alice	9	Level Representative in the Health Education curriculum committee
Arief	8	Level Manager; in charge of preparing the agenda for the weekly meetings
Larry	5	Level Representative in the Mathematics curriculum committee, and Coordinator for lesson studies
Jane	2	Assistant Level Manager, and Level representative in the English Language curriculum committee
Siti	2	Level Representative in the Science curriculum committee

This study adopts the social theory of learning perspective (Wenger, 1998) where teacher learning is conceptualised as the social participation of teachers as they engage in and shape the practices within their PLT.

The examination of field notes, in combination with Interaction Analysis (Jordan & Henderson, 1995), was used to identify video segments for further study. Interaction Analysis is a video-based analysis characterised by the investigation of "human activities such as talk, nonverbal interaction, and the use of artifacts and technologies, identifying routine practices and problems with the resources for their solution" (p. 39). It involves the process of conducting a preliminary data scan of video recordings and keeping content logs that record information about events in each video and their timecodes for further reference. During the preliminary data scan, segments with interactional "hot-spots" (p. 43) were marked for more in-depth study of the interactions taking place among the teachers. Segments were then viewed repeatedly and transcriptions of the speech were made (refer to Figure 1 for the transcription conventions). The discourse was studied with the intention of examining the local knowledge of practice generated by the teachers in the PLT as they discussed matters pertaining to the use of technology to enhance student learning.

Transcription Conventions

=	indicates latched speech where there is no gap between two turns
(.)	a very short untimed pause
<u>word</u>	underlining indicates speaker emphasis
e:r the:::	colon indicates lengthening of the preceding sound
-	a single dash indicates an abrupt cut-off
?	rising intonation, not necessarily a question
!	an animated or emphatic tone
,	a comma indicates low-rising intonation, suggesting continuation
.	a full stop indicates falling intonation
[ ]	indicates overlapping speech
( )	indicates a stretch of unclear or unintelligible speech
(shows picture)	non-verbal action

Figure 1: Transcription conventions used in transcriptions of meetings

Analysis of excerpts and findings

Context of the meeting

To illustrate the tensions faced by teachers within the P4 PLT as they grappled with having to simultaneously focus on matters pertaining to student learning while keeping their own professional learning in view, two excerpts taken from the second PLT meeting that took place in January 2010 will be discussed. The first 40 minutes were spent on a briefing conducted by the full-time school counselor and learning support coordinator to inform the teachers about students with special needs in various Primary 4 classes. Following some quick announcements by Arief and Jane, Larry proceeded to explain to the teachers on the use of a set of programmed Excel spreadsheets that had been prepared for teachers to teach the Mathematical concept of place value (e.g. the thousandth place value, the hundredth place value, the tenth place value etc). The programmed Excel spreadsheets (refer to Figure 2) included short scenario-based activities that involved students identifying the place values of different digits in numbers that ranged from single-digit to five-digit numbers expressed in monetary terms. A culminating activity designed for higher-ability students required the students to assume the role of a programmer who needed to fix an automated teller machine so that it showed the correct amount of cash withdrawn from the machine. This activity required the students to enter mathematical formulae into Excel which were of the correct syntax and which made use of cell-referencing. Soo Kee asked Larry to demonstrate the steps used for entering a formula into a cell as she was not sure how to do so. Larry explained the procedure in a step-by-step fashion, showing specific cells to click on while entering a formula into the correct cell. In the course of his demonstration, Jane and Arief explained how a cell within Excel may be referenced as this was a skill required of Primary 4 students in line with the *Baseline ICT standards* which described specific ICT competencies (e.g. basic typing skills and skills in manipulating data in spreadsheets) that students needed to achieve at different milestones (Ng, 2008).

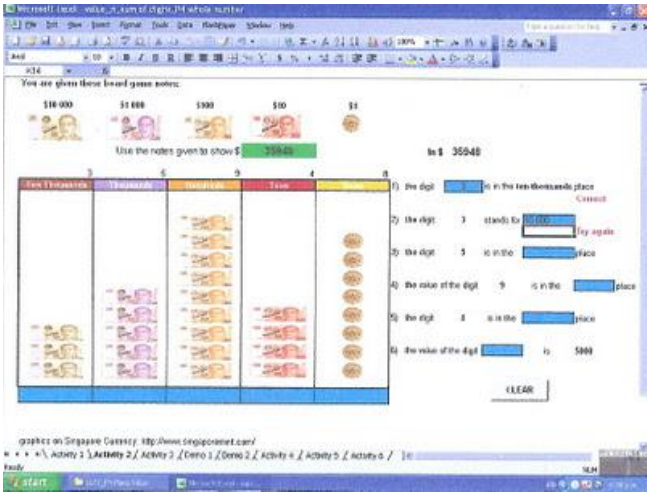

Figure 2: A screen shot of the programmed Excel spreadsheet used to teach place values

Soo Kee expressed her view that it was needful for the teachers to be able to see the step-by-step demonstration given by Larry so that they would be able to use the Excel spreadsheets in class. Larry, lamenting the lack of time, responded that such demonstrations were possible only if more time was allowed for the discussion of ICT-enabled Mathematics lessons. Ms. Woo felt that the issue of a lack of time could be addressed by having the teachers try the Excel spreadsheets on their own by following instructions in notes instead of spending time during the PLT meetings to go through the specific steps. Larry countered that the approach of asking teachers to try the resources on their own did not work in the past and Soo Kee added that notes could not sufficiently convey instructions required for step-by-step procedures. Figure 3 presents the transcript of two excerpts of the discussions that ensued.

Excerpt One of Meeting

21	Larry:	Actually, Ms. Woo, you see, all of us, our IT competencies are at different levels=
22	Ms. Woo:	=Yes=
23	Larry:	=So I, I feel, over these two years I feel that it may be good if we actually talk more about ICT lessons, and probably improve upon them, you see
24	Ms. Woo:	Because if it is like that, then it is basically not very professional, because it's just clicking but the pedagogy behind the teaching is not there. You're just showing them operational, you know what I mean?
25	Soo Kee:	I don't [think so. I feel that]
26	Larry:	[I don't think so.] Actually we need to teach why do we click this, you see? This one is referring to BY(i)TES, you see.
27	Ms. Woo:	Yea, those are only operational=
28	Soo Kee:	=But you see, the problem we had last year was that after every ICT lesson, we didn't even have time to come back and say "hey, is this useful or not?"=
29	Ms. Woo:	=Ah, <u>that</u> is important=
30	Soo Kee:	=So, we didn't even have that kind of time, so <u>every</u> ICT lesson, we didn't have time to review whether it was useful and ask "Okay, tell me, what were the areas for improvement? For the average classes, was it useful? For high ability? What else can we do to improve?" So, we don't have this kind of time, then end up we are like <u>always</u> rushing. At least now he shows us one step at a time. Last year, Mr Loh didn't even have time, he said "go and do it yourself". So, okay, do and die on your own (laughs).
31	Larry:	The, the reason is because=
32	Ms. Woo:	=So, this year, with one extra level meeting every month, we should be able to, but I'd rather you all cover that kind of things, rather than this kind of clicking, operational things, you know.
33	Larry:	Ms. Woo, it's not only clicking, you know, because it is more than that=
34	Ms. Woo:	=Because like in Excel, which cell to click can be taught =
35	Larry:	=It's not Excel only, you know, this is not talking about Excel only, you know. This is also about learning, like, about the place values, all these things. I was going very fast so I didn't explain to them, you see.
36	Ms. Woo:	(.) But, okay, that kind of=
37	Larry:	=There's also pedagogy, that's what I'm trying to say also=
38	Ms. Woo:	=Yes=
39	Larry:	=It is not only clicking=
40	Ms. Woo:	=If you can <u>concentrate</u> on the pedagogy, that's what we want, rather than concentrating on, you know, how to get the formula, that kind of things, kind of operational
41	Soo Kee:	For that one, I think he's quite fast=
42	Larry:	=I'm talking very fast, Ms. Woo, but there is really pedagogy. What I mean is I think we need time to talk about pedagogy.

43	Ms. Woo:	The group is given extra time this year. Every month, you are given one extra time so let's see how it works out, but rather than share about clicking, share about like what Soo Kee was talking about, after that what happened, before that what happened, you know? For example, why is it that we are teaching this whole thing, what is this whole activity for in the first place? You know?

Excerpt Two of Meeting

56	Larry:	There is a main objective also, it is all in the lesson plan already, if I have time, I would have gone through, you see.=
57	Ms. Woo:	=So why don't we concentrate instead on the why is it for, what is it for here, then the how to do it, can they try it out?
58	Arief:	(Shakes his head)
59	Jane:	No (J shakes her head)
60	Soo Kee:	But you see, cannot, it's connected,
61	Noraini:	Larry must tell us first.
62	Soo Kee:	You see, he can tell us what is it for, but if he doesn't tell you how to do it, you won't see the connection, you know. Then you cannot say "Oh, this can be used to teach that, I see."
63	Arief:	Not just that, the work about the Excel spreadsheet and other software need to be shown.
64	Ms. Woo:	Uh huh. Okay. How much time will you need, for example one lesson like that, how much time will you need to show, to explain, how much time do you need for one lesson to discuss, go through the pedagogy?
65	Arief:	It depends, if Excel spreadsheet, the first few take up a longer time, then the subsequent Excel spreadsheets will be fine, then later, we will do Geometer sketchpad, and then something new later, then Fun with Construction again.
66	Ms. Woo:	Then it will take time.
67	Larry:	The thing is that we are always left with no time to talk about pedagogy due to the lack of time. Do you realise?
68	Soo Kee:	Yes, I think the lesson review, review and the improvement on that lesson=
69	Ms. Woo:	=Yes, that part is more important=
70	Soo Kee:	=we only do it at mid-year, by that time, we would have forgotten all our lessons already.

Figure 3: Two excerpts of 18 January 2010 meeting

Students' competencies and teachers' competencies

While trying to explain the need for more time to be spent on ICT-enabled lessons, Larry cited the different ICT competencies possessed by teachers in the PLT as one reason (line 21 in Figure 3). In line 26, he also pointed out the need to teach students how to operate Excel spreadsheets as something required by BY(i)TES (acronym for *Benchmarking Your ICT Practices for Excellence in Schools*), a set of guidelines and performance indicators designed to help schools gauge the extent to which their integration of ICT in teaching and learning served to foster higher order thinking skills among students and a culture of experimentation and innovation within the school (Singapore Ministry of Education, 2007). Larry's reference to these guidelines suggests that the inclusion of certain task components in ICT-enabled lessons (e.g. referencing cells and inserting formulae in Excel spreadsheets) was made strategically in order to help students and the school achieve certain standards articulated within the guidelines. Larry's comment about the need for certain standards to be met with regard to students' learning on the one hand and teachers' ICT competencies on the other hand highlights the fact that teachers in a learning community have two levels of learning that they need to attend to – the learning of their students, and their own professional learning.

Operational aspects versus pedagogical aspects

Ms. Woo was of the opinion that the teachers should not focus on such aspects of using the Excel spreadsheets as they were less "professional" (24) but more "operational" in nature (24, 27, 32, 40). Instead, she felt that the teachers should focus upon the "pedagogy behind the teaching" (24), something which Larry felt that he did attempt to do (33, 35) but did not manage to achieve due to a lack of time (37, 42). A dichotomy was drawn between the operational aspects and the pedagogical aspects of an ICT-based lesson.

On the one hand, the teachers linked the operational aspects of an ICT-based lesson to actions related to the actual operation of the ICT tool such as the clicking of cells (24, 26, 32, 34, 39) and the keying in of formulae (40). On the other hand, they linked the pedagogical aspects of an ICT-based lesson to discussions on lesson objectives (56) and how the lessons may be reviewed and improved upon (43).

When Ms. Woo again raised the suggestion to have teachers try the ICT-based learning resources on their own time so that meetings could focus on the rationale underlying the use of the resources (57), she met with objections from Arief, Jane, Soo Kee, and Noraini (58 through 63). Noraini insisted that it was necessary for Larry to demonstrate the steps to the teachers first (61) and Soo Kee felt that there was a very close connection between knowing how to operate the ICT-based learning resource and knowing how it could be used to teach a particular concept (62).

Larry's observation that "we are always left with no time to talk about pedagogy" (67) seems to suggest that the teachers often attended first to issues other than pedagogy when discussing lessons during such meetings. This was perceived as the usual practice, as indicated by Alice during an interview held after the meeting took place, when she raised her concerns about the use of time during meetings:

> … there are times when the facilitators try to help us in terms of ICT but the time spent on going through the process of clicking this, going to this web page to click on this, opening the files – all these manual, step-by-step processes – I don't think we can do them during the PLT meetings. This should be done at our work areas in the staff room on a one-on-one basis, with the one or two teachers who do not know how to do it. So, maybe we can cut down on time spent on these things. I was thinking that we need more sharing of pedagogy, like why do we have this ICT lesson, in what ways is it beneficial, what the whole package is all about, that's all. We don't need to talk about what to click on, which websites to go to, which files to open. (Excerpt of interview, 12 November 2010).

Alice shared Ms. Woo's view that while it might have been needful for teachers to know how to operate ICT-based lessons, meeting times should be spent on discussing pedagogical matters instead of showing teachers the specific steps. In the following section, we shall examine what discussing pedagogical matters during PLT meetings could entail.

Discussion

According to a study by the British Educational Communications and Technology Agency (Becta) on the barriers teachers faced in the use of ICT in their teaching and learning, a significant determinant of a teacher's level of use of ICT is the level of confidence felt, which in turn is related to other factors such as one's level of competence and the quality of professional development received (2004). With regard to professional development, both operational aspects as well as pedagogical aspects are needed. Preston, Cox and Cox (as cited in Becta 2004) noted that teachers need to understand aspects related to the basic workings of an ICT tool and how technical problems may be solved. In addition, teachers also need to be equipped in the pedagogical use of ICT, such as how ICT may be used to enhance student engagement and to support constructivist teaching approaches (Balanskat, Blamire & Kefala, 2006).

Teachers face pressures in the use of time (Little, 1999). On top of that, teachers perceive that more time is needed to explore the use of ICT, to deal with technical problems, and to use ICT in the preparation of lessons and resources (Becta, 2004). Given that time is a limited resource, should teachers first address the operational aspects or the pedagogical aspects of the use of ICT in their teaching?

Snoeyink and Ertmer (2001) weighed the arguments for and against addressing operational aspects before pedagogical aspects in the professional development of teachers to help them integrate ICT into teaching. They concluded that teachers need to be equipped with the basic operations of an ICT tool before they could move on to address pedagogical issues, because without the technical know-how in the first place, the integration of the ICT tool into their teaching would appear out of reach. Likewise, Kissane (2003) proposed that mathematics teachers go through the first stage where they gain confidence through the learning of technical skills before they move on to the second stage where they learn how to manage pupil use of the ICT tool, then to stage three where they develop lessons incorporating the ICT tool before they progress to the final stage where they push curriculum boundaries in the incorporation of ICT into their practice.

At the same time, calls have been made for the use of new approaches of professional development related to the concepts of lifelong learning, knowledge sharing and peer learning where all teachers are looked upon as learners who shape their own learning process (Balanskat et al., 2006; Webb, Robertson and Fluck, 2005). However, the struggles faced by the teachers in the P4 PLT shows us that while the provision of organisational structures and the common time to meet as fellow professional learners is a very important step, more needs to be done to support teachers so that they may negotiate the twin demands of meeting student learning goals as well as attend to their own professional learning goals.

The struggles faced by the P4 PLT teachers seemed to be related to a lack of time for attending to both the operational aspects as well as the pedagogical aspects related to the use of ICT in their teaching. However, we surmise that what lies at the crux of the matter is the need for teachers to reconceptualise their own professional learning by way of being engaged as "learners in the area that their students will learn in but at a level that is more suitable to their own learning" (Wilson & Berne, 1999, p. 194).

This reconceptualisation requires the design of professional learning tasks that not only help teachers explore issues related to student learning, but which also help teachers foster their own professional learning. A strand of literature drawn from the study of mathematics education and which focuses on the interrelations between the learning of students, teachers, teacher educators, and educators of teacher educators (Zaslavsky, 2009; Zaslavsky, Chapman, & Leikin, 2003; Zaslavsky & Leikin, 2004) proves illuminative. Zaslavsky and Leikin (2004) built upon the concept of Jaworski's teaching triad (1994) which synthesises three elements involved in the creation of opportunities for students to learn mathematics. These three closely intertwined elements comprising the teaching triad of mathematics teachers include (1) the *mathematical challenge* which pertains to the way in which the teacher offers mathematics to his/her students depending on the students' learning needs and abilities, (2) the *management of learning* which pertain to a teacher's beliefs and strategies about teaching which shape the way lessons are conducted, and (3) the teacher's *sensitivity to students* inherent in how the teacher relates to the students based on his/her knowledge of individual students (Jaworski, 1994). Just as mathematics serves as a challenging content for students, the teaching triad of mathematics teachers serves as a challenging content for mathematics teachers (Zaslavsky & Leikin, 2004). Hence, the teaching triad associated with the work of a mathematics teacher educator (e.g. a teacher who facilitates the learning of fellow mathematics teachers) consists of the teaching triad of mathematics teachers, sensitivity to mathematics teachers and the management of mathematics teachers' learning. This conceptualisation gives rise to a nested triad as depicted in Figure 4. To foreground the types of learning that form the foci of the different levels of teaching triads, we added the labels "*student learning*" and "*teacher learning*" at the core of each triad; such a visual representation goes to show that classroom teachers who are tasked with facilitating fellow teachers' learning (i.e. teachers who take on the role of teacher educators) need to simultaneously negotiate the goals of two levels of learning – that of student learning as well as of teacher learning.

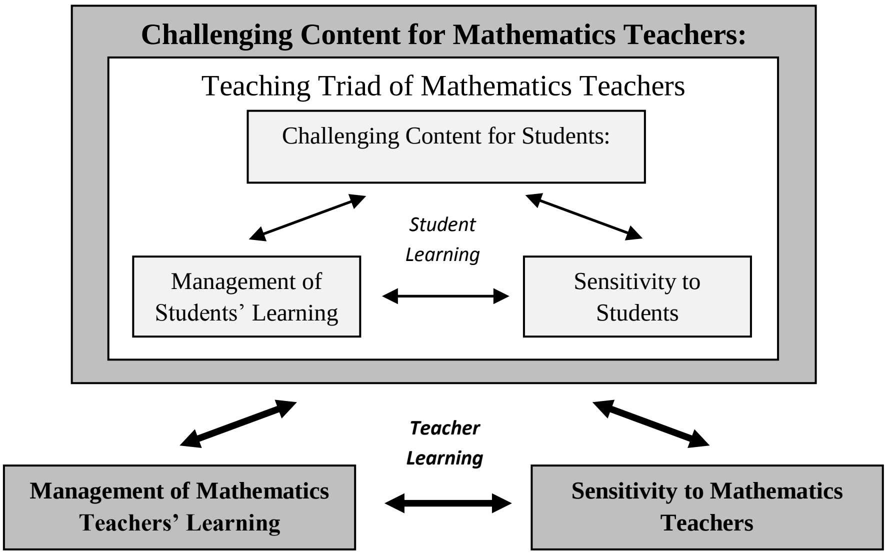

Figure 4: The teaching triad of Mathematics teacher educators (adapted from Zavslavsky & Leikin, 2004)

Zaslavsky and colleagues argued that different levels of tasks needed to be designed depending on whether one was facilitating the learning of students, teachers, or teacher educators. For example, a task in the form of a problem sum offered to a student during a particular lesson should not be presented as it stands to teachers for their discussion but should instead be broadened to include questions designed to create doubt and conflict that will propel teachers to question underlying assumptions about the teaching and learning of mathematics. This is grounded upon the assumption that tasks which create doubt and conflict can surface subtle content and pedagogical issues that are not often addressed. This implies that the design of learning tasks is pivotal:

> On the one hand, tasks are the means and content by which learning is facilitated. On the other hand, through a reflective process of designing implementing, and modifying tasks, they turn into a means of the facilitator's learning. (Zaslavsky, 2009, p. 110)

With regard to the activity in the programmed Excel spreadsheets used by the P4 PLT teachers to teach the concept of place values, one of the students' tasks was to identify the place values of certain digits in a 5-figure value expressed in monetary terms. The Excel spreadsheet, programmed to provide immediate feedback for figures entered by the student, showed a visual representation of the 5-figure value in terms of $10000 dollar bills, $1000 dollar bills, $100 dollar bills, $10 dollar bills, and $1 coins arranged in the order corresponding to their respective place values (Figure 2). To foster teacher learning, instead of asking teachers to solve the student's task, an example of a broadened task that could be presented to teachers is to ask the teachers to discuss how a change in the order of the dollar bills (e.g. re-order the bills so that they appear in the order of $10000 dollar bills, $100 dollar bills, $10 dollar bills, $1 coins, $1000 dollar bills) could possibly affect the students' ability of arriving at the correct answer. Such a question could engage discussion on the use of ICT-based representations to scaffold understanding of place values as well as how and when such scaffolds may be faded. The discussion could potentially give rise to the design of questions involving higher-order thinking skills that require students to pay closer attention to the place values of the currency shown instead of assuming that the order of the dollar bills correspond to their respective place values.

To further flesh out the differences in the design of student tasks that facilitate student learning and the design of teacher tasks that facilitate teacher learning, illustrative details pertaining to challenging content for students/teachers, sensitivity to students/teachers, and management of students'/teachers' learning are shown in Figure 5. The details are not meant to be exhaustive but are presented to show an example of how teachers working in PLTs could negotiate the twin goals of student learning and teacher learning through a careful design of teacher learning tasks that keep both students' learning and the teachers' own professional learning in view. With regard to issues raised by the P4 PLT teachers, the ICT competencies of students/teachers may be addressed in the element pertaining to sensitivity to students/teachers while the operational/pedagogical aspects of the use of Excel may be addressed in the elements pertaining to sensitivity to students/teachers and management of students'/teachers' learning.

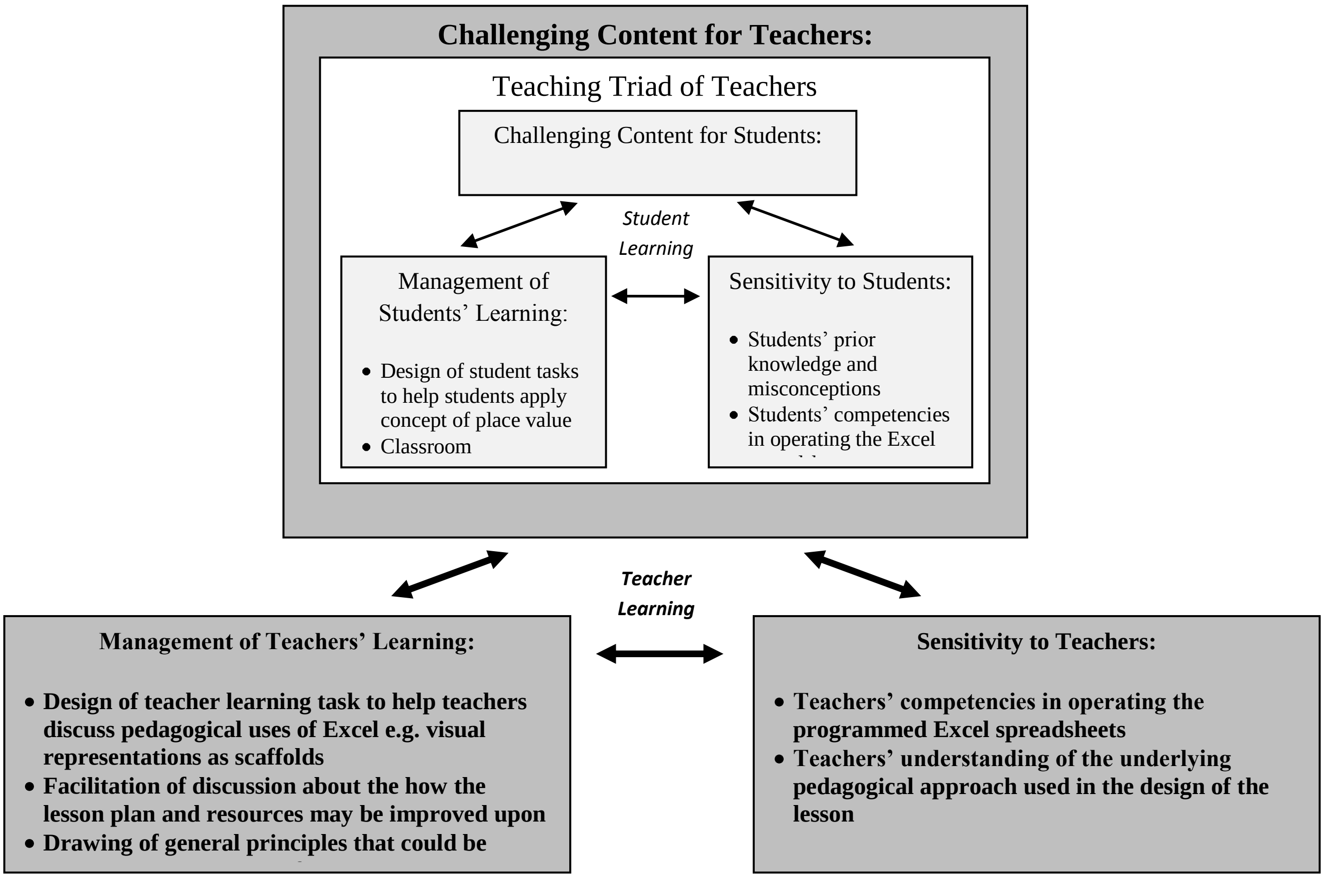

Figure 5: The teaching triad of teacher educators in relation to the use of programmed Excel spreadsheets to teach the concept of place values (based upon Zavslavsky & Leikin, 2004)

Conclusion

The lack of research investigating how teachers shape their peers' learning in professional learning communities is a concern, especially when the responsibility for teacher learning has been placed upon teachers themselves during a time when more and more educators tout school-based professional development approaches as being more effective than off-site professional development approaches. However, the provision of structures that enables teachers to meet regularly as members of professional learning teams, while important, are insufficient in helping teachers to effectively facilitate their peers' learning. Due to the close link between teacher learning and student learning, there is a need to engage teachers in reflection that monitors how changes in their own learning impacts the learning of their students (Stoll, Fink & Earl, 2003). We presented the concept of nested teaching triads by Zaslavsky and Leikin (2004) and argued that the nature of the learning task offered to teachers in a PLT plays a pivotal role as teachers' reflection may be stimulated through the appropriate modification or broadening of learning tasks that are offered to students. While originally conceptualised for mathematics teachers and mathematics teacher educators, the notion of nested triads could be applied to other subjects as well. Schools need to consider how facilitators of teacher learning may be supported in their endeavour of designing tasks offered to teachers to raise the quality of their learning to a level that is commensurate with the type of student learning envisioned by school reformers.

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The emergence of educational technologies in ethics education: exploring the Values Exchange decision making software.

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The Values Exchange decision making software offers a unique way to deliver ethics education to health care professionals. It does not attempt to objectify ethics nor does it use traditional ethics terminology. Reflecting a changing direction, it places emphasis on a student's existing knowledge, experience and ability to reason. This ability is seen as an inherent characteristic of all students but can remain latent if ethical decision-making is only valued if undertaken by ethics 'experts'. A case study, with five participants explored the ways in which the software facilitated users to think about ethical issues. The online environment created space that facilitated decision-making. Learning about oneself and others enabled users to arrive at new ways of seeing practice based issues, and new ways of seeing themselves. The findings from this small scale study suggest that the Values Exchange encourages thoughtful reflection that has the potential to manifest itself in benefits for both patient and practitioner.

Keywords: health care ethics, ethics education, decision making, web-based technology

Background

Shifts in the health care landscape have led to both challenges and opportunity for the field of ethics education. Technological advancements mean that patients have significantly greater access to information (Campbell, Chin & Voo, 2007). The practitioner is no longer the exclusive expert. Where once medical values dominated, awareness of a wider range of views is now needed. Ethics education has the potential to raise this awareness. There is however a general acceptance that ethics is both difficult to teach and to assess (Bertolami, 2004; Campbell et al, 2007; Singer, Pellegrino & Siegler, 2001). Bertolami (2004) has concerns that ethics curricula don't work. He argues that many current courses "do not cultivate an introspective orientation to professional life" (p.414) or encourage students to think for themselves, and there is the risk of students blindly accepting what is taught. Within health care education ethics is not always favourably embraced by students or staff (Campbell et al, 2007; Bridgeman, Collier, Cunningham, Doyal, Gibbons, & King, 1999). It is often a compulsory component and not always viewed by students as being relevant.

As a lecturer in health care ethics, my experience supports this literature. I teach an interdisciplinary ethics paper to 300 students a year from a range of health related programmes. These include physiotherapy, podiatry, medical laboratory science, paramedicine, oral health, psychology, applied mental health and health promotion. The paper competes with other clinical papers and despite the reality of inter professional teams in the workplace, the interdisciplinary nature of the paper means that some students view it as outside their own practice and not relevant. Furthermore, ethics is often seen as an 'intangible' subject area which may differ from a positivist science based paradigm which dominates many health science programmes. Educational technology may have the potential to help meet these challenges.

The Values Exchange decision making software

The Values Exchange (Vx) is a web based decision-making tool that offers a unique way to deliver ethics education by optimising the existing knowledge and experience of students. Offering deliberation on a range of health and social issues (Figure 1), a series of interactive screens are used to facilitate the deliberation of a case scenario (Figure 2). Using tick box options and free text opportunities the user moves from an initial 'gut reaction' to a well reasoned, justified position. Transparency is a central focus of the software and after individual deliberation users can view summaries of their own decision making and the views of other respondents. The Vx also generates a series of both quantitative and qualitative reports. Through this transparent exchange with others, users are able to reach a greater awareness of their own decision making processes as well as new understandings of others.

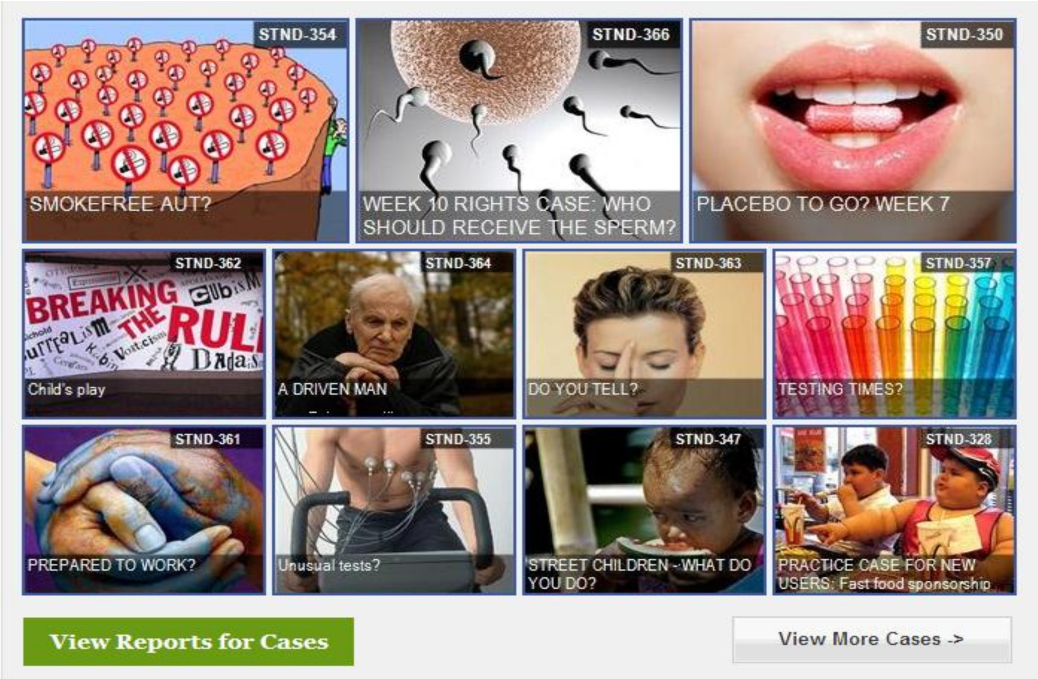

Figure 1: Values Exchange home page (http://aut.values-exchange.co.nz)

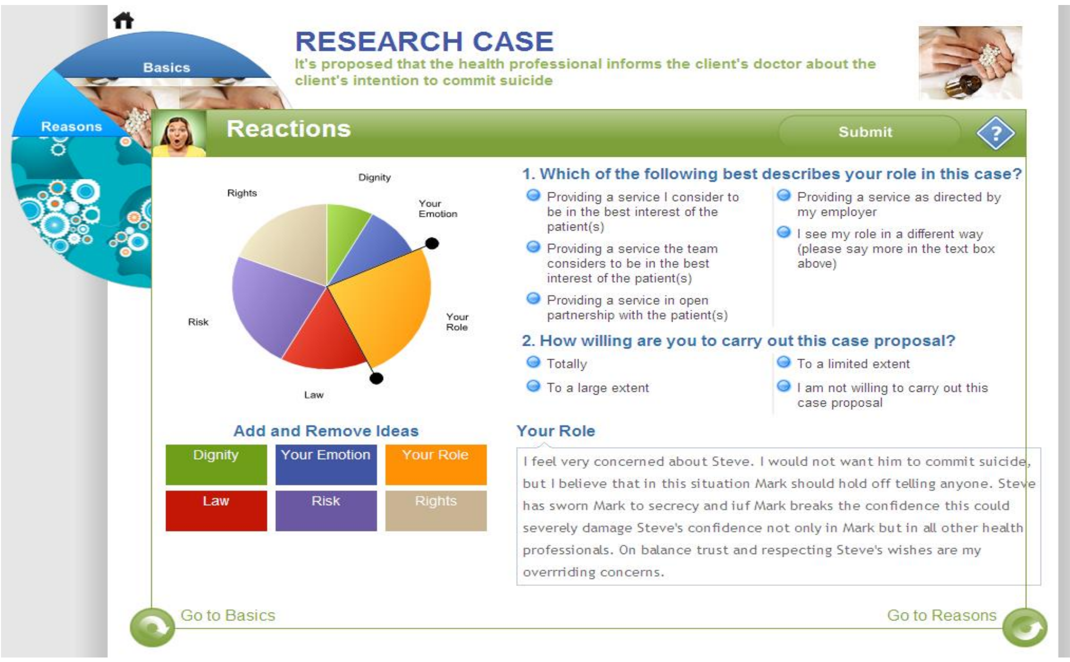

Figure 2: Values Exchange 'Reactions' deliberative screen

Philosophy and pedagogy

Not only does the Vx utilise a relatively untapped method of delivery, its philosophical underpinnings differ from many other ethics education examples. Prevalent teaching pedagogies include ethics education where students are taught objectively 'right' answers, where they are taught from a predominantly theoretical perspective, and education based on understanding ethical 'process'. The Vx is an example of the latter. It does not attempt to objectify ethics nor does it use traditional ethics terminology. Rather, the tool is supported by the position that ethics education ought to help students identify their own values and decision-making processes rather than instilling specific beliefs (Mathieson, 2008). In addition, the use of traditional ethics terminology may actually alienate students from confident, ethical decision making (Cowley, 2005). By focusing on understanding the decision making process, ethics education can be seen as an opportunity to encourage students to critically analyse situations, to think for themselves and through introspection be equipped to make ethical decisions in practice. Using everyday language the software incorporates traditional theoretical positions. By not specifically labelling these theories it enables the ideas to be considered, but does not impose intellectual authority. On a philosophical level, this helps democratise ethical decision making; legitimising lay access to the field of ethics. The Vx reflects a changing direction for ethics education. Godbold (2007) argues that ethics education "must start from the bottom up" (p. 184). The Vx does this by placing emphasis on the experiences and values that students bring to the classroom rather than an emphasis on the knowledge held by the teacher.

Rather than being restricted to ethics experts or committees, the Vx is underpinned by the notion that ethical decision making can be undertaken by everyone involved in the delivery of health care. The idea of everyday ethics has been developed further giving rise to the notion of an ethics toolkit (Seedhouse, 2009; Weston, 2001). This may include tools such as experience, values, rules, theories and one's individual capacity and ability to reason. Given the everydayness of Seedhouse's ethics vision, it is quite plausible that most people already posses the toolkit with many of the necessary resources to undertake ethical deliberation. Ethics education may then be about assisting people to realise the existence of such resources and providing an environment where its use can be developed.

The research

A small scale case study with five participants explored and described the ways the Vx facilitated users to think about ethical issues. Participants involved in both postgraduate study and health care practice used the tool to deliberate a provocative scenario. The decision-making process began by asking the user to identify the most important consideration of the scenario, along with the person or group that matters most. Following this, screens offered in-depth opportunities to explore the scenario and provide reasons for positions taken.Through viewing summary reports participants reflected on their own decision making along with the decision making of the other participants. An online questionnaire and face to face interviews further explored participant responses. Braun and Clarke's six step method was used for thematic analysis of all data (Braun & Clarke, 2006). The findings suggest that the Vx enabled participants to come to new ways of seeing. This related to new insights about the case scenario, new possibilities for dealing with the ethical issue and new insights about themselves as decision makers. Different elements of the Vx contributed to these insights. Primarily, new insights were gained by having access to the reports of others.

> "I realised how helpful it was to see what others had written and to see how honest they too had chosen to be."

> “The experience emphasised for me the importance of not solely relying on your own values and opinions when deciding on the best approach to undertake in a given situation – to be ‘open’ is crucial for a health professional... It made me realise that no matter what our stance was we all sought the same goal – everyone had valid comments that could assist the patient…and [these] extended the range of approaches I would have considered.”

There were also opportunities to learn about oneself.

> “It [the Vx] forced me to be honest with myself about unconscious aspects of my thinking and my beliefs. That was incredibly helpful even if uncomfortable.”

For others the Vx brought clarity and an increased awareness of decision making

> “I’m more clearly aware of how complex the decision is than when I started… [the Vx] helped me to understand the complexity of my own thought processes.”

Participants reflected on the online environment. Deliberating ethical issues using an educational technology was a new experience for all participants and differed from the way in which they would normally consider ethical issues. Several compared the environment to a face to face discussion. While one participant preferred the live interaction, others saw benefit in the online environment.

> “When I’m listening to someone speak I’m listening through the lens… of my own interpretation of whatever it is we’re discussing. But when I’m reading, it somehow impacts me more objectively. I’m reading it less through my own lens – so I think I’m hearing better when I’m reading it than when I’m listening to someone… I think in a discussion you’re often preparing yourself for rebuttal…I’m already working out my argument for when it’s my turn to speak, so not really fully taking in what the other person is saying.”

The environment was also seen to create a space in which decision making could take place. The participants reflected on space as relating to a ‘place’ where thinking occurred. For one participant the space created a valuable barrier from being swayed by others during the deliberative process, as may occur in a face to face setting.

> “It was just my thoughts to the very end…I think the benefit of not hearing other people’s opinions until the end is that you’ve worked out where you stand and why.”

Finally, with a reliance on their own ability to defend their thinking, the Vx gave users confidence in their decision making. As one participant concluded,

> “I think it’s really good to have confidence in what you’re saying…people should own their thoughts and I guess a programme like this helps them to do that. That, in itself is a good teaching tool if it gives them confidence…to see the pros and cons and work out what are the important

things and why am I thinking like I'm thinking. Even if they get from this, confidence with that process regardless of the final answer, see that's really important."

Conclusion

Few studies address the use of educational technologies in ethics education. Teaching experience and the results of this small study demonstrate that the Vx appears to provide a foundation for thinking and decision making. While case study research is not generalisable and the sample was small, the findings are potentially informative. As an online learning tool it offers unique features which may enhance existing methods of ethics education. The Vx offers a new direction in ethics education with significant potential to meet many current challenges. "The most important single factor influencing learning is what the learner already knows" (Ausubel, 1968, p.vi). This study shows that participants already possessed the skills necessary for thoughtful decision making. The Vx provided a space to be able and be allowed to think. Philosophically and pedagogically the Vx challenges many of the existing strategies present within ethics education and seems to be effective in facilitating students to be thoughtful practitioners. Importantly, the Vx may help to close the theory-practice gap by offering an easy to use framework where existing knowledge and experience can be utilised along with the varied perspectives of others to formulate effective ways to deal with practice based issues. A larger study is currently being planned to explore these tentative findings further.

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Working from the evidence of prior art and experience in curriculum database development

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There are many potential benefits from systematic documentation of university degree curricula, including facilitation of curriculum review, accreditation reporting and better information for students, lecturers and administrators. The importance of such documentation and its growing complexity has motivated many attempts to create software systems to manage it more effectively. However, there has been little reported on the process of creating such systems and experience of using them. This paper describes the 10 year evolution of the CUSP curriculum database at the University of Sydney's Faculty of Engineering & IT, from a 200 unit, engineering- specific repository, to a multi-faculty platform for 169 degree pathways and over 2000 units of study. The paper contributes to the understanding of challenges of large scale curriculum modeling and curriculum information management and shares lessons learnt in building systems to support these processes and the people involved.

Curriculum databases, curriculum modeling, academic standards, learning outcome standards

Introduction

University degrees aim to instill in students a set of skills, attributes and competencies over a progressive sequence of units or subjects that usually span three to five years of full-time study. Each discipline typically has its own set of expected graduate outcomes but at widely varying levels of formalisation and external accountability, subject to presence or absence of professional accreditation and the different approaches of the professional bodies involved. Systems and tools for tracking and managing the delivery of expected graduate outcomes are similarly disparate. Online curriculum databases that map learning outcomes across teaching programs are well-established at the level of individual disciplines, medicine in particular, and at a few individual universities, but unknown elsewhere.

The need for greater consistency in identification and monitoring of university outcomes has been a major focus of current higher education reform, through the work of the new TEQSA Interim Commission (Tertiary Education Quality and Standards Agency, 2011) and the Learning and Teaching Academic Standards (LTAS) Project of the Australian Learning and Teaching Council (2010). The activity and interest around outcome standards development has so far not spilled over into comparable interest regarding the information resources required for effective implementation of outcome standards across large, complex teaching institutions. Interest in the underlying theoretical and practical issues of developing systems for managing learning outcomes information on a broad institutional scale has been largely confined to medical education so far.

This paper discusses the literature on such curriculum information management systems. It then presents the design, research, lessons learnt and long term evolution of a series of such systems, deployed and evaluated in a live environment at the University of Sydney over the last ten years.

Background

Computer based systems designed to manage the documentation of teaching curricula on a broad university scale represent a growing, though under-reported, field of educational technology innovation. Among these new systems, described for purposes of discussion as 'curriculum information management systems', three main types can be identified. The first, and most visible, are systems that focus on providing online access to detailed unit of study outlines to both prospective and current students, such as the Course Profiling Systems at the University of Queensland and Griffith University. The second type provides student coursework information restricted to students enrolled within specific units, as seen in the Equella system recently introduced at the University of Canberra (2010). The third type provides teaching managers with curriculum data analysis and reporting as an independent service, separate from the student information and communication aspect. Pearson's Learning Outcomes Manager and the Blackboard Outcomes exemplify this type of management-focused system, both designed to integrate with the broader information functions of their proprietor's LMS.

While the range of systems used in management of curriculum documentation continues to grow, documentation of the field itself remains limited. Evidence of the practical impact of such systems on learning and teaching practice in Australian universities is fragmentary and circumstantial. Evidence of design issues faced in developing new systems, and the potential design approaches and solutions available, is similarly indirect and piecemeal, coming from work at a much smaller scale than the design of whole of university information system. Electronic Course Profiling Systems of the type developed at Queensland are mentioned briefly but favourably in a 2008 Australian Council of Engineering Deans report on the state of engineering education (King, 2008, p.88-9). The systems are noted as part of a 'highly desirable' systematisation of teaching administration. Another passing mention from a less favourable perspective is found in the 2009 National GAP issues papers. The Course Profiling systems are described as part of a 'proliferation of technology' that fosters a mechanical 'tick- box' tendency among academic staff responsible for updating curriculum documents (The National GAP, 2009, p.15). The AUQA Good Practice database cites the online graduate attribute mapping system used at Murdoch University (Lowe & Marshall, 2005) as an exemplar of university good practice (Australian Universities Quality Agency, 2007). The system itself, however, has been discontinued.

The Curtin Curriculum Mapping Tool (CCMap) has been relatively well-publicised through an ALTC Teaching Fellowship awarded to Curtin's Bev Oliver (Oliver, Ferns, Whelan & Lilly 2010). The Curtin tool aggregates unit of study details submitted via template to create overview charts summarising important curriculum aspects such as graduate attribute coverage, assessment methods, learning activities, learning resources. However the tool lacks the database support found in Course Profiling systems used at Queensland and Griffith. A full online database is planned for the future CCMap Version 3, but the current Version 2 remains dependent on spreadsheet technology. Updating is a slow manual process and there is no ability to integrate with other university systems for sharing data (Oliver et al. 2010, p.81).

The SUMO (Study Unit Organiser and Manager) system at the Sydney's Faculty of Education and Social Work is subject of a brief report in the university's *Synergy* magazine (Waugh, 2009), following the system's success in winning the inaugural Vice Chancellor's award for System's that Achieve Collective Excellence in Teaching. The report describes the general functions of the system and some of the benefits resulting. The benefits comprise more consistent and reliable unit of study information for students, improved quality assurance of curriculum design and easier preparation of curriculum design reports for external accreditation. The report does not include any discussion of broader implementation of the system beyond the local faculty, or any issues that might affect the chances of such an expansion. Why such systems emerge and remain at faculty level rather than operating as general university systems, despite their award-winning qualities, remains to be explained.

The literature of computer-based curriculum information management also includes a number of works dealing with different stages of the University of Sydney curriculum database work described in this paper. These contributions have been concerned with individual curriculum information management issues rather than overall system design. Calvo, Carroll and Ellis (2007) describe the OpenACS database technology used in the initial engineering unit of study database. Zhang, Calvo, Carroll and Currie (2006) describe the quantitative method used in analysing and reporting the data collected there. Currie, Carew and Zabella (2005) describe a curriculum mapping exercise conducted via the engineering database and present examples of curriculum mapping visualisations generated by the reporting interface, though without mentioning the database itself. Subsequent revision and expansion of the engineering system beyond its original engineering base has resulted in new work dealing more directly with the challenges of curriculum information management at a broad university scale. Papers by Kay & Gluga (2009) and Gluga, Kay & Lever (2010) focus on the challenge of analysing and reporting the alignment of teaching and assessment with teaching goals in an environment where learning is no longer bound within a single disciplinary representation of the intended goals, but involve multiple sets of learning goal specifications. The second of the two papers describes the eventual solution to this problem through the cross-mapping of different goal specification frameworks amongst themselves and how this solution was implemented in the new multi-faculty, multi-disciplinary system known as CUSP. This was welcome progress on a difficult issue, but still not much of an advance in terms of documenting the individual system, let alone developing a more systematic understanding of the field around.

The documented history of computer based curriculum information management as a specific field of educational and technical inquiry belongs primarily to medical education. Medical educators in the early 1990's were already attempting to formulate the generic features and software architectures of what they had come to call the ‘curriculum database’ (Mattern et al. 1992). There was also in-depth discussion of the broader dimensions and issues of computer-based curriculum information systems generally, and the design principles relevant to their development (Nowacek and Friedman 1995). Nowacek & Friedman's work includes explicit definitions of the terms 'curriculum information system' and 'curriculum database'. The former is defined as 'a representation, usually stored on a computer of the content and structure of the curriculum.' The curriculum database is defined as a particular type of curriculum information system, designed for administrative reporting rather than teaching or student use. Nowacek and Friedman postulate as a basic principle of curriculum information system design that the different information needs of students, academic staff and administration should be addressed separately by different systems, rather than all at once. The creation of a single integrated curriculum information platform is considered beyond the realistic expectations of university project budgets.

Nowacek and Friedman's approach assumes a curriculum that is relatively simple in structure and tightly controlled to start with. Otherwise the costs and risks of separately managing information for student, teacher and management purposes would be difficult to contain. Nowacek and Friedman's specific proposals may thus be contested in teaching areas where the curriculum is more complex and/or more loosely controlled than is the case in the teaching of medicine. There are nonetheless some important implications to be drawn for curriculum systems more broadly. One implication is that a core problem of university curriculum information management remains largely unaddressed in both theory and practice: the problem of integration between the different systems and processes involved in the creation and sharing of curriculum data. A second implication is that addressing curriculum information management at an integrated level will require a long-term strategy not just a single project. If the solution cannot be broken down in simple terms of different systems for different user groups following Nowacek and Friedman's model, then some other sort of staging will have to be found.

Purpose

The purpose of this paper is to document the design experience of an ongoing series of curriculum database projects at the University of Sydney in a way that enables a clearer understanding of the general issues and requirements of such systems in academic discussion and the planning and operation of future systems. The documentation takes the form of a retrospective design comparison reflecting back upon the principles and lessons of each successive database design. The contrasting succession of linked cases over a sustained period of time provides a means of developing a more precise and practically grounded picture of the problem to be solved and essential system requirements, from a long-term perspective, through critical reflection on the results and limitations of the different approaches tried.

Method

The use of longitudinal design comparison as a means of revealing and clarifying design ideas derives from the educational design research approach where complex educational problems are investigated through the iterative solution prototyping that enables a progressive clarification of the problem at stake and the solution possibilities (Reeves, 2006). A more distant source is Glaser & Strauss's 'grounded theory', which provides the general template for the generation of theory from data in the research of social phenomena (Glaser & Strauss, 1967). The instrument of comparison is a design reflection grid that compiles the key design elements of each successive curriculum database version in a simple concise form and enables contrastive analysis between the different instances. Key design elements are identified under four categories:

46. General concept: what was the design solution in practical terms?
47. Design principles: what were guiding principles and sources, if adopted from elsewhere?
48. Results: what outcomes were most significant from a practical perspective?
49. Limitations: what difficulties were most significant for ongoing operations?

These categories were extrapolated from Reeves' 'three characteristics of design research': (1) addressing complex problems in real contexts in collaboration with practitioners; (2) integrating known and hypothetical design principles with technological advances to render plausible solutions to these complex problems; and (3) conducting rigorous and reflective inquiry to test and refine innovative learning environments as well as to define new design principles. The first two of these characteristics match the first and second categories respectively. The third characteristic, concerning evaluation of the implemented design is addressed in the 'results' and 'limitations' categories.

The design reflection grid was completed in three stages. The first stage involved compiling the maximum possible detail on each grid item, working from available design records. These records comprised: (1) internal planning documents and project reports, (2) performance statistics from the individual databases and (3) previous published accounts by Zhang et al. (2006), Calvo et al (2007) concerning the first database version and from Kay and Gluga (2009) and Gluga, Kay and Lever (2010) concerning the current CUSP version.
The second stage involved identification of key design themes amongst the material elicited in the 'principles' category. There were many points to be made on this subject, reflecting the complexity of the systems under development. Some sort of internal structuring was required. Three aspects of curriculum information

management design were identified as major common elements in the design principles of each stage. These were the quality model, the process model and the visual representation model embodied in each system. The design principles were accordingly under these three headings. The concept of the quality model was adopted from Biggs' stages of 'institutional teaching reflection' and a conscious aspect of system design from the first database attempt (Zhang et al 2006). Under Biggs' three stage theory, the quality model (or QM) comprises 'the articulation of an espoused theory of teaching' and informs processes of quality enhancement (through teacher development) and quality feasibility (which removes obstacles to teaching quality) (Biggs 2001). The process model and the visual model represented entirely new suppositions, but connected with the 'articulation' aspect of Biggs' quality model through the issues arising when the model is articulated on a large institutional scale. The notions of the 'process model' and the 'visual representation model' correspond respectively to the questions of procedure and format when articulating a curriculum quality model on a systematic institution-wide basis.

The third stage involved identifying the major trends across the design series and refining the individual design descriptions around them. Descriptions for each design version were reduced to their most salient elements and first ideas of major trends were formulated. The process of writing up these trends generated further reflection on the decisive contributions of the different design versions. Design descriptions were then revised to ensure that these contributions were captured. Table 1 below shows the results in the completed design reflection grid.

Table 1: Design reflection grid

	Database version 1.0	Database version 2.0	Database version 3.0 (current CUSP system)	Database version 4.0 (planned CUSP ugrade)
GENERAL CONCEPT	UoS (Unit of Study) design repository is integrated with quantitative analysis & visualisation tools to inform institutional teaching reflection.		Integrated repositories of (1) unit of study outlines, (2) program sequence tables and (3) discipline learning standards. This enables fine-grained analysis for curriculum review and more detailed and reliable information for students.	Integrated curriculum information management system with personal study planner as interactive student interface. Student interaction drives review and improvement of curriculum communication.
PRINCIPLES				
QUALITY MODEL	UoS design is consistent with intended learning outcomes of the university [university graduate attributes]	UoS design is consistent with intended learning outcomes of the discipline [discipline attributes]	Program design is consistent with the intended learning progression of the discipline	Program design provides a clear and logical picture of intended learning progression
PROCESS MODEL	UoS review -> 1. Student information 2. general curriculum review	Student UoS information -> 1. UoS review 2. general curriculum review	Program + UoS student information -> 1. UoS review 2. general curriculum review	Program + UoS information pool grows interactively from student reflection as well as academic review
VISUAL MODEL (STUDENT INFORMATION)	Simplfied program map (without finer details of elective choice)	Detailed program map for basic range of programs	Full program guide	Personalised program guide.
VISUAL MODEL (ADMIN REPORTING)	Program sequence with UoS attribute details	Program sequence with attribute details	Program learning progression map with distribution of (a) core vs elective UoS (b) assessment and (c) learning outcomes against discipline learning standards	Student activity statistics Program learning progression map with distribution of (a) core vs elective UoS (b) assessment and (c) learning outcomes against discipline learning standards
RESULTS	206 units of study. 15 program sequences in single discipline/faculty Most UoS with complete outlines. Exact proportion not tracked.	389 units of study. 30 program sequences in two disciplines, single faculty. UoS outline full completion at 81.5%.	686 published units of study with 2579 unit outline versions, plus 1897 proxy outlines for outside faculty units. 169 program sequences in three faculties, 16 discipline areas Uos outline full completion at 86%.	Pending . . .
MAIN LIMITATIONS	Relies heavily on 5 yearly curriculum review to drive UoS review and updating. Falls into disuse outside review period. Graduate attribute descriptors need more precise definition.	Still lacks basic technical features to support regular use in student information. Especially session versioning and connectivity with other university systems. Graduate attribute levels need more precise definition.	Teaching leadership workload. Not resourced for surge of new curriculum quality issues. Program admin workload. At capacity limits in maintaining new course information. Student role remains under-developed. Original plan to incorporate student as feedback agent has shown limited appeal. Alternative student interaction strategy required. Assessment details often insufficient to verify outcomes.	Pending . . .

Results

The design evolution across the four database versions follows a generally consistent direction at the level of the overall design concept, information process, and visualisation. The general design concept remains one of an integrated student information and curriculum management tool. The information process remains one where information produced for student purposes is analysed and reported for management purposes. The principal visual image of the curriculum remains the sequential program map. The lessons learned in these areas are mainly at the level of how the original design vision is to be delivered, rather than a major rethinking. The main change of direction is in the approach to curriculum quality. There is a movement away from the analysis of curriculum quality based on whether particular outcomes are delivered or not and more on the question of what the intended outcomes actually are and how they are organized across the program as a whole.

Curriculum quality

The first database version was designed as a tool for supporting curriculum quality through the analysis and reporting of education design details compiled from unit of study outlines. The model of curriculum quality adopted was one of learning outcomes alignment, based on the quality of alignment between intended learning outcomes, teaching/learning activities and assessment (Biggs & Tang 2007). The concept had originated as model for individual teaching practice rather than large scale curriculum management but was assumed to apply equally well to learning and teaching at any scale. The flaws in this assumption were not initially recognized.

The first problem with outcomes alignment as a macro-scale model for curriculum analysis was underestimation of the data quality issues to be encountered when dealing with large numbers of units across different programs and disciplines. Even with the most powerful curriculum database available, there were still major difficulties in ensuring that unit of study data was present, let alone accurate and relevant. Even where reasonably consistent details existed, anything more than superficial relationships were often hard to find. Outcomes alignment at a large scale became a search for lowest common dominators, which were in some cases so low as to be not worth the trouble of finding. Apart from being somewhat naive regarding the issues of aggregating educational design data from large numbers of units, the outcomes alignment approach was also misdirected in placing the focus on unit level educational design to start with. The primary problem in trying to understand different university curricula was not the question of whether individual units happen to address particular program outcomes or not but what outcomes need to occur where in the program sequence. The primary information need was not the design details of individual units but the intended learning progression of the program as a whole.

Bachelor of Engineering (XXXX) (2012) - Assessed Course Goals: Engineering & IT Graduate Attribute Matrix

Print View

	No Level	Level 1	Level 2	Level 3	Level 4	Level 5
1: Design and Problem Solving Skills		CIVL2110 CIVL2410 CIVL2611 CIVL3205 CIVL3812 ENGG1801 ENGG1802 ENGG1803	CIVL3010 CIVL4903	CIVL3206 CIVL4024 CIVL4025		
2: Discipline specific expertise		CIVL2810 CIVL4903	CIVL2230 CIVL2410 CIVL2611 CIVL3206	CIVL3205 Recommended Yr3	CIVL4024 CIVL4025	
3: Fundamentals of Science and Engineering		CIVL2110 CIVL2810 ENGG1800 ENGG1801 ENGG1802 MATH1001 MATH1002 MATH1003 MATH1005 PHYS1001	CIVL2201 CIVL2410 CIVL2611 CIVL3205 CIVL3612 MATH2061 Recommended Yr3	CIVL4024 CIVL4025		Level N/A
4: Information Skills			CIVL2201 CIVL2410 CIVL3205 CIVL3206		ENGG4000	Level N/A
5: Professional Communication		ENGG1800 ENGG1801 ENGG1803	CIVL2410	CIVL3010 CIVL4024 CIVL4025 ENGG4000		Level N/A
6: Professional Values and Conduct		ENGG1801 ENGG1803	CIVL3812	CIVL3010 ENGG4000		Level N/A
7: Teamwork and Project Management		ENGG1803	CIVL3812 CIVL4903 ENGG4000			

Figure 1: Summary report on outcomes progression within a degree program from Database Version 3.

The model of curriculum quality in successive curriculum database designs has accordingly evolved away from the quality of outcomes delivery and attainment and towards the quality of descriptive knowledge about what outcomes were intended to be. The final formulation of the curriculum quality model at the fourth database iteration was one where the curriculum design 'provides a clear, logical picture of learning progression'. This model still allows space for attention to unit level outcomes alignment as part of the global learning picture, but more at the level of explanatory detail, not the main picture itself. The macro-view of the curriculum 'wood' is prioritised over that of the individual unit of study ‘trees’.

The database reporting screen at Figure 1 above illustrates a transitional moment in between the two approaches to curriculum quality. In the Version 3 database design, curriculum quality still remained first of all a question of outcomes alignment, but with learning progression a growing concern at the same time. Simpler discipline outcome descriptions had been tried in previous database versions and found inadequate because they failed to adequately represent more advanced levels of learning. Tables of program outcomes descriptors in a matrix format had been developed for various disciplines to better define the learning progression there. These discipline outcome tables identified the key learning domains for the discipline and a set of criteria-based performance levels for each domain. The descriptive content for the performance criteria was developed using a combination of external accreditation standards and current unit of study content for reference. All learning domains and performance levels were matched against relevant elements of the external accreditation standards.

The matrix shaped outcome description frameworks could be used as a template for the reporting of outcomes alignment, as the reporting screen at Figure 1 above shows. The key learning domains are listed down the left side while columns across the table from left to right represent performance levels. Unit codes are listed against the different learning domains at a specific performance level wherever there is assessment of relevant unit level learning outcomes, based on current unit of study outlines. Elective units are included (in red) based on the extent that particular learning domains and performance levels are assessed across the group as a whole.

The intention in developing the matrix framework had been to enable a more precise evaluation of the way individual units contributed to the intended discipline outcomes by defining more precisely the kind of learning progression involved. However, once it became possible to ask such questions about the individual units, the individual unit ceased to be the problem. In the Design learning domain, for example, it was possible to ask whether Unit of Study 'X' was at Level 5, 4 or 3 and to answer the question according to criteria of whether students in the unit had to independently address complex design problems (Level 5), or simply complete complex tasks to given specifications (Level 4), or just work through a guided design exercise (Level 3). The hard question to answer was the question of what level was actually required. Until this question could be answered, there was not much point in knowing whether the attainment of Unit of Study 'X' happened to be at Level 5, 4 or 3. The real question here was not: 'Is this unit achieving what we want?' but 'What do we really want from this unit?'

Curriculum information process

The expansion of the database into the student information domain has been slow and incremental, beginning with a limited investment in one specific student information channel. The process design of the first database version, illustrated in Figure 2 below, comprises a process of curriculum design monitoring and reporting (represented by the grey dotted line) wrapped around the production and distribution of unit of study outlines (black arrows). The combined process begins with unit outline development shared jointly between unit coordinators and program coordinator, followed by release of approved unit outline for student viewing, followed by generation of analytical reports based on aggregate unit of study data. The reports would then inform periodic high level curriculum review that would then, in turn, feed back to the unit of study development process. Students are positioned off to side of this process, as ultimate recipients of the unit outlines, but otherwise having little role to play. The primary purpose of the combined process is management level reporting and analysis, as was the case in Nowacek and Friedman original 1995 curriculum database concept. The new database departs from Nowacek and Friedman's model mainly in dealing more directly with the sourcing of curriculum data. The different approach was a practical necessity in a discipline context where curriculum development was not centrally based to start with, but dispersed across individual units of study.

Attempting to link decentralised curriculum development into a centralised curriculum management process was obviously a significant change from the perspective of academic autonomy. The need for staff good will and co-operation in achieving this change meant that strict care was needed to avoid any intrusion beyond what was reasonably required for the flow of curriculum data (Oliver et al., 2010; Sumsion and Goodfellow, 2004).). This was an additional reason for database development to remain focused on its original purpose and cautious about any sort of wider role in managing communications between academic staff and students. The expansion that came was not through attempting to take over established communication channels but rather the need to fill gaps where communication was under-developed or non-existent.

The basic features of the growth experienced by the database are summarised graphically in the contrasting information flows of the first database design (Figure 2) and the most recent attempt (Figure 3). The basic features were an (1) expanding functions and content resulting in (2) intensified content development and (3) a need to draw upon a broader range of content contributors. The two additional functions developed were management of learning outcome frameworks (such as faculty or discipline learning outcome tables and competency standards for external accreditation) and ‘program planner’ pages that provided information about program structure and requirements for enrolment planning purposes. Of the two functions, the program planner pages were by far the largest growth area for new content development.

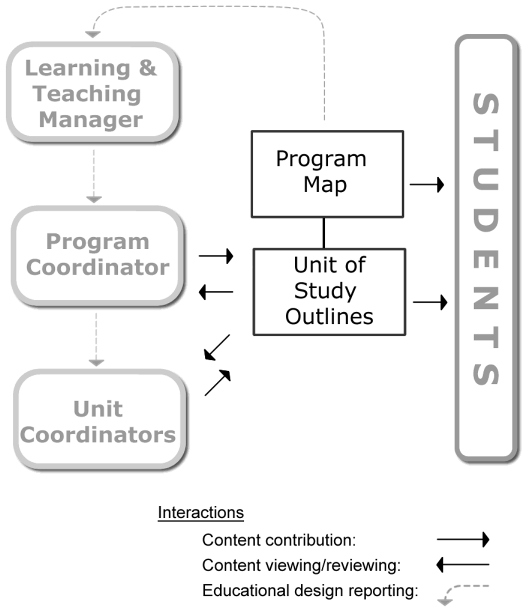

Figure 2: Information flow in Version 1 Database

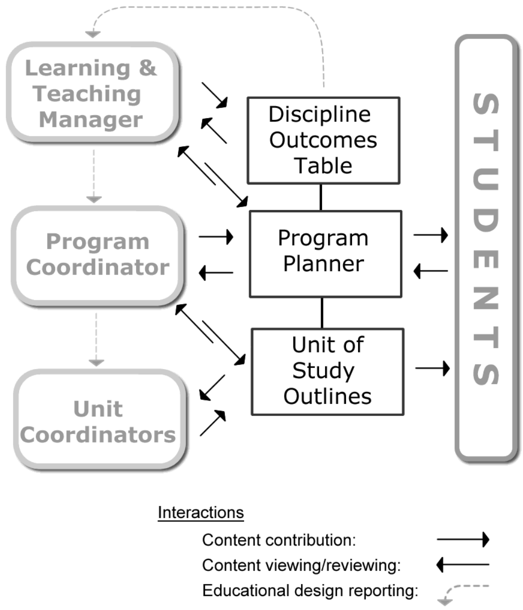

Figure 3: Information flow in Version 4 Database

Growth in program planner information took a number of forms. There was first of all greater depth of program information, focusing in particular on enrolment sequence details and core/elective relationships, in order to meet the need for more accurate analysis of learning progression in degree programs. There was growth at the same time in the range of programs covered, driven partly by extension of the database to other faculties and disciplines and partly by gaps in existing program documentation, particularly concerning combined degrees.

The initial motive for improvement in program planner information had come from the curriculum analysis side of the database. Following the initial involvement with program planning, however, it became apparent that there was a broader issue of student access to relevant program information when making enrolment decisions. This student information need coincided closely with the curriculum management need for better tracking and analysis of learning progression. There remained a question however of how exactly to address need for better program planning details. The problem was essentially a combination of (1) the volume and complexity of the information (2) its scattered location, (3) unreliability and ambiguity in the program documentation that existed, (4) reliance on undocumented informal practices to fill gaps in official documentation and (5) limited human resources to address these matters. The curriculum database development process had been helpful in taking measure of these issues but the database as it existed was nowhere near offering an actual solution.

A possible solution was identified in student feedback responses to a trial attempt at standardising combined degree information in the Version 3 database. The suggested solution was an interactive online course planner where guidance could be provided based on previous enrolment patterns as well as official rules and requirements. The planner would provide both flexibility in the exploration of individual enrolment options but also structure and direction. It would at the same time feed a new and more dynamic pool of enrolment planning information that would be continuously updated from current student experiences. The proposal forms part of the design specifications for the Version 4 database.

Curriculum visualisation

The visual approach of the successive curriculum database designs did not change to the same as extent as was seen in their approaches to curriculum quality and information process. The main visual form representing the curriculum remained essentially the same throughout: a program map comprising units of study in some sort of enrolment sequence from first to final year down the page. The program map was realised in different forms from one database to the next but the basic idea remained the same. The main changes were growth in the amount of program information to be conveyed and an accompanying move towards simpler text based representation of program elements and away from use of more complex visual techniques such as icons and colour coding. The first database version provided the most aesthetically pleasing program map, with units of study represented by series of tile icons (Figure 4), but was hard to maintain amid repeated revisions of program information requirements.

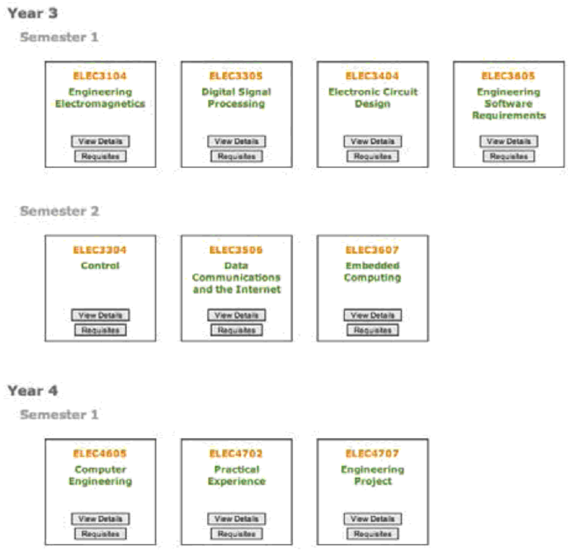

Figure 2. Program Map from Version 1 Database (Zhang et al., 2006)

Continuous growth on the content side has encouraged a preference in subsequent database versions for simpler, more functional layouts over those requiring graphical investment. Growth in program-related content also meant growing problems of information load and navigation. Satisfactory solutions are still to be found for the integrated visual presentation of major and minor options within enrolment sequence tables, and for referencing of degree rules at the same time. Further design experimentation will be required in these areas.

Conclusion

This paper attempts to clarify the design requirements of large scale university curriculum information management systems through reflection on previous design experience. The key design problem has been essentially one of integrating the monitoring and reporting of curriculum quality with student course information. The design experience has brought lessons for each of these two areas, as well as for the integration problem itself.

The lesson in relation to curriculum quality is that more attention is needed to the quality of learning outcomes description from the perspective of learning progression, and possibly less attention to the question of whether particular outcomes are attained or not. Do the program's learning outcome specifications provide a clear and logical picture of learning progression through the program? Or just a list of vague qualities that graduates might hopefully possess? In relation to student course information, the experience has shown how information quality can benefit from the use of a curriculum database, particularly in the area of enrolment planning. In relation to the problem of integration between curriculum outcomes management and student course information, the experience confirms Nowacek and Friedman's warning that the problem is forbiddingly complex and unlikely to be fully resolved in a single university project. However the experience, also shows that improved integration can still be achieved incrementally, focusing on specific areas of information need, rather than all at once. Concerning the future direction of curriculum database development, the experience has suggested that students may potentially play a more active role and indicates how this might be achieved through the development of an interactive online planner.

The point regarding learning outcome quality requires some further discussion in the context of the current national initiatives on university outcome standards and in the context of curriculum theory more broadly. The need for clearer, more systematic descriptions of university learning outcomes is well recognised, to judge by recent ALTC and TEQSA work in the development of discipline-level learning outcome standards (Tertiary Education Quality Standards Agency, 2011; Australian Learning & Teaching Council, 2010). The key issue in this paper, however, is not simply one of having better outcome standards, but standards that ensure a clear and logical picture of learning progression across university programs. In the new discipline Threshold Learning Outcome standards (TLOs) developed by the ALTC's Learning and Teaching Academic Standards project, learning progression is present to an extent that distinguishes between undergraduate and postgraduate educational levels, but nothing deeper. The new TLO's are intended as normative standards against which university teaching programs are held accountable rather than as tools for analytically breaking down the key elements of learning progression within programs. From the perspective of the curriculum database experience, this kind of analytical breakdown of the learning area is precisely the first step required before any specific targets are defined. The idea is that defining the field of play should come before any goal posts are set up, rather than trying set up goal posts with only a rough notion of the terrain they stand upon.

It must be acknowledged that this is not the first occasion on which learning progression has been raised as a curriculum design issue. Sumsion and Goodfellow (2004) and Green, Hammer and Star (2009) mention the inability to capture learning progression as problems in mapping of university graduate outcomes. A concern with learning progression may more indeed be seen as a core thread of modern educational thought, embodied in work of Piaget, Bloom's taxonomy and the SOLO taxonomy. The idea that learning should be defined against some sort of progressive scale, such as Bloom or SOLO, is a standard part of currently recommended methods of outcomes-based curriculum design (Biggs & Tang, 2007). While a concern with learning progression has always been present in curriculum theory, the general concern has not yet translated into any sense of urgency regarding learning outcome progression across university programs, let alone a systematic approach to the question. It has taken repeated exposure to the same problem, in many different teaching programs and discipline contexts, to begin to appreciate that identification of intended learning progression is not just one problem of university curriculum design but the most important problem currently faced.

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A discussion of the factors affecting the implementation of one-to-one computing learning environment in a primary school

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Abstract

This ethnographic case study describes and analyses the conditions that support the seamless integration of information communication technology (ICT) into the classroom with school initiated student one-to-one computer ownership program in a primary school. The findings suggest the importance of two factors: technological infrastructures and teachers' beliefs and practices. In addition, curriculum, school leadership and professional development also play less visible but supporting functions in the process of integrating ICT into the teaching and learning process.

Keywords: one-to-one, integration of ICT into teaching and learning, future school

Introduction

This paper describes and discusses the conditions that support the seamless integration of information communication technology (ICT) into the classroom vis-à-vis the school-initiated one-to-one computer ownership program for all its Primary 4 (i.e., aged 10) students. The school in this case study research has implemented a one-to-one student computer ratio for all its students when they started school at Primary 1, with computers provided by the school. Starting from Primary 4, students procure and use their own computers for learning.

The school in this research study is one of the eight future schools under the FutureSchools@Singapore program. The FutureSchools@Singapore program is a collaborative project between the local educational ministry and information communication development authority. The main aim of the program is to have a small group of schools lead the way in providing possible models for the seamless and pervasive integration of information and communication technologies (ICT) into the curriculum for engaged learning in schools.

One-to-one learning environment

Research studies have indicated that one of the main reasons for lower ICT usage in educational setting is due to the lack of the necessary technological resources (Crisan, Lerman, & Winbourne, 2007). "Studies have suggested that there is little use of ICT in primary schools as access is still the major challenge – limited access leads to limited use, resulting in limited impact" (Tay, Nair, Lim, p. 40). The main intent of the school's one-to-one initiative is to overcome this barrier of insufficient technological hardware.

The school in this study took a progressive approach by providing the necessary computing device (i.e., notebook computers) from Primary 1 to 3. In Primary 3, the school started to discuss the student one-to-one computer ownership initiative with the parents. All the cohort of 225 students and parents supported the program – 160 students purchasing the school recommended notebook computer model, 50 using their existing computers and the remaining 15 student who tapped on to the financial computer assistance scheme provided by the local infocomm authority (i.e., Infocomm Development Authority, Singapore).

Conditions for ICT integration

A review of the relevant research studies (Benes, et. al., 2008; Bouterse, Corn, & Halstead, 2009; Chere-Masopha & Bennett, 2007; Divaharan & Lim, 2010; Dourneen & Matthewman, 2009; Garthwait & Weller, 2005; Hayes, 2007; Masopha & Bennett, 2007; Passey, 2006; Penuel, 2006; Sipilä, 2010; Tondeur, Cooper, & Newhouse, 2010; Towndrow & Vaish, 2009) conducted in the area of ICT integration and pervasive use of technology in the classrooms suggest the importance of the following factors: (1) Technological infrastructures and support; (2) Teachers' beliefs and practices; (3) Curriculum; (4) School leadership and (5) Professional development

Technological infrastructure (i.e., the physical hardware such as the computing devices and the wireless network) and technical support are critical elements for successful and seamless ICT integration into the classrooms.

Many researchers have ranked teachers' beliefs and practice as one of the key factors for successful ICT integration (Chere-Masopha & Bennett, 2007;Garthwait & Weller, 2005; Hayes, 2007; Oliver, 2010; Penuel, 2006; Sipilä, 2010; Tondeur, Cooper, & Newhouse, 2010; Towndrow & Vaish, 2009).

In general, curriculum refers to subject content that is developed in line with the guidelines set by the governing education body.

The school leadership provides the direction and support in terms of school policy that outlines goals and also the necessary resources for the teachers. "Successful change and ICT implementation in schools depends on effective leadership" (Stuart, Mills, & Remus, 2009, p. 734). "Strong and coherent leadership was an important factor in initiating and maintain the impetus of integration ICT" (Hayes, 2007, p. 392). Ng (2009) also reports that strong leadership is needed to promote quality ICT integration.

Professional development is an essential part of every teacher's development to improve his/her skills and knowledge. Research has suggested the importance in professional development for the integration of ICT into the curriculum (Penuel, 2006; Sipilä, 2010, Ward & Parr, 2010). "A variety of types of professional development… are needed to meet not only the varying needs of individual teachers, but also the varying ways in which ICT can be used" (Ward & Parr, 2010, p. 113).

Research design and methods

An ethnographic case study design is adopted in this exploratory study (Stake, 1995). The main intent is to discuss the key factors supporting the one-to-one program. The paper describes the school's effort and process in the implementation of the student computer ownership program, as well as its one-to-one computing learning environment initiative to date. Although ethnographic case studies seem to be a poor basis for the purpose of generalisation to inform about future practices, the intent is not to understand other cases. The most important criterion is to maximise what we can learn from the case rather than for generalisation purposes. The implementation considerations of this school could be used to inform the education fraternity regardless of where they are situated.

The research methods include: (1) questionnaire survey and informal interviews with teachers, parents; (2) the review of documents students (i.e., schemes of work and lesson plans) and (3) observations by the authors. Data collection from teachers, parents and students aim to provide a more comprehensive account of the case. The data from the various research methods (i.e., questionnaire surveys, informal interviews, review of documents and observations) mentioned above were triangulated to enhance validity of the study.

Key findings

Teacher, students and parents self-reported questionnaire survey

After 9 months of implementation, parents, students and teachers gave positive feedback on the school's implementation of the student computer ownership and one-to-one computing learning environment programs. Parents, students, and teachers involved were asked to rate the implementation of the programs on a questionnaire survey based on a Likert-scale of 1 to 7, with 1 being strongly disagree and 7 being strongly agree with the questionnaire statements. Of the 169 parents who responded to the survey, an average score of 5.32 was recorded when they were asked whether the students' computers were well-used. The 22 teachers who were directly involved gave an average score of 5.5 when they were asked to rate the success of the one-to-one program for the cohort of Primary 4 students. All students reflected that the notebook computer or their personal learning device was a useful tool for their learning.

Twenty-two teachers who were involved in the one-to-one program for the Primary 4 cohort of students took a simple survey rating the importance of each of the five factors mentioned above on a Likert-scale of 1 to 7 (1 being not important and 7 being very important). Technological infrastructure was ranked first with an average score of 6.35, followed by teachers' belief and practice at 6.17, curriculum at 6.00, school leadership at 5.48 and professional development at 5.30. All teachers involved tend to agree that the above factors were at least somewhat important in contributing to the success of the program.

Observations on the conditions for one-to-one learning and ICT integration

Technological infrastructures and support
The ICT department worked with the teachers and also liaised with various industry representatives to set up the necessary infrastructure (e.g., wireless network). The school's ICT team of teachers and technicians also worked with these representatives to recommend a model of computer (i.e., 13 inch, full-featured notebook computer weighing approximately 1.8 kg) with the necessary software (e.g., word-processing, presentation, spread sheets, and anti-virus), warranty and repairs, and insurance scheme for the students. The school also had a 4-man technical team to set up and assist technical requirements and troubleshooting.

Teachers' beliefs and practice
As teachers who view technologies positively tend to incorporate the use of ICT into their lessons, special care was taken in the selection of teachers who would be teaching these Primary 4 classes. All the teachers were ICT savvy and have been using ICT for their administrative work, leisure, as well as teaching in the classrooms. Most of the teachers selected have a good track record of ICT use in their classroom teachings to ensure the success of this first implementation of the program.

The pedagogical concept of learning from and with technology (Ringstaff & Kelly, 2002) guided the teachers in their planning of lessons. Broadly speaking, learning from and learning with technology could provide a very useful conceptual technological pedagogical knowledge framework when integrating ICT into teaching and learning. Learning from the computer leans itself more towards the behaviouristic theories of learning whereas learning with technology has its roots from the constructivist and social constructivism paradigms. More passive behaviours such as reading and listening are associated with learning from technology, while more active behaviours such as creating, writing, and updating are associated with learning with technology (Harris & Rea, 2009).

Curriculum
The use of ICT was explicitly spelled out in the curriculum plans and schemes of work on how ICT would be used in the classroom. Detailed lesson plans were also planned and shared by all teachers. For instance, the use of the digital storytelling approach in the teaching of languages was planned, shared and adopted by all teachers of the school. The digital storytelling is a simple and effective approach in allowing students to create their digital 'compositions' with digital images and also personal digital voices. Images and student's digital narration were added to enhance the stories. Students also created pictorial graphs with the spreadsheet software application to analyse trends and patterns in their Mathematics lessons. Teachers also sourced for relevant videos and learning materials to be shared with their students in their Science lessons.

School leadership
Since its inception, the school leaders have been actively promoting the use of ICT to all its stakeholders – parents, students, teachers, non-teaching staff, and officials from the local education ministry. Co-ordinators of the various departments (e.g., the English, Mathematics, Science, and ICT) have also been actively promoting the use and integration of ICT into the curriculum. The procurement and maintenance of the infrastructure hardware and computer networks have been on-going. Principal also strongly supported the allocation of necessary technological and manpower resources for the ICT department of the school. In addition, the principal also led several local and overseas study trips to learn more from the other schools, especially with regards to the integration and use of ICT in teaching and learning.

Professional development
Teachers were encouraged to attend in-services courses, seminars, and conferences (local and overseas). Teachers also shared actively in their weekly meetings on pedagogical insights and administrative/logistical requirements to enhance each other's professional developments, especially in the area of ICT integration into the curriculum. In addition, the school also encouraged the teachers to be practitioner-researchers to look deeper and evaluate on their own practices. Teachers would share their projects and research studies in their in-house research seminar and also at local and international conferences. A few of the teachers were also actively publishing in international refereed journals and books.

Discussions and Conclusion

This ethnographic case study once again highlighted the importance of taking a holistic approach towards the integration of ICT into the classrooms and curriculum (Lim, 2007). Although the questionnaire survey and informal interviews with the teachers involved in the one-to-one initiative seem to suggest that the technological infrastructures and teacher beliefs and practice are the most critical factors, the other factors (i.e., curriculum, leadership and professional development) may be less visible to the teachers but they play important and supporting roles in this endeavour. Even with an elaborate technological infrastructure, teaching and learning would not be possible without committed and skilful teachers who are on the ground implementing the day-to-day lessons in their respective classrooms. In addition, directions for the school leadership and channelling of the necessary resources are all critical factors to be considered. A good curriculum plan also provides the necessary structure and procedures of how to carry integrate ICT in a more seamless and pervasive manner.

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An instructional design model for screencasting: Engaging students in self-regulated learning

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Students entering first year university mathematics courses in Australia often show gaps in their mathematical understanding and may not have the cognitive and metacognitive skills to cope with abstract thinking. Screencasts produced as learning support for these students have definite benefits as learners have flexibility in accessing the resources at their convenience, and they can watch step by step model explanations of concepts and operations. Nevertheless, the instructional format of most mathematical screencasts focuses on expert performance of, and commentary on a particular skill, and often neglects to consider the active engagement and participation of the learner.

This article provides an overview of instructional design approaches to screencasts, and of self-regulated learning models. It then introduces a preliminary instructional design model building on self-regulated learning theory for the creation of screencasts, in order to foster and enhance students' cognitive and metacognitive skills in understanding complex mathematical concepts.

Keywords: screencast, self-regulated learning, engagement, mathematics support

Introduction

Interest has grown in recent years in what is sometimes referred to as the learner experience. It situates learners at the centre of the experience, and empowers and motivates them to assume responsibility for their own learning. It benefits from teaching and learning strategies designed to encourage students to see themselves as active thinkers and problem-solvers (Creanor, 2008). Learner-centred education may be facilitated by technology, for example through the provision of online learning material, self-access resources and peer support, mediated through online discussion and sharing of ideas. When learning complex and abstract concepts and problem solving, learner support is often crucial, as it is in the case of mathematical concepts and logical reasoning. Most Australian universities offer mathematics support to their students in the form of face to face help from a tutor, during certain hours. There are access limitations if many students are seeking the tutor's help at the same time, for example before assignment deadlines or for exam preparation.

To provide 24 hour support to students, tutors at the Mathematics and Statistics Help (MASH) Centre at Swinburne University of Technology produce screencasts for students to access through the Centre's website. What commenced as a small project to support students from one university, has now become a collaborative research project involving The University of Limerick (Ireland) and Loughborough University (UK), and will lead to a large number of screencasts available to students (MathsCasts, 2011).

By accessing video based instruction that combines multiple media formats, it is expected that positive learning outcomes will be achieved. Nevertheless, the instructional format of most screencasts has relied upon a didactic model of pedagogy, and often does not include scaffolds to ensure the active engagement and participation of the learner. To address this issue, we consider an instructional design model based on self-regulated learning theory in order to foster and enhance students' cognitive and metacognitive skills in understanding complex mathematical concepts.

Instructional design approaches

A screencast is a video recording of movement on a computer screen, together with audio narration. In mathematics learning, screencasts have been used to capture the handwritten step by step solution of a mathematical problem. With such recordings, students are guided by an expert as they would in face to face explanation, but there is an added benefit of flexibility of access and use of these explanations. Students can watch a screencast anywhere anytime, online or alternatively download and play back offline or from a mobile device, pause it to make an attempt at a solution themselves and replay as often as required.

Most literature on the effectiveness of screencasting in higher education focuses on student learning and use of the recordings, but not on student engagement and best practice of instructional design. Sugar, Brown and Luterbach (2010) describe the "anatomy of a screencast", following analysis of screencasts on how to undertake certain tasks on the computer. The authors found common structural elements and instructional strategies. However, these relate to a computing context, and may be different for mathematical problem solving screencasts. Heilesen (2010) provides an overview of the literature relating to podcasting and points out that the positive outcomes from the use of screencasts may be caused by the use of the technology, rather than by the technology itself. He argues that techniques shown to improve academic performance such as active learning and revision may be supported by the technology. Screencasts may be designed to allow students to personalise their learning, highlight important information and listen at their own pace (Sutton-Brady, Scott, Taylor, Carabetta and Clark, 2009). Sutton-Brady et al. also emphasise the need to focus on pedagogical design when producing short screencasts targeting individual topics to distinguish them from a repeat of lecture content. Heilesen (2010) recognises the opportunities available through this technology, as screencasting "has opened up for new ways of integrating classroom teaching and net-based learning on the basis of pedagogical concerns rather than mere administrative convenience".

McCombs & Liu (2007) suggest to record complimentary information rather than replicate existing information, and to add extra visual information to explain the content and to trigger "new focus and attention". Particularly in mathematics education, this visual information needs to be captured when explaining a solution step by step. In the mathematical context, Mullamphy, Higgins, Belward and Ward (2009) point out that "this presentation format [screencasts] is considerably more engaging for students than the use of chalk, PowerPoint or audio-only podcasts."

While there are strong arguments for the provision of screencasts for mathematical support, there is no guarantee that students will either access these or learn from them. It cannot be assumed that all students would have the skills to self-regulate their learning when presented with complex mathematical concepts. In this paper, we argue that screencasts of explanations of mathematical problem solving, where emphasis is on a clear explanation of the problem solution, may not in fact be as engaging as they could be if instructional design also focused on student engagement. To address this problem, self-regulated learning theory is considered in relation to the design of screencasts and we suggest a model to enhance engagement of students with screencasts.

Self-regulated learning

While screencasting provides a form of content and academic scaffolding, our concern is to ensure that students independently develop the skills to self-regulate their own performance and become aware of the gaps in their understanding of complex conceptual tasks. Effective learning is only guaranteed if learners are actively engaged in processing learning resources. Therefore the most essential instructional design approach for effective screencasting is to ensure that the pedagogical approach encourages and promotes self-directed learning or self-regulated learning (SRL). Models of SRL share certain assumptions about learning and metacognition, though they may differ on mechanisms to foster SRL processes (Corno, 1989; Pintrich and de Groot, 1990; Goldman, 2003).

There are five assumptions shared by all SRL models. Self-regulated learners are expected to:

- be active in all aspects of the learning process, i.e. in creating goals, inferring meaning and applying strategies;
- be capable of monitoring, controlling and regulating aspects of their own cognition;
- be able to set goals for learning and self-monitor their own progress;
- they may be limited by individual or contextual constraints or distractions; and
- are influenced by the characteristics of the learning task and environment. It is the learner's own self-regulation of motivation, cognition and behaviour that mediates the impact of these external factors.

More important for the design of instruction however, are the three stages of self-regulation, which may occur linearly or recursively during a learning episode:

1. planning and goal setting;
2. monitoring processes and metacognitive control, whereby the learner tries to regulate aspects of the tasks, self and context; and
3. reflection on self-knowledge and task achievement.

SRL was selected as a guiding theoretical framework for the design of screencasts as it is based on assumptions about the learning process that are constructivist and regard effective learners as those who are capable of setting goals for their learning. They plan, monitor and regulate their own cognition, behaviour and motivation (Zimmerman, 2001). While some learners are able to apply general cognitive strategies to well-structured as well as to ill-structured domains, most students need some practice to apply their general cognitive strategies to new domains. Students who have not yet learned to regulate their learning in relation to a domain need external regulation and scaffolding to process and integrate new information.

Both cognitive and metacognitive strategies are central to knowledge construction activities. Coping with new and abstract concepts requires learners to possess specific strategies related to understanding content, but also to have a repertoire of metacognitive processes so that they are able to monitor and regulate their attention and motivation when complex concepts have to be learnt. In general, research has shown that students who lack self-regulatory and metacognitive skills learn very little from didactic, teacher centred approaches, and that some form of scaffolding is needed when they encounter challenging tasks.

There is little research on the specific area of how students learn from screencasting, but there are parallel studies with web-based multimedia formats indicating that successful learning is an interplay between system features (i.e. the screencast), learner characteristics and cognitive processes (Azavedo, 2005). In short, students can learn successfully when they are motivationally, behaviourally and cognitively active, able to set goals, plan their own learning pathway and monitor their understanding. This can only happen if the learning environment or learning episode invokes SRL, and when cognitive and metacognitive processes are scaffolded.

SRL theory to inform the design of mathematical screencasts

By applying SRL theory to the design of screencasts, certain pedagogical features need to be considered and scaffolding built into the design. We propose the following preliminary model based on the three stages of self-regulation, for the design of mathematical screencasts:

Table 1: An instructional design model for the development of screencasts, built on SLR theory

Stage of self-regulation	Scaffolding
1. planning and goal setting	• Provide an overview of the concept being presented • Activate prior knowledge
2. monitoring processes and metacognitive control	• Ask students to set a goal for the session • Present questions and tasks to check for understanding, and to get students to actively engage in the problem solving process
3. reflection on self-knowledge and task achievement	• Encourage students to reflect on the learning process and on their understanding of the concept • Ask students to document areas of uncertainty and to prepare questions for their lecturer or tutor

This model is a preliminary model as we have not yet applied it to an actual screencast and evaluated its effect on student engagement. We suggest how it could be applied to a screencast in the next section.

The model applied to a screencast

A typical mathematical screencast is this example on how to identify the equation of a circle (The Equation of a Circle, 2011). This screencast captures the tutor's explanation of how to rearrange an equation in such a way that the centre and radius of the circle can be found, thus showing that the equation indeed represents a circle. The screencast proceeds as follows:

- Equation and the task are given.
- Statement of what general form to look for, and how to find centre and radius once the form is found.
- Step by step explanation resulting in the general form, statement of centre and radius.

This screencast was recorded for first year Engineering Mathematics students and focuses on the mathematical explanation, without explicitly attempting to engage the learner in active problem solving. In that sense it is a typical mathematical screencast. An instructional design approach taking into account SLR and following the above model may also include the following:

- At the start, the problem is placed in context, to motivate why it may be beneficial to know if an equation represents a circle.
- Prerequisites are listed, and guidance is given on how to acquire these, e.g. if a learner does not remember how to complete the square, they are guided to the appropriate screencast.
- The learner is asked to note which areas covered in the screencast (or not covered) they have problems with, and follow up on these with the tutor or by watching relevant screencasts.
- The learner is also asked to set learning goals, e.g. "I will be able to identify the equation of a circle by rearranging the equation after working through these screencasts".
- The narrator pauses regularly, suggesting to the learner to pause the recording and try for themselves first before watching the explanation. The narrator also asks the question "what would the next step be", and gives the learner time to think.
- The learner is asked to self-assess their performance, e.g. after watching they are asked to attempt the same problem themselves, and to try other problems.

Conclusion and future work

The paper has provided a brief overview of self-regulated learning models, and applied SRL as a guiding theoretical framework for the instructional design of mathematical screencasts. SRL is a good choice because it allows us to directly theorize how learner characteristics, cognitive processes, and system structure interact during the cyclical and iterative phases of planning, monitoring, control, and reflection while learning - features that are typically ignored in the design of screencasts. Our primary goal has been to explain the dynamics of students' activity as they seek to understand abstract concepts. To achieve optimum learning learners need to be self motivated, mostly self-guided, and to be supported in learning situations where they are expected to learn abstract concepts individually, mediated by technology. Our research indicates that by including scaffolds to foster cognitive and metacognitive strategies, students will be better able to comprehend complex concepts and evaluate their own performance to direct their efforts. Our future research will seek to embed these scaffolds into screencasts and to evaluate their effectiveness in engaging learners.

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What if student attrition was treated like an illness? An epidemiological model for learning analytics

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Learning analytics is a technology on the rise in higher education. Adapted from business analytics, this approach is being used to track and predict student engagement and success in higher education. There is evidence to suggest that learning analytics can be successfully used to predict students at risk of failing or withdrawing and allow for the provision of just in time intervention. Despite this, the output of universities is not like that of other commercial ventures and business models for understanding consumer behaviour, for instance, are not equipped for accurate prediction of learning outcomes. The model presented in this poster is an attempt to create a predictive framework for 'learning health' from a multifaceted, epidemiological perspective. The model serves as a framework for understanding early student success at the micro and macro levels and provides a foundation for evidence-based use of learning analytics within a higher education perspective.

Keywords: learning analytics, student retention, early alert, learning health

Learning analytics and higher education

According to the 2011 version of the Horizon Report (Johnson, Smith, Willis, Levine & Haywood, 2011), learning analytics is a technology to watch over the next five years. Learning analytics is the integration of data about or generated by students and is based on similar analytics used in business modeling. This type of analytical modeling is being used to understand consumer preferences and purchasing behaviour, for example.

The most common use of learning analytics in higher education is to identify students who are potentially at risk of failing or withdrawing from their studies (Campbell & Oblinger, 2007). For example, Macfadyen and Dawson (2010) discuss an 'early warning system' which tracks student engagement with a university learning management system for identifying students who are not interacting with the online course material. They argue that the use of learning analytics in this context can accurately predict 81% of students who will fail a subject and allow for appropriate intervention to take place in these instances.

Critiquing learning analytics

Although there is evidence accumulating that learning analytics can help with reducing unnecessary student attrition, the use of these analytics are limited by a number of factors. Although there are undoubtedly complex processes underpinning consumer preferences, business models attempting to understand preference in a consumer context are simply about whether consumers purchase the product or not. Which consumers purchase which products is also of interest but, ultimately the behaviour being analysed is simply that of an alternate choice, the consumer equivalent of a multiple choice exam. Biggs (1999) in particular is critical of using multiple choice as a way of understanding learning outcomes and encouraging deep approaches to learning. A framework aimed at understanding student engagement in learning through choice, such as that attempting to understand consumer behaviour, is similarly limited. The framework for understanding learning based on business analytics is therefore not suited to the complex and multidimensional phenomenon that is human learning.

To understand the current level of analysis involved in learning analytics, one only needs to look to the work of B.F. Skinner (1948). Skinner famously used instrumental conditioning techniques to examine learning in pigeons and rats. Pigeons learning to peck and rats will press a level for food rewards under certain circumstances. Counting the number of times a student clicks on a learning management site is similar in many ways to counting lever presses. Although instrumental conditioning has been pivotal in the development of general theories of learning, strict behaviourism is an inadequate approach for understanding the complexity involved in student learning in higher education. A more complete approach for understanding student engagement and predicting quality student outcomes requires a more sophisticated way of synthesising data pertaining to multiple indicators of the student experience and about the students themselves.

The epidemiology of learning health

The model presented in this poster and outlined in table 1 is an attempt to develop a framework for learning health. Using health as an analogy to learning is advantageous to business models for a number of reasons. Epidemiological models are based on myriad micro and macro level factors that impact on individuals in different ways. As effective learning is also about a large range of factors influencing student success in individualised ways, the use of an epidemiological approach is more readily adaptable to learning than is an approach based on consumer behaviour. An additional benefit of adopting an epidemiological perspective is that it does not take a deficit approach to understanding outcomes. Good health is not just about increasing life expectancy, it is also about enhancing day-to-day living. Similarly, any approach to managing student attrition should not just be about keeping students in higher education, it should be about enhancing learning outcomes. The current approach is an attempt to develop a framework to allow learning analytics to do just that.

The learning health framework has been adapted from that of Turrell and Mathers (2000). This framework was selected as the basis for the current approach for several reasons. Firstly, it has been created within an Australian context and therefore has applicability to our national circumstances. Secondly, this framework has been specifically created to account for socioeconomic factors which are amongst those highlighted by the Australian Government as being of concern within the current widening participation agenda (Australian Government, 2009). The framework also encompasses multiple levels for consideration and is similar to the multiple levels of factors impacting learning in higher education. The adaption of this framework to learning, keeping in mind what is known about the reasons for student attrition (e.g. Yorke & Longden, 2004), with possible sources of data is presented in table 1. The table includes a concise outline of the model depicted in the associated poster.

Table 1: Outline of learning health framework based on Turrell & Mathers (2000)

Level of analysis	Indicators	Data sources
Micro	Engagement with course material Attendance on campus/in class Course satisfaction Academic capacity	Learning management system Class attendance register Survey tool or CRM Educational history – Student information system
Intermediate	Enrolment load Number of working hours Socioeconomic status	Student information system Student engagement survey Student information system/GIS software
Macro	Support available at institution Government support Degree structure Course/unit/subject requirements	Institutional information systems Student information system Course management database Course/unit/subject profile system

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E-books – a key to greater accessibility

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Macquarie University Accessibility Services (MQAS) converts learning materials into accessible formats for students with access needs. The process is time and labour intensive and with unrealistic timelines can result in materials being delivered late. If learning materials were initially published directly in an accessible format, resources would be saved and students would receive their learning materials on time.

The emergence of the e-book allows students easier and faster access to content with choice and control over its delivery mode. When content is published directly as an e-book in ePub format, it can be read on a number of e-readers. Additionally, students using an iPad can change the font style and size to suit their needs or listen to content using iOS's built in text-to-speech software.

An academic's new book, *Foundations of College Music Theory* was published straight to this format, allowing students faster access to their learning materials and the ability to listen to them.

Keywords: Accessibility, e-book, ePub publishing format, iPad assistive technology, text to speech, music theory

Conference themes - Equity of experience

This poster documents the publishing of an academic text directly to the ePub format, bypassing the traditional print publishing route and giving students equitable access to their learning materials, without the need for reverse engineering. Using an iPad, students can read their learning materials, in the font and size of their choice, or listen to them being read out using the iPad's text-to-speech function.

Background/Context

Annually Macquarie University Accessibility Services spend 42,000 hours converting print content into accessible formats for students with access needs. This is expensive and time-consuming and students experience delays in receiving their learning materials, due to the volume of content and labour intensive nature of the conversion process. The project aims to find a universal design solution to the inequity of access to information and knowledge. The emergence of e-books provides an opportunity to explore the efficacy of direct publishing by academics into an accessible ePub format.

All parties set out to:

* Develop a media-rich text book available to all students at a low cost
* Present the Higher Education sector with a proof of concept, showing the successful implementation of universal design principles in the developing of e-books for the iPad
*Develop the content in a format that allows students with sensory and learning disabilities access, using the accessibility features of the iPad
*Establish the resourcing required to facilitate the publishing of an e-book from concept to publication

Outcomes

1. A working methodology was developed where the Academic and Educational Developer and the E-book Development Team interacted to produce an academic text that was published directly to ePub format (by passing traditional print publishing) and available to download onto an iPad:

This methodology involved:
a. Mocking up the content in a Word document
b. Prototyping one chapter in ePub format
c. Evaluating with the academic the content and layout of the one chapter in ePub format
d. Developing the full book in ePub format
e. Evaluating with the academic the full book content and layout in ePub format
f. Completing the book in ePub format
g. Securing an ISBN number for the e-book

2. An academic text, *Foundations of Music Theory*, by Professor Suzanne Court was published directly to ePub format for students to download and then read or listen to on their iPad.

3. The research yielded the following e-book project timelines and specifications
E-Book Title:
Foundations of College Music Theory
Length: 400 pages consisting of 26 chapters of 18pt Sans Serif text in Word, 500 images and 180 audio files

Educational Development hours:
Discussing content, planning layouts, formats, diagrams etc = 70 hours

Design hours:
Formatting, resizing & optimising 500 graphics = 70 hours
Optimising 180 audio files = 10 hours

Publishing hours:
Converting content into ePub format and creating e-book = 30 hours

Total hours = 180

4. This research resulted in a new, shorter and faster publishing model. Whilst the Print Publishing Model consists of 11 stages, commencing with the academic's writing and ending with the student listening to the reverse engineered content, the new e-book publishing model has only 7 stages, with no reverse engineering.

The two models are set out below:

The 11 stage Print Publishing Model
1. Academic writes content
2. Academic works with editor
3. Registering the book with an ISBN number
4. Printing the book
5. Promoting the book
6. Distributing the book
7. Student purchases book
8. Book is given to MQAS
9. MQAS strips and scans the book
10. MQAS converts the book into electronic text

11. Student listens to the book on their computer using third party software

The new 7 stage e-book Publishing Model
1. Academic writes content
2. Academic works with Educational Developer and e-book Development Team
3. Registering the e-book with an ISBN number
4. Promoting the e-book primarily through new media channels
5. Distributing the e-book online via iTunes, online stores and LMSs
6. Student downloads the e-book
7. Student listens to e-book on iPad using the text to speech reading software

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Riding the seismic waves: re-blending teacher education in response to changing demands

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Blended learning plays an important role in many tertiary institutions but little has been written about the implementation of blended learning in times of adversity, natural disaster or crisis. This paper describes how, in the wake of the 22 February Canterbury earthquake, five teacher educators responded to crisis-driven changing demands and changing directions. Our narratives describe how blended learning provided students in initial teacher education programmes with some certainty and continuity during a time of civil emergency. The professional learning generated from our experiences provides valuable insights for designing and preparing for blended learning in times of crisis, as well as developing resilient blended learning programmes for the future.

Keywords: blended learning, disaster planning, teacher education

The Canterbury earthquakes

At 4.35 am on Saturday 4 September 2010, a 7.1 magnitude earthquake struck the Canterbury region of New

Zealand. The University of Canterbury, situated 40 km from the epicentre, was closed for two weeks. At 12.51 pm on Tuesday 22 February 2011, another large earthquake struck the city.

> We could hear it coming. The shaking was moderate at first but quickly became violent. After about 20 seconds it relented and departed as a rolling wave motion. I was on my way back to my office from the café. I latched on to a nearby tree during the most violent phase. Looking up I watched a five-storey building repeatedly separate and then rejoin its neighboring annex – opening and closing a fissure three or more stories high. Windows began to fall just as the shaking stopped. I moved towards the assembly area. As I did so a student asked me if class would be on that afternoon. I said I thought not but I was only 90% sure I was right. The future was uncertain. (DB)

This shallow 6.3 magnitude earthquake caused widespread destruction in the central business district and tragically resulted in 181 fatalities. A state of civil emergency remained in place for several weeks. This is not the time to describe the city-wide impact of this event or the personal trauma in the immediate aftermath. Suffice to say that all staff and students evacuated the university that afternoon safely to deal with the pressing realities of locating loved ones; broken homes without power, water or sewage; streets swamped by liquefaction; comforting and assisting friends, family and communities; and life as we have never imagined.

The University quickly mobilised its emergency management team and closed the campus. By the next day it was evident that teaching and research activities would be suspended for some time as campus damage was assessed. Within two days the Vice Chancellor noted in his daily message to the university community that many students were accessing Learn (our Moodle-based LMS) and that e-resources were available through the Library, and by day four a commitment was made that the University would continue to offer a full-year academic programme in spite of the uncertainty surrounding some campus buildings. The campus remained closed for approximately three weeks and most staff lost immediate access to their teaching and research resources including laptops which were left behind in the evacuation process. The impact of this sudden evacuation was significant because the earthquake occurred during the first week of the academic year.

One of the key factors in the College of Education being able to respond to this disaster was the existing infrastructure, pedagogy and capability to support blended learning. The College of Education, one of five Colleges within the University, has an established reputation for distance education and was amongst the pioneers of online learning in New Zealand with its first fully online teacher education course offered in 2001. In the ensuing years the College developed considerable capability and expertise in online and blended learning, including strong bi-cultural understandings and strategies (Hunt, 2007). By the beginning of 2011 every course had some web-support, with many lecturers making extensive use of the LMS to meet the needs of initial teacher education and postgraduate students. Furthermore, an initiative to revitalise flexible learning options (FLO) in 2010 had ensured that each course had one coordinator and one online course site to cater for multiple occurrences including campus, distance, and regional blended offerings (Davis, et al. 2011; Davis, Mackey, McGrath, Morrow, Walker & Dabner, 2010). Faced with the sudden closure of the campus and the unavailability of physical spaces and resources, College of Education staff were generally well placed to respond to the emergency situation we found ourselves in at the beginning of the academic year.

This paper describes how a group of teacher educators re-oriented themselves, re-thought their pedagogies, and responded to crisis-driven changing demands and changing directions for one undergraduate programme in the weeks following the February earthquake. Our narratives describe how we endeavoured to engage dispersed and distressed students, and how we strove for equity of experience for students who were no longer able to access regular, on-campus courses as they had intended, as well as for those students who were expecting to engage in distance study. Blended learning became the 'lifeboat' to support our earthquake pedagogies, and our experience and expertise in online learning provided the 'compass' to navigate through this storm. It has been a bumpy ride but our professional learning provides valuable insights for designing and preparing for blended learning in times of crisis, as well as developing resilient blended learning programmes for the future.

Literature: Online and blended learning

Internationally universities have increasingly been adopting online and blended learning strategies to complement and, in many cases, replace, traditional face-to-face delivery. Rationales for adopting such strategies include, amongst others, perceived economic efficiencies including the ability to operate in a global context, supporting diversity through equity of access for students unable to attend regular classes, enhancing students' campus experiences especially in large classes; and pedagogical effectiveness including increased interaction (Dziuban, Moskal, & Hartman, 2005; Sharpe, Benfield, Roberts & Francis, 2006). In relation to pedagogical rationales, blended learning has been described as a complex concept with the potential to provide insight into the multiple ways that learning theory, technology, pedagogy and context might be combined to enable optimal learning (Cross, 2006). Most definitions of blended learning assume a combination of online and face-to-face learning experiences (Osguthorpe & Graham, 2003; Stacey & Gerbic, 2009). For example, Garrison and Vaughan (2008, p. 5) describe blended learning as "the thoughtful fusion of face-to-face and online learning experiences" and suggest that "face-to-face oral communication and online written communication are optimally integrated such that the strengths of each are blended into a unique learning experience congruent with the context and intended educational purpose." As Garrison and Vaughan (2008) contend, blended learning is usually the result of a considered and deliberate attempt to design learning experiences congruent with a specific context and educational purpose. Successful blended learning programmes often aspire to achieve goals such as pedagogical richness, access to knowledge, social interaction, personal agency, cost effectiveness, and ease of revision (Osguthorpe & Graham, 2003, p. 231). Furthermore, blended approaches are more likely to support effective learning when students are well-prepared with the necessary skills and understandings to engage in the range of activities and interactions offered (Hamilton & Tee, 2010). Stacey and Gerbic (2009) agree that effective blended learning requires a transformative process which is more complex than layering in technology to an existing context, and that successful blended learning offers increased flexibility for students.

The use of blended learning in initial teacher education is not new and blended approaches are commonplace as in other areas of higher education. For example, Geer (2009) reports on the use of online discussions in a first year teacher education course; and Simpson and Anderson (2009), describe the redesign of an entire initial teacher education programme using blended approaches. The role of blended learning within the University of Canterbury's initial teacher education programme has also been well documented elsewhere (see for example, Davis, Mackey, McGrath, Morrow, Walker & Dabner, 2010).

The literature on blended learning assumes, in general terms at least, that technology facilitates the blending of one or more of delivery modes, different web-based technologies, synchronous and asynchronous interactions, locales, roles, and different pedagogical approaches (Sharpe, Benfield, Roberts & Francis, 2006). When institutions or programme leaders consider these complex options for designing effective learning experiences they are usually working within the parameters of known conditions and contexts. Little has been written about the actual implementation of blended learning in times of crisis or disaster, although it is acknowledged that blended learning provides access to education in situations where physical attendance is dangerous, difficult or impossible. For example, Bonk and Kim (2006) note that blended learning came to the fore during the SARS pandemic when physical contact was unsafe, and that blended learning enables educational opportunities in contexts where political turmoil and unrest make it unsafe to congregate. This paper addresses the realities of implementing and adapting blended learning 'on the fly' in times of unexpected adversity and crisis. This is not 'business as usual' or 'teaching as planned' but highlights the potential of responsive blended pedagogies to provide access to continued learning opportunities and enable student engagement in an extreme context.

Methodology

This research was triggered by a series of unexpected and disruptive natural events and consequently the research framework has evolved in tandem with the learning experiences of staff and students. The aim of our study was to analyse our collective experiences so that we might improve our practice and be better prepared for future contingencies. Our framework is based on a retrospective and reflective design model in which the authors came together as a community of teacher educators to purposefully reflect on our experiences as we responded to changing institutional and student needs. This research presents excerpts and findings from a series of autobiographical accounts written by the authors reflecting individually and collectively on how we adapted course content and teaching in response to the changing context in which we were working. Quotes are identified by the author's initials. We offer descriptive and detailed accounts which give an account of 'what it is like' to be up close in this context as defined by the authors and subsequent events (Cohen, Manion & Morrison, 2007). Cochran-Smith and Lytle (2009) advocate the importance of university academics developing an inquiry-centered approach to operate as professionals in the world of educational practice in order to understand the effects their teaching may have on their students and their own teaching beliefs and practices. The conclusions are made within a qualitative framework in which they are analysed through the lens of the participants and the context in which we were working (Cohen, Manion & Morrison, 2007).

This research draws on our experiences teaching across a range of teacher education programmes and curriculum courses. We all employ some blended teaching strategies and within the group there is considerable experience in developing and designing blended learning courses. We all lost access to our offices and physical resources on the day of the earthquake and initially we all worked from our homes before being re-located to temporary accommodation on campus. The research group formed voluntarily in response to an invitation to reflect on and analyse our post-quake experiences and with the purpose of crystallizing our own learning in order to support others. Several weeks after the February earthquake each of the authors wrote a series of reflective narratives based on our individual experiences. A thematic analysis identified categories and themes from the autobiographical data as reflective statements were compared and contrasted, and linkages and connections were made (LeCompte & Preissle as cited in Mutch, 2005). Data was also gained from the online forums and used to support and inform the conclusions made. We met regularly to compare and contrast our experiences and to identify the themes, synergies and key learnings from our collective experiences. The group developed a diagrammatic representation of those experiences to conceptualise the phases and activities which characterised their response to meet student needs via blended learning strategies (See Figure 1).

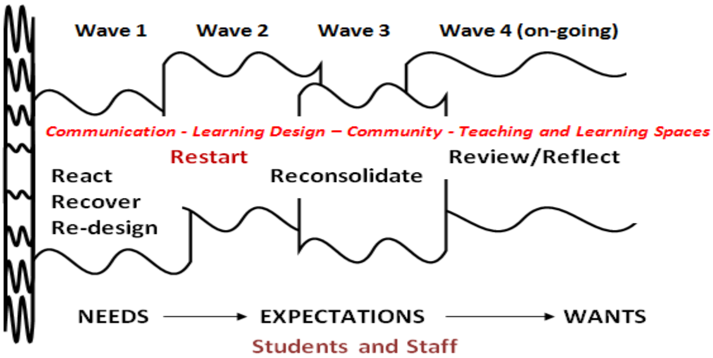

Figure 1: Waves of response

Waves of response

The analysis of our experiences identified three phases of activity. The first phase, spanning three weeks between 22 February and 14 March, was characterised by initial reaction to the emergency situation followed by an intense period of recovery and re-design of learning spaces and approaches prior to the recommencement of teaching. The second phase, characterised by a re-start of teaching activities spanned approximately four weeks from 14 March to 8 April. The third phase, following the Easter mid-semester break, focused on reconsolidating and was somewhat more open-ended in its duration as different timelines applied to different courses and cohorts. The final phase is ongoing as academic staff review and reflect on their semester one experiences and apply their learning to semester two. This paper will focus predominantly on our experiences and findings from phases one and two as we highlight lessons that may benefit other institutions in disaster planning and recovery.

Wave 1: React/recover/re-design

Communication

As we compared our reflections of the first few days after the quake it was evident that our main focus in the initial phase was making contact and maintaining communication with each other and with students. We were extremely fortunate that the university's IT infrastructure was not damaged and that we were able to use familiar channels such as the website and the LMS. For some of us these communications involved contacting and reassuring whole cohorts of campus-based Christchurch students, while for others it meant locating and checking on individual students or staff members. We were also concerned about a large number of first-year distance students who were attending an introductory residential school in Christchurch, all of whom had been instructed on 22 February to return home. Multi-level communication was a strong focus at institution, programme and course levels for staff and students. Comprehensive updates were published at least daily on the official UC website; a dedicated UC Facebook site provided a hub of interaction (Dabner, 2011); and programme coordinators began posting news items (with associated automatic emails) to students via the LMS.

The experiences of September 2010 had taught the university the importance of referring all staff and students to the official UC website for key communications. This strategy ensured an organised flow of clear messages but not everyone had access because the city's telecommunications infrastructure had been affected and large areas were without power, phone and/or internet access for some days. Information was relayed via virtual and real social networks but there was no sure way of knowing how many students were missing vital communications. The overall feedback in ensuing weeks confirmed that, rather than lack of communication, some students were at times overwhelmed with the number of messages they were receiving via email and the LMS.

Learning design to accommodate staff and student needs

It quickly became evident that our planned teaching and learning programmes would need to change. No campus buildings collapsed but the severity of the quake meant rigorous engineering assessments were required before safe occupancy could be assured. This process took time with some buildings out of commission for weeks and others still undergoing remediation six months later. We were immediately required to re-think our teaching strategies and evaluate our ability to offer courses beginning from 14 March. Meeting student needs was a high priority and the following reflection, from the coordinator of a postgraduate Honours programme encapsulates the challenges we all faced:

> The course was due to start the day after the earthquake. The day before I had set everything out on the floor ready for this first class which was my usual way of doing things. However not only did our building sustain a lot of structural damage, the water-pipes burst and everything on the floor was moldy when I was able to retrieve it three weeks later. I had already posted an introduction letter and a course overview up on Learn before the commencement of the course, and knew that most students had already downloaded the material. However after a week, and with limited capabilities working from home, I added two messages, asking how they all were and reassuring them that the most important thing was to support friends and family at this time. I assumed all could retrieve these messages and all had homes…I was very wrong! Some had left, one had lost her home and several had no power. My assumptions of 'normality of practice' were challenged and I really had to consider individual students' needs to create meaningful learning experiences and a professional learning community, and how I could use various technologies to accommodate this. I discovered that this would continually change as the needs of the students and the context changed. (FG)

All of our considerations about re-starting teaching were coloured by the realisation that the individual needs of staff and students were varied and extreme. We were working in an abnormal context and it is difficult to convey the extreme conditions in which we found ourselves. We were shocked and unsettled, and yet at the same time trying to be positive, pro-active, professional and forward looking. Just staying in touch with each other via email and phone was time-consuming as we worked from home. In the midst of what became known as the 'new normal' (which in reality was anything but normal) our re-start preparation began by reflecting on the state of course readiness for delivery and the viability of campus versus blended or online strategies.

> It became clear within a very short time that there was only one delivery option (at least initially) and that was via Learn. Imagine the environment, large parts of Christchurch didn't have power, the news was preoccupied with sanitation issues, people were in shock, there were funerals. Aftershocks were frequent. On the news there was a clip of a University of Canterbury lecture that stopped mid sentence, followed by shouting and screaming students. I tried to imagine myself taking a large group lecture and being a warden in the event of another quake. Then I had a phone call from a senior staff member asking if I could deliver face to face. She said literacy was a priority (forgive me but I was thinking sanitation was a priority at that point). In hindsight the call helped crystallize my confidence in Learn as the most effective delivery mechanism. I realised also that, unless directly involved in designing and implementing teaching material for Learn, [it was difficult for] staff members [to] be truly aware of its capacity. (PB)

All of us reflected on similar considerations about how we could best adapt our existing flexible learning options to cater not only for distance and regional students but also for the larger cohort of campus based students. While the transition might seem like a simple one, the reality was different. The timing of the earthquake meant that none of our first-year students (distance or campus) had even begun their orientation and introduction to the LMS, e-portfolios, email and other ICT resources. Following Garrison and Vaughan's (2008) principles, our flexible learning strategies were carefully planned and students were provided with additional resources to facilitate off-campus learning. However, our planning had not included contingencies such as not being able to provide students with a face-to-face introduction to the online environment, nor had we considered the impact of not being able to access any of our non-digital teaching resources. Furthermore, none of our campus students had access to the additional resources, for example CDs and DVDs, which were sent to distance students. While we could make this material available online there were well-founded concerns about the ability of students to access these given the compromised telecommunications infrastructure across the city and the difficult situations that many students were living in. There were also concerns about maintaining the quality of the learning experience, what students' needs and expectations were in these extreme circumstances, and how decisions about teaching and delayed timeframes might disadvantage or disenfranchise students living outside of the disaster area. However, in spite of these factors lecturers were realistic that the best course of action was to adapt the existing online material to cater for the needs of all students.

The re-design activities differed across the members of our group reflecting the variety of courses and teaching styles. The re-design of courses occurred in a very condensed timeframe of approximately one week to plan, create, prepare and launch a very flexible online programme. One example is described below:

> I began a review of the maths modules within Learn to determine the extent to which additional resources and learning activities would be required to enable the course to be taught without face to face lectures. The initial focus was on the redesign of the lectures and tutorials for the first five weeks of the course. Our first step towards restarting was to ensure all students had access to all of the distance learning materials – the study guide CD and the video recordings of children modelling the numeracy strategy stages and children undergoing numeracy assessment interviews on DVD. The second step was to redesign the modules to include the capture of lectures which were then made available online. These lectures were the platform on which subsequent learning experiences and tutorials were based. Our initial response was to reduce the amount of information transmission in each session and replace it with practice and/or application activities. In some instances lectures became self-directed learning experiences within Learn - supporting students to locate, engage with and evaluate web-based resources. (DB)

As we worked through the re-design phase we were also conscious that we needed to hear from students to gauge their readiness and capacity for re-engaging. Alongside internet access, students also needed the emotional capacity and personal circumstances to enable them to commit to their studies. Looking back we recognise that some students welcomed the routine while others needed space and flexibility to engage at a much slower pace (or not at all). Again, different strategies worked in different courses. PB recalled "being worried about connecting with the students and knowing I had to show a strong on-line presence and focus." Her first step was to post a reassuring 'News' item, and her second step was a 'Choice' activity which invited students to self select into a group. This proved to be significant as it was designed to make each student step into a space that said 'I'm here, I'm ready.'

The re-design phase was short, sharp and focused. Staff worked from their homes and mainly relied on electronic resources as the campus was still closed. We were also extremely grateful for the support we received from our regional campus staff, other universities and organizations during this time. We were able to request and receive copies of essential curriculum materials at short notice from the Ministry of Education and colleagues working in other centres. Our university library was generously provided with unprecedented access to electronic materials to support staff and students in their teaching and research activities.

During this time we were all very conscious of the need to stay connected with our students and to reassure them that their courses would go ahead. Strategies included posting news items in the LMS, email, and those of us involved in one first-year course used a flip-video to record ourselves planning aspects of the course along with a light-hearted musical introduction. Students responded extremely positively to the 'real people' talking to them from this impromptu video filmed around a kitchen table. Together we noted the need for positive leadership and strong course-wide communication. Students needed to know, more than ever, that we were 'there' and "we needed to be there in multiple ways….The Learn site became the course place so the facilitator's voice needed to be present, steady and constant…yet without turning into a nag". (PB)

Wave 2: Re-start

The re-start of teaching began officially on 14 March, almost three weeks after the scheduled beginning of semester. Some of our courses were launched in fully online mode while others included some on-campus sessions as safe teaching spaces including tents and single-level buildings became available. These spaces were scarce and consequently online learning became the cornerstone of 'restart' teaching. Teaching via virtual classrooms offered content delivery and a place for students to discuss points and ask questions. Learning was supported with new multi modal resources including pod casts and video demonstrations. Face-to-face teaching was often workshop-based and built on content explored within the virtual sessions. These complementary workshops were optional allowing those on-campus students remaining in Christchurch to attend while recognising that many had opted into 'flexible' mode to accommodate their personal situations. The re-start phase focused on meeting students' expectations while working within the physical constraints imposed by lack of facilities, and the wider context of post-quake stress.

The need for supportive community

We were conscious of the fragility of our students and their general unpreparedness to engage in independent online learning. We recognised too that some students were feeling overwhelmed especially when they reported difficulties with some courses where materials were uploaded with very little scaffolding. We concurred that students need to be well prepared for blended learning and that the teacher's role is critical in supporting students in this mode (Hamilton & Tee, 2010). Our reflections also identified a common understanding of the importance of scaffolding new learning approaches, and building a sense of community.

> I deliberately tried to utilise the Learn site as a teaching site which would require active participation from the students and which forced them to engage not only with me but with each other. For example, I set up a link to Google Docs, in which all students had to add in a synopsis of their readings. Once all had added their entry they completed a synthesis in pairs which was posted for all to view, compare and contrast. Discussion forums were set up, especially for the first assignment, for all questions and discussion. This helped us to build a learning community within the virtual world. It re-emphasised the social construction of knowledge, and how we all needed to take a responsibility within this process. (FG)

As lecturing staff, experienced in establishing diverse delivery contexts, we instinctively sought face-to-face introductory opportunities with students. Typically lecturers communicate directly with students, especially those entering their first year of study, to scaffold and structure course based experiences. While defying the odds to find suitable spaces, these windows of direct communication with students, who had been expecting on-campus delivery, represented a significant step in establishing learning communities. For example, DB organized a student meeting in a local school hall to help re-establish his relationship with students and to reassure them that we had their best interests at heart. He noted that as campus spaces became available two lectures were held and "while they were advertised as 'optional but highly recommended' on both occasions over 80% of students attended. The students were tired but attentive. Their questions focused on ensuring that they had understood key concepts but it was evident that they had no capacity to explore beyond this" (DB). Similar strategies were noted by others too, for example:

> I made personal contact by phone with each student, which proved to be vital. Some were very anxious because a decision had been made to deliver most of their courses online which many had made a deliberate choice to avoid. I was able to negotiate for my class to meet face to face as soon as possible. The first class involved a lot of sharing of one's stories and recounting personal experiences…something which was necessary. With most teaching spaces out of action we were in new surroundings and had to discuss what to do in case of an aftershock…which did indeed eventuate! Every class began with a general sharing of where we were at, so we could collaboratively problem solve. Although the Learn site became a communication tool which enabled us to quickly and efficiently communicate with each other I could not under estimate the need for personal e-mails, so they felt their personal and professional needs were being met, valued and respected! (FG)

As a group we also identified a number of practical strategies we had employed to support students through this re-start period. These included streamlining and simplifying online course sites; revising course maps and outlines; highlighting course changes; providing additional resources (particularly for technical aspects like creating e-portfolios); adjusting assessment tasks and assessment dates; posting and emailing regular updates; and personally following up students who had not accessed the online course sites. This was a very intense period of activity for all of us as "teaching then began to span seven days, with messages and questions appearing daily that needed a timely response" (ND). We recognised the importance of being visible and responsive in the online spaces and made it a priority to respond to students' questions in the online forums. These strategies paid off and we were able to observe some sense of community amongst students, for example:

> Students started to develop relationships with other students within their visual art forum discussions (12 groups of 17 students) facilitated by my colleague and I. Using digital cameras some of the practical work they completed was shared and celebrated within the community. Students began to take ownership of their question forum, offering answers at times before staff and also providing encouragement and support to each other at times. (ND)

We also noticed that students would respond to each other's questions in the forums. This was especially evident in the ICT module of one first-year course where it was common for students to provide ideas and solutions to other students' questions before lecturers had a chance to respond.

Waves 3 and 4: Re-consolidate, review and reflect

Phases three and four are interconnected, overlapping and involve slightly different timeframes and activities depending on the courses we are leading. These phases are commonly centered on teaching and managing the blend between online and on-campus learning and iterative processes of reviewing and reflecting. The period following the Easter term break has been a time of consolidating teaching but it has also been characterized by uncertainty and the need to continually reflect on what we were doing and how to respond to unfolding circumstances. For example, Christchurch experienced two more significant earthquakes (magnitudes 5.6 and 6.3) on the afternoon of 13 June which resulted in another evacuation and the campus being closed for a week at the beginning of the mid-year exam period. This section will touch on one or two key insights from these phases while acknowledging that we are still learning from these ongoing experiences.

The third phase began after the shortened one-week Easter term break as more teaching spaces became available and some courses scheduled more face-to-face classes. This in itself was problematic as timetables changed weekly and staff and students needed to cope with the uncertainties of different facilities and different timeslots. It is not surprising that attendance at classes was erratic bearing in mind that many students, particularly those living in the eastern suburbs, were coping with the ongoing impact of the earthquakes. Roads were badly damaged, public transport was operating on limited schedules and routes, and heavy traffic flows were condensed into suburbs where businesses had re-located and retailers were open. Furthermore, many students and their families had left town at least temporarily to escape the ongoing unsettling aftershocks. Our response was to adopt a relaxed approach to attendance and to encourage students to manage their own blend of learning experiences by opting into campus or online classes depending on their circumstances and irrespective of their official course enrolment status. This flexible approach was feasible because the online course sites had been designed around the needs of our distance students and then broadened to provide resources and complementary elements for campus-based students. We also used the campus classes to record videos and podcasts to enrich the online classes. The challenge for some students was the need for them to work more independently in difficult circumstances and some were unable to manage their time successfully. Students needed to be proactive in checking Learn sites and emails regularly to receive latest timetable and course information. It was absolutely critical to provide clear weekly overviews for each course to guide students through their options.

The delayed start to the semester, adjustments to course content and different teaching strategies also impacted on timelines and methods of assessment. We found ourselves re-evaluating assessment approaches and priorities and revising assignments and tests to simultaneously accommodate the varied circumstances of our campus, regional and distance students. As a group we noted that, more than ever, the first assessment activity in a course represented a 'critical incident' for some students when they really had to make a commitment to working through the difficulties and challenges or not. PB described her experiences and the need to provide optimum flexibility to meet students' needs.

> Our first piece of assessment [in week 5] was a turning point for some students…it encouraged students to 'face' study commitments. Although I established a forum and requirements were available on the site I had many emails from students seeking support. I rang these people because I had a range of options for completing the task over a three week timeframe.... flexibility with dates helped…I think this point was pivotal in their decision making [to persevere with their studies] (PB).

Assessment activities were complicated further with the aftershocks of 13 June. The possibility of further earthquakes prompted a university-wide move to replace exams and tests with take-home or online tests or assignments to avoid having large numbers of students sitting in lecture theatres. Again, as a group we were reasonably well-placed to accommodate these arrangements as we already used a variety of assessment strategies for our distance students and these were able to be adapted for our campus cohort.

Phases three and four are ongoing for us. At times we feel confident that we can see the horizon while at other times it seems as if we are still battling some rather challenging waves. We have learnt a great deal since September 2010 about the ways that blended learning can meet the changing needs of students in times of crisis and natural disaster. Our survival story serves as a timely reminder for other institutions to consider their preparedness for unexpected and unknown interruptions to business as normal, whether that involves pandemics, civil unrest, or natural disasters. Our concluding section aims to prompt educators to take stock of their own readiness to respond in times of crisis so that they might consider how blended learning can be thoughtfully designed to provide optimal learning in changing contexts.

Recommendations for an academic emergency survival kit

We found ourselves in an unexpected and unprecedented situation on 22 February 2011. We were considerably better prepared than many other programmes within the university because we had recently revised and revitalized our flexible learning strategies for pre-service primary teacher education courses. Every course had one well-structured online site designed to support distance, regional campus and local campus students; there was one course coordinator responsible for all occurrences of a course; and we were well supported at the institutional level with professional development, digital media specialists, and distribution and administration support. In spite of those strengths we have identified critical areas for contingency planning and realise that we can be better prepared for future unexpected disruptions whether they arise from earthquakes, other natural disasters or pandemics. We offer the following points to help other institutions plan how they might sustain equitable experiences for students in times of disaster or crisis:

Communications: What channels including social networks are you ready to use for communications with staff and students? Do staff and students know about and feel confident accessing these channels? Are these channels likely to remain viable in disaster or emergency conditions? Do you have access to simple technologies you could use to create instant communications and resources for students (for example flip-videos, pod-casting)?

Staff: How well prepared are staff to implement blended or online strategies independently within a short timeframe? What professional development and support do you need to initiate now to ensure staff have the technological capability and the pedagogical understanding to work predominantly in an online or blended mode should the need arise? Do staff know how to access files, applications and other resources remotely?

Students: How well-prepared for independent learning would your students be if your institution had to shift all teaching and learning into a distance, flexible or online mode at short notice? What additional supports or resources might students need in order to continue their learning activities independently? Could students complete alternative location-independent assessment activities if necessary?

Resources: In the event of a sudden and extended evacuation from your premises how will you access the materials you require to continue teaching? How many of these resources are electronic? How might you utilize cloud computing to ensure continued access should your institution’s infrastructure and servers be damaged? Do you have adequate off-site back-up and disaster recovery plans for electronic material? What physical resources do you need to digitize or arrange alternative access to (for example, off-site copies, and mutual arrangements with another institution) for you and your students?

This has been a year of challenges for staff at the University of Canterbury. The authors of this paper and many of their colleagues in the College of Education can also report that 2011 has been characterized by unsurpassed collegiality, professional learning, and admiration for the courage and resilience of staff and students alike. The way we plan for the future will be different as expressed by ND:

> Positive outcomes that have emerged from my experience include the melding of the distance-campus dichotomy to adopt more of a blended delivery leading to greater congruency, currency, and community for students. Lessons learned are impacting new course developments in my area, for example the planned provision of CD/DVDs to all students regardless of delivery mode, and the increased utilisation of an online environment to teach, enhance and support. For some staff, I believe there may have been a realisation of the usefulness and ease of online communication and community development in the absence of face-to-face contact. Others have experienced adopting new approaches, utilising multi-media more and an increased understanding of the powerful

affordances of the web environment. The 'letting go' required to deal with the challenges presented by the earthquake appears to have been a challenge for many staff and students; yet perhaps also a revelation of the positive affordances of technology and an e-environment in times of crisis.

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ICT as learning media and research instrument: What eResearch can offer for those who research eLearning?

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ICT for Learning and ICT for Research: An overview of emerging landscape
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Abstract and Symposium Plan

Students' interactions in digital learning environments are distributed over time and space, and many aspects of eLearning phenomenon cannot be investigated using traditional research approaches. At the same time, the possibility to collect digital data about students' online interactions and learning opens a range of new opportunities to use ICT as research tool and apply new research approaches. This symposium brings together some of the recent advancements in the area of ICT-enhanced research and aims to discuss future directions for methodological innovation in this area. The session will include four presentations that will explore different directions of ICT use for eLearning research.

Lina Markauskaite will provide a brief overview of the scope and recent developments in this area. This will be followed by three cases introducing different directions of ICT use for eLearning research.

Rob Phillips and Jan Herrington will outline how they use summaries of use of eLearning technologies (Learning management system and lecture recording data) to predict and investigate student study behaviours in eLearning environments.

Peter Reimann will not so much focus on classical e-learning scenarios, but on the more mundane classroom. He will report on his European research in the EU funded Next-Tell project where method and technologies are being developed that make it easier to track students' activities in classrooms and during homework. A particular focus will be on methods to move from activity monitoring to knowledge tracking, and on how teachers can be supported in making use of the rich and diverse data that can be made available on students' learning.

Shannon Kennedy Clark and CoCo research team will introduce how the combination of two techniques - video capturing and data mining – have been used for studying student decision making patterns in a multi-user virtual learning environment.

This set of short stimulus presentations will be followed by interactive panel discussion. Our initial questions for the audience will include: (a) scalability of ICT-enhanced tools to support student and teacher decision-making in mainstream online courses; (b) possibilities for digital data sharing, integration and collaborative research; and (c) ethical issues.

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A perceptual training module for pilot instrument scans

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The current generation of young people have grown up with digital technologies and this has led to widespread consideration of how to use these technologies for education and training. We are interested in the potential for developing game-like training modules for deployment on personal digital devices to allow trainee pilots to practise information extraction skills for a variety of different contexts. The current study is based on an instrument scanning perceptual training module reported by Kellman and Kaiser (1994). While we expect that novices will be able to easily learn the instrument scanning tasks, it is important to ascertain whether their performance reflects an increased understanding of the flying situation, or just a correct choice learned implicitly within the context of the specific experimental tasks. If the latter, the possibility of negative transfer of gaming strategies to real world performance requires further examination.

Key words: cognitive skills, instrument scanning, aviation, perceptual training

Introduction

Growing up digital

Growing up digital means that many children will have spent as much time interacting with digital technologies and virtual worlds as with the real world (Gee, 2007). Because of this, it has been argued that their skills and knowledge may be different through greater exposure to virtual, rather than real, experiences. The nature of experiential learning, and the patterns of sensory and motor information accumulated over a lifetime of experience may be subtly skewed by vast amounts of visual data impinging on cognition from screen-based activities. Growing up digital may result in automated responses learned through video games and virtual worlds becoming more deeply embedded than responses to real-world stimuli (Gee, 2007). The fact that the current generation of young people have grown up with digital technologies has led to widespread consideration of how to leverage these technologies for education and training. Given the degree of engagement engendered by video games and interactive multimedia, there has also been much interest in using a gaming metaphor in training and education (Gee, 2007). The current study is based on an instrument scanning perceptual training module reported by Kellman and Kaiser (1994). We are interested in assessing the potential for developing game-like training modules for deployment on personal digital devices to allow trainee pilots to practise information extraction skills for a variety of different contexts.

Information management skills for flying training

New generation aircraft have more advanced avionics and customisable multi-function displays, requiring pilots to have better information integration and information management skills. New perceptual training paradigms are being investigated to develop rapid information extraction and the ability to scan instruments and sensors for contextually relevant information at an automatic level. It is important that flying training methods support the development of appropriate cognitive skills to interpret instrument readings in context and avoid the danger of negative transfer that interferes with future performance when reading instruments in the actual aircraft. To this end, the ability to extract information from instrument displays must be achieved through tasks that facilitate the development of appropriate mental models of the flying domain.

Kellman and Kaiser (1994) reported on a prototype perceptual training module using an instrument scanning task, aimed at promoting more efficient information extraction, higher order pattern processing, and automaticity. The task required the participant to identify the situation depicted by a standard 6-instrument display under speeded forced choice conditions. Flying an aircraft is an inherently dynamic activity and the instrument readings during flight are constantly changing. In order to create a snapshot of a dynamic display that represents a range of specific flying situations, movement of instruments was represented symbolically by arrows rather than displaying actual movements. The use of symbolic representation of movement within a perceptual training module is problematic however if moving stimuli were used, there would be a more serious problem. Many depicted situations can only be maintained for a limited timeframe, e.g., in the extreme situation, a descending turn will eventually become a crash landing.

Kellman and Kaiser (1994) showed that reasonably brief periods of perceptual training (between 1 to 2 hours) produced dramatic improvements in speed and accuracy for determining the aircraft situation, both in experienced civil aviation pilots and in non-pilots. Although, as would be expected, experienced pilots were initially faster than non-pilots, by the end of the training period, novices were extremely accurate (performing at ceiling) and faster than the initial performance of experienced pilots on the task. Kellman and Kaiser (1994) tested novice and experienced pilots but even for experienced pilots, the initial response times were around 7 secs. With practice, response times for novices and experienced pilots fell to around 5 and 3 seconds respectively. These data suggest that participants learned to recognise the tested situations rapidly, but then needed to check each instrument sequentially to confirm that it was congruent with the depicted situation.

The current study uses a similar paradigm to Kellman and Kaiser, but also includes some extra speeded training to emphasise information extraction and to consider differences between novices and experts. In particular, the expertise reversal effect (Kalyuga, 2007) describes the fact that the same task will be perceived differently by novices versus experts, and that the cues and aids provided to help novices may interfere with performance of experts (and vice versa). In order to complete the task, particularly given that arrows indicate direction of motion rather than subtle movement of the instrument, a novice can get most information from the attitude indicator without reference to other instruments. In contrast, an experienced pilot will recognise the need to check other instruments depending on the flying situation indicated. A novice will be able to complete the experimental task without needing to form a more complete mental model that incorporates complexities of the flying domain not represented in the specific training task.

In order to investigate what information is being used by novices who can complete the experimental task as quickly as experienced pilots, our study includes some additional conditions. The attitude indicator will be displayed for differing amounts of time (between 250 ms and 600 ms) and then one of the five other instruments will be displayed. The participant will be asked to identify whether the second instrument is consistent with the attitude indicator (i.e., have novices learned the relationship between the attitude indicator and other readings, or have they just learned to complete the task using the least amount of information required).

Given our interest in the development of mental models, it is also important to ensure that novices are not just relying on a single display (the attitude indicator) to determine the aircraft situation, and then checking by whatever means available that other instruments are compatible with this reading. A second speeded task will be included whereby five instruments other than the attitude indicator are displayed, then those instruments disappear and the attitude indicator is shown. The participant needs to decide whether the attitude indicator is congruent with the instruments, a task that will be difficult if they have previously only focused on interpreting the attitude indicator and then checking the consistency of other instruments with this.

Method:

Participants

Preliminary data have been recorded from two of the authors of the paper in order to set parameters for the actual data collection. Participants for the data to be reported at the conference will be university students enrolled in a first year psychology program who be invited to participate as part of their research experience.

Materials

The main stimuli used in the study comprised a prototype of a standard 6 instrument panel (Figure 1). Participants will also be asked to complete a questionnaire which provides brief demographic information and information on previous flying experience and gaming experience. The study will be delivered via the web using Inquisit v3 (Millisecond Software, http://www.millisecond.com). Participants will be requested to devote their full attention to the task, and work in a quiet environment free from distractions, but it should be noted that the use of web-based delivery in relatively uncontrolled circumstances mimics the conditions under which web-based and mobile training operates. It is left to the participant to set the parameters of their working environment. We predict that, while data may well be more variable, the findings will not be compromised by web-delivery, and indeed, any findings that are not sufficiently robust to be demonstrated in these conditions will not be sufficiently robust to provide opportunities for future mobile training.

Figure 1. Six main instruments of the Cessna-based instrument panel used for stimuli in this study.

Procedure

Participants who consent to participate in the study will be presented with a brief description of the study, and then a sequence of training pages describing each instrument of the instrument panel (see Figure 1) and what information it displays. They will then be given a series of instrument clusters depicting specific aircraft situations. Two such situations are shown in Figure 2. In the left hand panel, the artificial horizon shows the aircraft pointing to the blue and banked left with respect to the horizon. The turn indicator and heading indicator show a left turn and the altitude indicator and vertical speed indicator are both consistent with an aircraft climbing in altitude. The airspeed indicator shows an appropriate speed. Thus all the information is consistent with an aircraft in a climbing left turn. In the right hand panel, the artificial horizon shows the nose pointing down and the aircraft banking right with respect to the horizon. The turn coordinator and heading indicator also indicate a right turn, and the altitude indicator and vertical speed indicator are consistent with an aircraft descending in altitude. Thus all the information is consistent with a descending right turn. The nine aircraft situations depicted in the experiment are Straight and Level, Level Climb, Level Descent, Climbing Left Turn, Climbing Right Turn, Descending Left Turn, Descending Right Turn, Level Left Turn and Level Right Turn. An additional Incongruent condition is also included, where one of the instruments is not congruent with each of the other instruments. For example, the turn coordinator displayed in the left image of Figure 2 may be changed to indicate a right turn such that it would be incongruent with each of the other instruments indicating a climbing left turn.

Figure 2. Left panel shows a climbing left turn whereas the right panel shows a descending right turn

Having completed the training section, participants will be presented with a sequence of 30 instruments clusters (*Standard Block*) and will be asked to identify the aircraft situation as rapidly as possible. Although there will be 30% of trials that are incongruent, theoretically requiring participants to check at all the instruments, it may be that they tend to focus on the artificial horizon to identify the aircraft situation and do not check all other instruments systematically. In order to promote more rapid effective information extraction using all the instruments, participants will be asked to practice with a sequence of trials in which the artificial horizon is presented briefly with all other instruments masked, then it is masked, while one other instrument is revealed (*Speeded Single Instrument Block*). The participant's task will be to identify whether the instrument is congruent with the artificial horizon. We will attempt to use this task for establishing a threshold for information extraction from the artificial horizon. In order to test whether participants are focusing primarily on the artificial horizon to interpret the aircraft situation, then checking via possibly idiosyncratic perceptual cues whether the other instruments match the artificial horizon, a further training condition will be used. In this condition (*Reverse Instrument Block*), all instruments except the artificial horizon will be shown, and then they will be masked and the artificial horizon revealed. The participants will be asked to identify whether the artificial horizon is congruent with the other instruments. In between each sequence, the participant will complete a Standard Block of trials to track performance at identifying the aircraft situation. In order to test the perceptual versus cognitive nature of the learning achieved, participants will finally be tested on a set of instrument panel stimuli in which the nature of the instruments and their interaction will remain consistent with previous training; however the overall position and look of the instrument panel will have changed substantially.

Results and Discussion

Data from our participants will be collected and analysed in August/September to be presented at the conference. The first pass of analysis will be to confirm that novices can learn the task of identifying the aircraft situation from instruments. Preliminary data have already been collected from two of the authors, neither of whom are pilots, and these data suggest that the tasks are all manageable within the allocated timeframes. There is an obvious caveat is that each author has gained incidental experience with the tasks while constructing the experimental stimuli, and has at least some familiarity with the flying domain. The preliminary data from two of the authors demonstrated two quite different strategies for completing the tasks that bear on the suitability of games-based training modules for high risk real world tasks. One of the authors, who has not played any videogames, focused on establishing the aircraft situation and then establishing the correct response in the given task, either selecting the aircraft situation, or stating whether the instruments were congruent. The other author, who played videogames regularly as a young person, was strongly motivated to establish the fastest performance with greatest accuracy, thereby looking for any perceptual cues that allowed the task to be performed rapidly, whether or not the aircraft situation was consciously identified. These different strategies prompted us to implement the extra condition to test transfer to slightly different instrument layout to see whether automatic processing as a result of repeated speeded practice results in transfer to a new layout without conscious awareness of the aircraft situation, or whether this strategy promotes negative transfer by fixating on very specific perceptual cues available in a given context rather than on developing a cognitive model of the flying task from which the instrument scanning task has been extracted. If the training task implicitly activates performance strategies based on a gaming metaphor, there is an urgent need for careful research on what exactly is being learned from virtual training environments and what are the implications of using virtual environments for training novices. While we expect from previous research (Kellman & Kaiser, 1994) and from our own experience that novices will be able to easily learn experimental tasks that mimic information integration of a complex form (instrument scans), it is important to ascertain whether their performance reflects an increased understanding of the flying situation, or just a correct choice learned implicitly in terms of the responses required of them (congruent versus incongruent). The latter situation gives rise to the very real possibility of negative transfer in future training tasks and real world flying situations.

Conclusions

Automated responses are based on trust in the anticipatory cues embedded in information being processed, and we extract anticipatory cues implicitly and without conscious awareness (e.g., Starkes & Ericsson, 2003). This study investigates the type of learning taking place in a game-like perceptual training module based on an instrument scanning task. If growing up digital results in automated responses learned through video games and virtual worlds becoming more deeply embedded than responses to real-world stimuli and we have only limited control over how automatic behaviours are selected and activated, it may be difficult to remediate automatic trained responses that are dangerous when real-world risks are involved.

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Reinventing the 21st century educator: Social media to engage and support the professional learning of teachers

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Learning for the professions has grown beyond mere consumption of knowledge and become a knowledge creation process. The new effective teacher must think more about process than content, enabling learners to operate in the digital world rather than learn a discrete body of facts. The paper will present the teaching and learning possibilities accompanying the social, participatory and collaborative tools that have emerged in the Web 2.0 era. For beginning teachers, competence in e-learning and the capacity to employ these tools to support lifelong professional learning is essential. As technologies continue to change, there is a now a stronger emphasis on teacher learning and that is proactive, experiential and mediated by digital tools. The complexity of teachers learning and teachers' knowledge is acknowledged and theorised, and evidence is presented that digital tools and their affordances can enable and support teacher learning in a number of productive ways.

Introduction: Teacher knowledge and learning

With the growth and expansion of the Internet and social computing, digital tools are widely used to mediate social interactions and communication. Social networking sites, blogs, wikis, skype and virtual worlds are all part of suite of social- collaborative tools that enable communication and collaboration on a global scale. Extensive research indicates that these technologies are widely embraced and that the majority of students now own a mobile phone, PDA and laptop. Along with the universal and widespread integration of these tools in every transactions and socialization, there has been an increased focus on the importance of students learning social media skills and digital literacies (Siemens, 2007).

The aim of this paper is to identify essential aspects and processes relating to the professional learning of teachers, and what part digital tools may have in supporting teacher professional learning. The paper argues that there is enormous value in exploring the potential of web 2.0 tools for professional collaboration, inquiry practice, reflection and personalized learning. Several models of teacher professional development are explored in order to identify teachers' needs, showing how digital age thinking and networking have changed expectations of what it is to teach and learn in 21st century classrooms. There is currently little research that investigates how teachers learn with social media and digital tools. To address this gap, the paper considers pedagogical change and presents a number of teaching frameworks and models that can be mediated by web 2.0, enabling virtual communities of knowledge building. The paper also investigates the core components of these models and proposes that digital tools and their affordances can enable and support teacher learning in a number of productive ways.

Changing models of teacher knowledge and professional learning processes

Teacher knowledge is best seen as dynamic, and hence inseparable from the processes of learning and reflection. Professional learning in turn is an active, experiential process, through which knowledge is enacted, constructed and revised in a socio-cultural context. This does not however mean that teacher knowledge is only to be developed through experience and reflection. Hargreaves et al (2003, pages 197) commented that teachers are agents of change and that "teachers are having to learn to teach in ways that they have not been taught". Such skills can be developed through social negotiation processes, dialogue and reflection. Shulman's (1887) model of pedagogical reasoning was originally developed as a foundation for teaching reform. The model comprises actions that a teacher undergoes during the teaching process including comprehension of subject concepts, transformation of subject knowledge into teaching and instruction, evaluation of learning, reflection and new understanding of the learning process, self and the teaching process. The most original and significant part of Shulman's classification of teacher knowledge is the category of pedagogical content knowledge (PCK), indicating that teachers do possess a specialised knowledge base. As teaching continues to evolve, several researchers have revisited Shulman's model with a view to exploring how its relevance in the age of Web 2.0. Koehler & Mishra, (2009) have questioned the relevance of Shulman's (1987) model suggest changes to reflect the evolution of learning theory since that time. The original Shulman (1987) model is grounded in constructivism, while the revised model (Shulman & Shulman, 2004) includes connectivist approaches that assume that teachers create knowledge through connections in an open, digitally connected world where they operate in many overlapping communities. Teacher knowledge is therefore complex and multi-faceted, and the nature of teachers' professional learning needs to be made more explicit.

Models portraying the complexity of teacher learning

A number of models have been developed in an attempt to portray the complexity of teacher knowledge and learning, and all have overlapping features. These models are compared and summarised in Table 1. All three models recognise that teacher learning is multifaceted and dynamic, and that development of teacher skills and knowledge is highly interactive, individualised, socially mediated and metacognitive. Teacher learning and teacher knowledge are two sides of the same coin: the former involves active, experiential activities and through the processes of engagement and learning, knowledge is created, enacted, considered and revised. Pedagogical thinking is subject to many different influences and factors, and is a constant interplay between formal and informal learning, personal constructs and professional expectations, objective and subjective experiences. Therefore, the development of professional skills and competencies is very much an individual learning trajectory, and that it may be enabled by interplay of factors, including practical experience and participation in communities of practice. In the following section, the five competencies described by Shulman & Shulman (2004) as reflection, vision, community, capability, motivation, will be considered in the context of how digital tools can be used to mediate and to support teacher learning.

Table 1: Comparison of models of teacher learning

Theorist and model	View of the teacher	Type of knowledge
Banks, Leach & Moon (1999) [Four categories of teacher knowledge]	• Teacher seen as knowledge professional • Complex and individual	• Subject knowledge • School knowledge • Pedagogic knowledge • Personal constructs
Hoban (2002) [Professional learning System]	• Teacher knowledge as a dynamic and constant construction	• Transformative and generative
Shulman & Shulman (2004) [Ready, willing and able]	• Having vision, reflection, motivation, community, practice, understanding	• Ready (having vision) • Willing (motivated) • Able (knowing and begin able to do)

Affordances of digital tools and social media

Given the affordances of digital technologies how might we best apply web 2.0 tools and social media in developing professional knowledge? Similarly Burden (2010) asks the question "Which aspects and affordances of Web 2.0 technologies are capable and suitable for mediating the elements of professional learning. Social media and Web 2.0 can be seen as tools which afford learners the potential to engage in meaningful activities for learning. Such activity may be autonomous or collective, and can encourage communication beyond text-based media with easy publication of user-user created resources. Stimulating enquiry, supporting collaboration, engaging with new literacies and generating multimodal artefacts are all novels ways of developing knowledge and comprehension. The use of Web2.0 tools can enhance users' abilities and enable collaboration, collective knowledge building and exchange of ideas. Several views of the affordances of Web 2.0 tools show the capacity for participatory, community building experiences. For example McLoughlin & Lee (2007, p.3) note how blogging empowers learners to express their views and explore others' They identify the following categories of 'affordances' associated with Web 2.0 or social software:

- Connectivity and social rapport
- Collaborative information discovery and sharing
- Content creation
- Knowledge and information aggregation and content modification.

They also make the crucial point that social software affordances do not, by themselves, guarantee that effective learning and reflection will occur. This requires 'careful planning and a thorough understanding of the dynamics of these affordances' (2007, p.4). It is therefore useful to weave together particular types of Web 2.0 affordances with the opportunities for learning that they might offer, and to provide exemplars of tasks. A useful way viewing this is to present a number of purposeful activities with the affordances of Web 2.0 (Fisher, 2006). These activities are not discrete, but are rather overlapping and interwoven (See Table 2).

Table 2: Linking meaningful/purposeful activity with affordances of digital tools

Distributed Cognition	• Accessing resources • Discovering and inquiring • Composing, creating and presenting multimodal texts with digital tools
Engagement	• Playing and exploring uncertainty • Taking risks • Responding to immediacy • Learning though multidimensional interactivity
Knowledge creation	• Creating and adapting ideas in dynamic ways • Modelling • Representing ideas in multimodal forms
Community and communication	• Sharing ideas and resources • Engaging in reflective dialogue • Participating in local and global communities

Burden (2010) gives some examples of how Web 2.0 tools such as wikis and virtual worlds can be used to support teacher professional learning. Collaborative wiki learning environments can be created by teachers to explore, write and share their perspectives on a particular pedagogical problem. The wiki space provides an alternative context for learning and reflection where the teacher is freed from the constraints of the staff room and classroom and is afforded the space to articulate and share ideas. In addition, participation in wiki is a self-generated form of professional learning and can bring the teacher into global networks for sharing ideas. Teacher learning through experience and construction in virtual worlds and 3D VLEs is enabled by the provision of alternative learning spaces which provide participants with "the ability to explore, construct and manipulate virtual objects, structures and metaphorical representations of ideas" (Dalgarno &Lee, 2010, p. 11). These authors identify five specific affordances that 3D VLEs might generate for learners:

1. spatial knowledge representation;
2. experiential learning;
3. engagement;
4. contextual knowledge; and

5. Collaborative learning.

Each of these affordances might generate a learning task that correlates with the aspects of professional learning identified by Shulman & Shulman (2004: Table 3). The potential of virtual worlds such as Second Life to host alternative learning experiences for teachers is gaining momentum as the learning process is highly experiential and engaging. Such examples show that these digital tools can be integrated into models of professional learning for teachers. Three different models of teacher professional learning are those of Hoban (2002), Banks Leach &Moon (1999) and Shulman & Shulman (2004). The latter describe teacher competencies as "ready, willing and able" and its aim is to assist in identifying and explaining teacher learning in a more explicit manner. As this model encapsulates the core ideas of Hoban (2002) & Banks, Leach & Moon (1999) it can explain how digital tools can mediate and develop the attributes of vision, motivation, understanding, practice and reflection and community. According to Shulman & Shulman (2004) the accomplished teacher must have vision, a clear sense of classrooms as learning communities and motivation. In teacher education, vision means having a view on the purpose of education within society; a philosophy of learning and teaching; and positive proactive view of their own professional learning. The affordances of digital tools and social media have, and continue to have, a major impact on the social, economic and cultural aspects of society and education. Web 2.0 tools can support the dimensions of an accomplished teacher outlined by Shulman & Shulman (2004), by enabling networking practices, information sharing, distributed learning and content creation.

Conclusion

This paper has outlined the various processes that underpin teacher learning within a broadly situative perspective based on socio-cultural views and theories of learning. Key features or affordances of Web 2.0 technologies are identified as being particularly valuable and harmonious with teacher learning, even though most of these applications were not designed originally for teacher education or even education in the wider sense: Innovative practices supported by social media provide an opportunity for teacher educators to look at wider implementation issues around technical infrastructure, but they must also address pedagogical challenges such as the integration of informal learning experiences, the limitations of existing physical and virtual learning environments and the personalisation of learning experiences. There may be a culture shock or skills crisis when "old world" educators are confronted with the expectation of working with participatory web 2.0 tools, and technologies with which they lack expertise and confidence. For these reasons, there is a need to make time for talking, awareness raising, and discussion of what pedagogic approaches and tools best support the key competencies identified by Shulman & Shulman (2004). The goal is to facilitate learning, to blend the formal and informal, to support knowledge building and distributed cognition and engagement. The affordances of web 2.0 tools and digital technologies can support the growth of a reflective learning community to enable critical dialogue and communication while nurturing creativity, independent inquiry and communication. This can be achieved by employing the tools, resources and opportunities that can leverage what teacher do naturally – socialise, network and collaborate.

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Managing Large E-learning Development Initiatives: Lessons learnt from the Australian Flexible Learning Toolbox Project

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This paper reports on a research consultancy undertaken for the Flexible Learning Framework in reviewing management processes undertaken as part of Series 13 of Flexible Learning Toolboxes. Toolboxes are e-learning products that cover multiple Units of Competency in National Training Packages. In the 13th iteration of the project a number of initiatives were implemented designed to support the development of 7 Toolboxes. The research explores the role of documentation and communication processes and their impact on the development experiences of key stakeholders such as the designers, developers and managers of the products. Findings identified a number of important factors with regard to the use of design documentation and project management processes that are important to successful development as well as some recommendations for future iterations.

Keywords: Toolboxes, Project Management, Instructional Design, Flexible Learning

Project Management for E-Learning

Project Management is key to a range of human activities that do not involve repetitive tasks. In a sense we are all project managers (Patel, 2008). At a systematic level, however, Project Management seeks to manage the essentially linear time-based phases that begin with the project specifications and end with completion and handover (Lock, 2007). Within these phases, a range of issues needs to be managed such as:

- Project Complexity
- Client's requirements and scope changes
- Organizational restructuring
- Project risks
- Changes in technology
- Forward planning and costing (Kerzner, 2009)

Assessing the success of a project is more than simply evaluating the final product. It is tempting to set the criteria for success based on whether it performs as desired, comes in on time and comes in on budget. Pinkerton (2003) warns against such a narrow approach to Project Management however, emphasising the need to close the project loop so that good things are repeated and bad things are avoided is a key aspect of future project success.

In managing stakeholders, Perrin (2008) contends that the process is not one of managing the stakeholders themselves but the flow of information between them. Effective communication, therefore, is the basis of both effective process and final quality. This occurs through interaction between stakeholders and documentation of a range of processes such as project specifications, design, evaluation and so on. This is particularly true in IT environments where complex contractual relationships can compound the communication between managers, designers and developers (Burnett, 2007).

Documentation functions to preserve knowledge, communicate expectations and requirements and as an empowerment tool. These provide key outcomes in terms of conservation, consistency, enhanced self-regulation of teams, as well as the reduction of error (Robinson, 2009). The extent and nature of documentation required within projects can vary, however. There is a current move towards more flexible approaches to design and development such as agile approaches (Selic, 2009) and a commensurate focus on ensuring documentation is lightweight (Zhang et al., 2010).

Similarly, the interaction between stakeholders varies depending on the nature of the project. Different contexts often have different requirements. Development may be conducted within small or large teams, managed internally or remotely or even consist of geographically dispersed members. In such cases, Social Media is now seen as integral to collaborative project management. Beyond the practical aspects managing remote development, it is able to capture unstructured tacit knowledge (Ollus, 2011).

The purpose of this research was to explore how communication and documentation processes can best be implemented within e-learning development. The Flexible Learning Toolbox Project was used as the basis for the study. As a large initiative consisting of 7 individual projects, managed from a single organization, but consisting of teams that demonstrate a broad range of experience, size, and organizational contexts, this environment provided a level of diversity from which to draw findings.

About Toolboxes

The Flexible Learning Toolbox Project has been leading the development of quality e-learning for the Vocational Education and Training sector of Australia since its inception in 1997. The initiative has been jointly funded by the Australian Government and all States and Territories through the Flexible Learning Framework since 2000 with the goal of providing high quality cost effective interactive e-learning and assessment resources featuring scenarios, rich media and activities.

In that time over 110 Toolboxes have been developed to deliver approximately 190 Training Package qualifications and supporting over 1,000 units of competency. The full list to Toolboxes can be found on the Flexible Learning Framework site (http://toolboxes.flexible-learning.net.au/).

As the Toolbox project has evolved, so have the development approach and management practices. These have included the ongoing development specifications as technologies have matured, the integration of Recognition of Prior Learning as a formal component of the submissions and the modularisation of content to support disaggregation of Toolboxes into Learning Objects. Development processes have also been impacted by the introduction of accessibility guidelines in accordance with WCAG 2.0 principles. Key milestones consisted of an induction process, Proof of Concept Submission reviewed by the National Reference Group, and Mid-term and Alpha submissions that demonstrated the product at various levels of development. The project also provided for a team of mentors – e-learning experts with experience across a range of vocational and tertiary educational settings. Series 13 saw further innovations, specifically:

- The replacement of the initial two-day Toolbox induction workshop in Melbourne with individual team meetings between the project managers and the teams at their location;
- The implementation of a Functional Specifications document as the basis for development and quality assurance; and
- Aligned with the use of Functional Specifications, the removal of a technical build requirement at Proof of Concept and Mid-term stages and the pushing of technical testing to later in the product development cycle.

Development was undertaken by Australian Registered Training Organisations and monitored by a team of National Project Mangers, though development teams varied in terms of their constitution, with some being undertaken by specialist e-learning instrumentalities, others within TAFEs and some involving a mix of RTO and external developers.

The purpose of this research was to explore how Communication and Documentation processes impacted on the experiences of development teams in the above context. In particular, the research sought to identify those aspects of the process that could inform best practice design and development of e-learning across a range of settings.

Methodology

To address the above research aims, data was collected from key stakeholders in Toolbox Series 13 that could be analyzed to identify common findings as well as specific noteworthy issues. The Toolbox Project was overseen by a National Reference Group and implemented through three parties:

- The Development Teams (7 teams total);
- National Project Management team (3); and
- Mentors (2).

Data was to be collected through semi-structured interviews via teleconference in order to identify specific issues and affordances of the approach based on the participants' experiences. This approach benefitted from the potential to provide opportunities for emergent information that may in particular be used to inform analysis of the final question. This was triangulated through analysis of those forms of documentation that was identified as good practice. The research was conducted in accordance with the initiating organisation's ethics procedures, leading to a report to the National Project Management team.

Findings

The first series of findings relate to the communication approach undertaken in Series 13. This approach was characterised by the provision of an induction session for development teams and the use of the Project Management software Basecamp to manage communication during the development cycle. Formal communication was undertaken through reporting documentation for specific stages of the project such as Proof of Concept, Mid-term, Alpha, Beta, and Final submissions and the feedback provided as a part of this.

Data gathered from participants tended to focus on issues that evolved from changes in personnel at the initiating organisation and the nature of initial induction process. While teams reported positive experiences at the initial induction, the focus on the relationship between teams and the National Project Managers meant that when there was a significant change of staff, there was a tendency for the key messages that evolved from the process to become lost. This was exacerbated by the lack of a group process, so individual teams were not always working on the same interpretation of the processes. A renewed impetus on ensuring quality at Alpha and Beta submission stages and the use of communication tools like Basecamp managed to ameliorate some of the potential issues that could have befallen the project. However in some instances, changes within development teams themselves exacerbated this situation. The strongest level of clarity occurred where any decisions that arised from discussion were recorded online and where negotiations on aspects such as timelines and recommended improvements were recorded online as part of a formal decision process.

Participants also identified the need for consistency in terms of feedback. One of the defining characteristics of Toolbox development is the integration of technical and design quality checks (National Project Managers), design support (Mentors), and strategic direction (National Reference Group). It was important that teams received feedback that was consistent between all three. In those cases where feedback was provided from several, there was the potential for a lack of consistency. Teams demonstrated a preference for a single 'voice' in terms of feedback, with all forms of formal feedback documentation being checked for duplication or contradictory advice. Similarly, participants noted the potential for confusion where feedback varied between phases of the project such as the advice given between mid-term and Alpha. Ultimately the best forms of communication occurred where a knowledge was maintained throughout the project and filtered through a single communication channel.

The second findings focused on the role of the Functional Specifications documentation in terms of its value for both design and quality management. Functional Specifications embodied the design and content of the Toolbox in a paper-based form. One of the advantages of this was that it alleviated some of the pressure on teams in terms of their ability to source and write content in a timely manner and have that instantiated in a working prototype. The potential of the documentation was that it could provide evidence for design without the need of a refined product.

This proved to be something of a double edged sword. The fact that this project involved a range of developers from state-based e-learning specialist VET organizations to small RTOs working within specific industries and with limited e-learning development experience meant that a single approach to design documentation was unsuitable.

The National Project Managers accommodated this by providing flexibility in the format of this documentation. Nevertheless, participants reported enhanced workload as a result that tended to offset the benefits. One of the main issues was that teams already had established practices for documenting design. In some cases, the structure of the organizations themselves required specific approaches, while in others the Functional Specifications document limited the capacity of teams to redesign rapidly in the light of evaluation or user testing. In fact there were several approaches undertaken to encapsulate design, such as:

- the use of a publishing system, where documentation styled by Instructional Designers was automatically output to XHTML;
- rougher levels of documentation used to workshop design such as Powerpoint and Word Processing templates that evolved as ideas developed; and
- custom Functional Specifications that were tied into individual organizations' own management and quality assurance processes.

While the last of these could generally be managed within the project scope, the first two resulted in duplicated effort and in one case at least, a tendency for the Functional Specifications to be reverse-engineered. While most participants acknowledged the value of Functional Specifications, it was considered by many that the content-oriented nature of Toolboxes tended to create lengthy documentation that was difficult to read. Several teams identified its value primarily where interactions needed to be defined or for media which is not so easily documented through traditional forms of scripts and templates.

Issues were also raised in terms of the value of Functional Specifications as a tool for communicating design. All teams had input from an Industry Reference Group and required conversations between subject matter experts, designers and developers and not all of these were versed in interpreting such documentation. A simple matter of how much text would appear on screen, for example, is difficult to gauge without seeing the page instantiated in the product. The fact that at Proof of Concept all but one team provided an online prototype in addition to Functional Specifications indicates that this augmented rather than replaced the value of an interactive proof of concept.

Conclusions

As is frequently the case in qualitative research, findings proved to go beyond the initial questions and identified a range of emergent strengths and issues of the processes undertaken in Series 13 of the Flexible Learning Toolbox Project that are beyond the scope of this paper. Nevertheless, there were clear generalisable trends from the research that can be used to inform future large scale development projects in terms of communication and documentation processes. In particular, it is recommended that:

1. Whole group induction processes have value in terms of developing communities of practitioners with enhanced collaboration and feedback between teams. While not as efficient for individual teams in terms of having their own needs met, they can ensure consistency in terms of expectations.
2. Online Project Management tools have become essential to large distributed development projects, particularly in their capacity to set milestones, monitor progress and record decisions and exceptions to the process. They also play a large role in promoting the communities mentioned above.
3. Formative feedback should be sourced from a wide variety of stakeholders, however such feedback needs to be channeled through a single communication point.
4. Flexibility is required in documentation processes to ensure that they meet the needs and the capacities of the contexts in which they are to be used. Some settings require a more agile approach than others and this should be acknowledged.
5. Flexibility is also required in deciding where the focus on documentation should be, with value particularly evident in defining interactive elements rather than purely instantiating content.
6. Online prototypes of e-learning provide the best mechanism for formative iteration of design, particularly for those with content rather than design expertise and e-learning novices.

After 13 successful iterations, the Flexible Learning Toolbox project has been both witness to, and instrumental in the maturing of e-learning design and development, particularly in the Vocational Education and Training sector. As the tools and processes mature along with the products themselves and the designs evident within them, it is anticipated that findings such as these can further contribute to our understandings of best practice in providing online learning across a range of post-secondary learning contexts.

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Developing critical perspectives in a media saturated world: Using digital video clips to shape learning in marketing

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This paper describes how digital video clips are being used to support the development of critical perspectives and greater awareness of the location of marketing practice in wider moral, social and political arenas. The context is an undergraduate marketing subject, *Brand Management*. Adobe CAPTIVATE 5.5 facilitates the combination of video clips sourced from *YouTube* along with music, images and educator voice-overs into integrated online learning resources for the subject. Discussion in this paper is limited to just one topic area for the subject, ethical issues in branding. To engage students to explore contested ethical issues a multimedia resource has as its focus the Australian Government's proposed legislation to mandate plain cigarette packaging. This illustration of the use of digital video clips highlights the significant potential for development of online marketing curriculum and meaningful learning in marketing, providing greater attention is paid to the pedagogy that underpins the use of digital videos.

Keywords: digital video, critical perspectives, blended learning, marketing, brand management

Introduction

In a media saturated world marketing students do not lack stimulation in their area of study. In fact as consumers, they are immersed in the phenomena that they are studying – in this particular case, brand management. Brands are part of marketing students' daily lives – they buy particular branded products, they are exposed to high levels of marketing communications, to TV programs such as the *Gruen Transfer* that focus on advertising and brands, and to online corporate and user generated content about brands on websites such as *YouTube.*

In this context, a key challenge for marketing educators is how to make what is familiar and everyday into a subject of study, of critical analysis, and to help students view branding strategy and practices from more than a user (or a managerial) perspective.

The author is currently developing online resources in a project exploring innovative ways of introducing blended learning that challenges learners in marketing subjects with more demanding and higher-level cognitive tasks based around the use of digital video (Burden & Atkinson 2007). An undergraduate marketing subject *Brand Management* that is offered in both face-to-face and distance modes is the subject of the trial.

The use of video technology by marketing academics is not new. For example videos provide by textbook publishers and *YouTube* clips are commonly used in teaching in the discipline. However, this use is often confined to purposes of stimulating student engagement, illustration of how marketing concepts can be applied and provision of a variety within a lecture format. It is likely that, to date, the pedagogic opportunities afforded by digital videos have been not been fully realised in the discipline.

One particular area where digital videos can be used is to develop rich learning resources to support the development of critical perspectives. The next section provides a short discussion of critical perspectives in the marketing discipline and the capacity for digital videos to assist meaningful learning in this regard. This is followed by a specific illustration of how digital videos have been used to develop a resource that engages students and stimulates them to explore multiple perspectives around a Government proposal to mandate plain packaging for cigarettes. The paper concludes with a brief discussion on future directions for this work and wider implications for the use of digital videos in the marketing discipline.

Using digital videos in to develop critical perspectives in marketing

Discussion on optimising educational benefits from video use is not new in business education. In 1998 management educators Marx and Frost (1998) highlighted the power of videos to engage students by heightening arousal and motivating students to become more responsive to content being presented. They cautioned however, about the dangers of embracing video as a teaching tool then using it in ways that reinforce learning modes that support passive, superficial consumption of video offerings rather than more desirable approaches to learning. Their warnings are just as relevant today.

In marketing education and more broadly in higher education there is a need for learners to not only acquire knowledge, but to actively and critically engage with new knowledge and make meaning from this new knowledge. The style of learning being encouraged in the brand management subject under review could be characterised as what Kappinene (2005 p.238) terms *constructive learning*.

> Constructive learning means that learners accommodate new ideas into their prior knowledge. This process of constructing knowledge is a process of meaning-making not of knowledge reception. This meaning- making process results from puzzlements, perturbation, expectation violations, curiosity or cognitive dissonance.

This view of learning aligns well with calls in the marketing discipline for a more critical perspective on marketing education and practice. What is needed, argue Catterall et al. (2002) is a shift from:

- a narrow focus on marketing as a management function within a firm to a focus on how managers do marketing in wider social, cultural and historical contexts
- studying marketing from a single (managerial) perspective to studying marketing from multiple perspectives: marketing mangers in companies, consumers and citizens
- marketing concepts as needing to be learned, to marketing concepts and techniques made problematic

This approach obviously also requires a shift away from a content based approach to teaching and learning and a greater emphasis on students making meaning of marketing knowledge from both a personal and a wider societal perspective. If rich learning environments developed using digital video clips can be designed with a critical edge there is the potential for powerful learning outcomes.

Background to the resource development project

Brand management is a second year undergraduate subject in marketing and advertising programs and is offered in both distance and face-to-face modes. An important goal of this project is to enhance blended and flexible learning experiences across all cohorts. The use of multilayered resources provides a way to create dynamic learning environments and move towards more equitable learning experiences across diverse cohorts.

Adobe CAPTIVATE is being used as a tool to bring together video clips, images, music and educator voice over. The voice over serves a number of purposes including: providing context, giving explanation and direction, questioning and stimulating critical reflection. Pauses are inserted in various places to encourage students to reflect on the stimulus presented and consider their own position and the contested positions around the issues in question.

There are a variety of sources of material in this subject, much of which can be sourced from *YouTube*. These include:

- Ads for branded products
- Company brand overviews
- Subject related cases provided by publishers on DVD
- Video clips from business schools (uploaded to *YouTube*)
- Student presentations (uploaded to *YouTube*)
- Marketing consultant presentations (*YouTube* & SlideShare)
- Advocacy group campaigns e.g. *GetUp!*
- News items relevant to branding
- Television entertainment programs such as *MadMen* and the *Gruen Transfer*

The resource outlined in the following section uses ABC news clips and a segment from a 2010 episode of the *Gruen Transfer*. All of this material was downloaded from *YouTube.* This resource relates to just one topic in the unit – ethical issues in branding. Rather than talk about ethical issues in an abstract fashion, the selection of the current debate on plain cigarette packaging was chosen a vehicle to surface various ethical issues in branding in an engaging and substantive way.

Illustration: Examining perspectives on plain cigarette packaging

The Australian Government's intention to legislate to mandate plain packaging for cigarettes is a topical ethical issue in branding that can be bought to life by the use of multimedia. The use of real or hypothetical scenarios to provide context to explore ethical issues in marketing is not new. However, use of video clips adds richness, authenticity and greater depth to the presentation of multiple perspectives around a contested issue. There is a stronger base for student engagement and a greater opportunity for students to appreciate the rational and emotional appeals being made by the various stakeholders.

A detailed discussion of the specifics of how the video clips are used is now presented. For distance students, pauses are inserted at question points to provide students to take the time to consider the relevant issues and their response to them. In face-to-face-mode the Captivate presentation is paused at relevant moments to provide time for reflection and discussion in small groups and then the larger group.

Initially students are presented with two short ABC news clips. The first clip presents the Health Minister, Nicola Roxon, announcing the proposed changes to cigarette packaging and the arguments that support the change (http://www.youtube.com/watch?v=KtQQVWKJjug).

The second clip reports on a poll commissioned by the Cancer Council indicating strong community support for plain cigarette packaging (http://www.youtube.com/watch?v=rgz055UhiDQ&feature=related).
The following questions are then posed to students:

> Is the Australian Government entitled to legislate to mandate plain cigarette packaging?
> What is your response to the arguments presented by the Health Minister supporting the Government's position?

Having been presented with government and community perspectives the students are directed to consideration of the financial position of tobacco companies as discussed by a representative from British American Tobacco Australasia in another ABC new clip (http://www.youtube.com/watch?v=wEXH7mqEEWE&NR=1).

Students are then asked:

> If you accept that cigarette brands represent very valuable assets for tobacco companies, do you believe these companies should be compensated for this government restriction on the use of their intellectual property?
>
> If the tobacco industry funds advertising to create opposition to the changes (for example amongst small retailers) should the fact that tobacco companies are funding the advertising be made known

to viewers of that advertising?
Or is it OK for them fund other organisations, such as a small retailers alliance, to argue against the changes?

Students are invited to explore the potential limits of regulation on portrayal of harmful products, for example, whether regulation should be extended to representations of smoking in popular culture.

If as a society we want to discourage smoking, should the depiction of cigarette advertising in movies and television be regulated?

The focus is then switched to a personal position where students need to reflect and draw on their personal experience and values to respond to the following questions*:*

If your uncle, a heavy smoker, had been diagnosed with lung cancer do you imagine that this would influence your views on the promotion of cigarettes?

Would you take a well-paid marketing job in a tobacco company? Are there particular industries that you would choose not to work in as a marketing/advertising graduate?

At this point, students are shown an episode of the *Gruen Transfer* that canvasses all these issues, both reinforcing what has been already explored and demonstrating to students how they have comprehensively dealt with a variety of perspectives on this topic. Finally, students are invited to reflect on their positions on these issues and consider whether exposure to the different perspectives has provoked any change in their views or understandings. Presenting the video clips along with voice over and text in an integrated resource sets up the potential for students to associate the video clips with other media (e.g. stimulus questions) and find the relationship between the video clips and the other media (Young and Asensio 2005).

Currently the activities linked to the use of the multimedia resources are not assessable. After a trial period of use of the resources, consideration will be given to the appropriateness and potential benefit in assessing particular aspects of tasks. Ways of enhancing interactivity will also be explored. Refinement and development of the resources and activities will be informed by evaluation of not just this topic area but more broadly of the use of digital resources across the various topics in this unit.

Concluding comments

With the proliferation of online media that can be used to enhance learning in marketing, there is a strong need for wider discussion of the learning designs that underpin the use of digital videos and other online material. Learning design is described by (Young & Asensio 2002) as a dialogue between pedagogy and technology. Frameworks such as the *DiAL-e framework* (Burden & Atkinson 2008) and the *Three 'I's framework* (Young & Asensio 2002) framework provide a conceptual basis and language to elicit and describe taken for granted teaching practices and to challenge and enhance practices around learning design. These frameworks will be drawn on in other parts of this more comprehensive project and results of their use disseminated at a later stage.

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Evaluating E-portfolios for university learning: Challenges and Opportunities

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E-portfolios provide a web-based space where students can demonstrate their development of expertise in a wide range of skills and knowledge, whether in discipline knowledge or graduate capabilities. However, it is yet to be demonstrated how readily these tools can be integrated within the university curriculum. This paper reports on the results of a pilot implementation of the Mahara e-portfolio tool in an Australian university, involving different curriculum contexts across two semesters. Students in the participating units were surveyed on their perspectives about the usability of the e-portfolio tool, the support provided and its effectiveness for their learning. The results suggest that, like all successful curriculum innovations, e-portfolios need to be integrated into the learning and teaching process and students need to understand the benefits as part of successfully engaging with the tools. Amongst the implications is the question of whether the currently available e-portfolio tools are sufficiently sophisticated to integrate seamlessly with existing LMS platforms to meet the changing demands of higher education.

Keywords: e-portfolios, technology, student capabilities, work-integrated learning, assessment

Background

E-portfolios provide a web-based space where students can demonstrate their development of expertise in a wide range of skills and knowledge, whether in discipline knowledge or graduate capabilities (JISC, 2007). As suggested by Joyes et al (2009) e-portfolios can be used for a range of purposes in the learning process, for different audiences, at different times. In some fields, such as pre-service teacher education, e-portfolios are advocated as spaces to demonstrating evidence of reflections on learning during placements, practicums or skill development to prospective employers (Levin & Camp, 2002; Berg and Lind, 2003). Learning from both formal and informal contexts can be included, as decided by the learners, for selective sharing with others such as teachers, peers or prospective employers (Beetham, 2005).

While many studies advocate the benefits and efficiencies to be gained from the implementation of an e-portfolio system, others report challenges such as the introduction of a new form of assessment and technology for students and staff to deal with (Tosh et al., 2005; Butler, 2006; Darling, 2001; Wilhelm et al., 2006). In many e-portfolio trial case studies, it can be seen that these assumptions of time and resource savings for staff, students and administrators were often held by those working on the projects. However, in reality it was discovered that simply implementing an e-portfolio tool for students as a form of assessment does not necessarily lead to the expected benefits of reducing staff workload and increasing student engagement (Joyes, Gray & Hartnell-Young, 2010). In contrast, these studies found that introducing a brand new concept and technology to staff and students can present additional challenges that need to be carefully balanced against the advantages, and the benefits of e-portfolios will not be realised unless the complex process of implementation is carefully managed. While the literature includes examples of the successful use of e-portfolios in student learning contexts, there is also evidence in the literature suggesting that implementing technologies such as e-portfolios does not necessarily lead to the expected benefits of reducing staff workload and increasing student engagement (Gibbs and Gosper, 2006; Joyes, Gray & Hartnell-Young, 2010).

University Context

In order to explore the current and future need for a centralised learning portfolio, a working party was established at an Australian university. Amongst the drivers for the exploration was the relatively recent introduction of a set of graduate capabilities such as *critical thinking, problem solving, creativity* and *effective communication*, to be embedded in each program as part of the Curriculum Renewal Program. E-portfolios provide opportunities to capture the development of these capabilities, which have typically been considered as difficult to assess (Race, 2006). Similarly, the University's Sustainability policy encouraged lifelong learning, with particular reference to *work-integrated learning*. Learning portfolios can enable students to demonstrate the development of expertise over time, with permissions to enable different views for different audiences and a resume builder, which were seen as useful in transition to work or further study. A third factor was the requirement that all students undertake a *Participation* unit, for example work placements, internships or practicums. E-portfolios were seen as potentially providing a centralised, student-designed space where they could collaborate with peers from the workplace and the University, flexible enough to be adapted to changing requirements.

In order to inform the University's decisions about whether to invest in a centralised e-portfolio tool for use across campus, trials were conducted in 2010. While several e-portfolio systems including commercial systems such as PebblePad and in-house developed systems such as the QUT Student e-portfolio (McCowan, Harper and Hauville, 2005) are available, Mahara e-portfolio tool was chosen, largely because of its open source nature and its functional ability to support the learning outcomes of the units involved.

Two theoretical frameworks were used to guide the project. Collis & Moonen (2001) suggested a 4 E Model to guide decisions about integrating technology into learning, which provided a framework for evaluating e-portfolios for potential University-wide rollout. Collis and Moonen advocated that, to be integrated effectively, technologies need to be considered from the following perspectives:

- Environment – broader institutional policies and culture need to support the use of the tool;
- Personal Engagement – academics and students need to see the potential for the tool in order to allocate time and effort toward changing from their current behaviour;
- Ease of use – academics and students need to be able to focus on the intended tasks rather than the tools;
- Educational Effectiveness – both academics and students are time-poor and need to be convinced that the new tool will be effective for their learning context.

Building on the 4 E Model, Gosper, Woo, Muir, Dudley, & Nakazawa (2007) developed a Communications, ICT and Organisation (CICTO) framework which is used to evaluate educational technology pilots at the University. The framework is comprised of three parts:

- Part 1: Teaching and Learning Context –identify the context in which the software is to be trialed
- Part 2: Software Capability Analysis – assess the effectiveness of the software in supporting the specified use
- Part 3: Environmental Impact Analysis –identify issues relating to the sustainability of its use within the University e.g., training, support, compliance, workload, risks.

Methodology

The study used a mixed methods approach (Creswell, 2003) involving surveys with student users of the e-portfolio system and interviews with participating academics over two semesters in 2010. In order to gather feedback from students about their experiences in using Mahara, Collis and Moonen's 4 E model and the CICTO framework (Gosper, Woo, Muir, Dudley, & Nakazawa, 2007) were used as the basis for the development of a survey to gather students' feedback at the completion of each of the two semesters. The survey included questions relating to the e-portfolio's usability, technical support, and overall effectiveness for learning. The online survey link was sent to all students in the participating units.

In addition to the student perspectives, the participating academic were invited to capture their reflections during the trial and individual interviews and focus groups were conducted to explore how they experienced to e-portfolio tool. Due to space limitations these are not addressed in this paper.

Phase One

Phase one of the Mahara trial involved two units; an under-graduate Internship program with 82 students and a post-graduate Higher Education unit with 31 students. Convenors of both units were keen to explore the potential of an e-portfolio tool to enable students to store and share evidence of their learning, encourage reflection on the learning journey and to streamline assessment and feedback processes.

The Internships e-portfolio involved students using the blog to capture their reflections from the internship experience, the forum to interact and share with fellow interns, and views to create and submit authentic assessment tasks related to project planning and job application.

The use of Mahara was optional for the Post-graduate Higher Education students. Within this cohort, almost half the students successfully used the tools while the other half continued to use the Blackboard email tool for submitting their tasks.

This paper reports findings from the phase two trial. Some results from this first phase are included as part of the discussion in this paper, however more details were published in an earlier paper (McNeill, Diao & Parker, 2010).

Phase Two trial

Feedback from staff and students of these units was used to inform a wider trial in semester two, which included a first year under-graduate Computing unit (COMP) and a capstone Education unit (EDUC) as well as a repeat of the Internship unit (INTERNSHIP) from phase one. In Computing, first year students are encouraged to begin collecting evidence of their developing graduate capabilities at the outset of their studies at the University, thereby introducing notions of critical reflection and documentation from one of their first units. This cohort was a blend of on-campus and off-campus students, using the Learning Management System (LMS), Moodle, with single sign-on access to Mahara. They were provided with the user-manual but no dedicated training session. The Department of Education capstone unit trialled the e-portfolio in phase two to meet one of the requirements of the NSW Institute of Teachers (NSWIT), that a schedule of professional standards is collected by graduates from teacher education programs before they can be employed as teachers. This cohort used the University's central LMS, Blackboard and had one hour tutorials each fortnight (six sessions) during semester dedicated to learning about how to use the software and maintaining their portfolios. In the Internships program, only the Mahara e-portfolio system was used for the delivery of the unit, with no LMS environment. The e-portfolio design was improved for semester two, 2010 in response to feedback gathered from semester one, including more time for training and clearer and more scaffolded tasks.

Results

Of the total 271 students from the three cohorts in the study, 105 participated in the Phase Two survey (38.7%). This section presents the results of the survey.

The first question in the online survey asked students to select the option that best described how successful they were in accessing the Mahara e-Portfolio tool, as shown in Table 1.

Table 1: Accessing the Mahara e-Portfolio Tool

1. Please indicate how successful you were in accessing the Mahara e-portfolio tool,		
Answer Options	**Response Percent**	**Response Count**
Very successful - I managed to use the tool for the purposes of the unit	48.6%	51
Quite successful - I managed to get in and do some of the tasks	45.7%	48
Not very successful- I managed to log in to Mahara but could not submit the tasks	5.7%	6
Very unsuccessful - I tried but didn't manage to log in at all.	1.0%	1
	answered question	**105**
	skipped question	**0**

Overall, **94.3%** of students responding to the survey were very successful or quite successful in accessing the Mahara 2-Portfolio tool. However, seven students (**6.7%**) were not able to submit tasks. One of these students, from COMP, was not able to log in at all. All Students from EDUC were very successful or quite successful.

The next question asked respondents about Mahara's helpfulness during the unit, as summarised in Table 2.

Table 2: Agreement with the tool's helpfulness

2. Please indicate your agreement with the following statements. The tool helped me:								
Answer Options	**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**	**N/A**	**Rating Average**	**Response Count**
Collate my work for submission as part of the unit's assessment	11.8% (11)	**53.8% (50)**	14.0% (13)	8.6% (8)	11.8% (11)	0	2.55	93
Reflect on what I have learned during the unit	17.2% (16)	**43.0% (40)**	11.8% (11)	16.1% (15)	11.8% (11)	0	2.62	93
Integrate and make connections between the things I have learned (whether in this unit and other contexts)	10.8% (10)	**37.6% (35)**	19.4% (18)	15.1% (14)	17.2% (16)	0	2.90	93
							answered question	**93**

Of the respondents, 65.6% agreed or strongly agreed that the e-portfolio was helpful in collating their work for assignment submission for the unit and just over 60% agreed or strongly agreed that the e-portfolio tool helped them reflect on what they had learned during the unit. In contrast, **48.4%** of all respondents agreed or strongly agreed that the e-portfolio helped them to integrate and make connections between the things they learned in this unit and other contexts but one third disagreed or strongly disagreed with this statement.

Comments relating to this question sometimes included provisos on Mahara's successful use, for example:

"While I managed to turn in my assignment, the tool is hideously flawed for our purposes."
And
"I managed it successful but overall I think that Mahara is poorly structured."

Question 3 asked respondents about the usability of the e-portfolio tool, with results presented in Table 3.

Table 3: Usability

3. These questions are about the usability of the tool:							
Answer Options	**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**	**Rating Average**	**Response Count**
The e-portfolio was generally easy to use	5.4% (5)	**31.2% (29)**	23.7% (22)	28.0% (26)	11.8% (11)	3.10	93
I had sufficient support to use the e-portfolio tool	8.7% (8)	**40.2% (37)**	32.6% (30)	10.9% (10)	7.6% (7)	2.68	92
Technical issues limited my use of the e-portfolio tool	9.8% (9)	25.0% (23)	25.0% (23)	**31.5% (29)**	8.7% (8)	3.04	92
						answered question	**93**

Of all respondents, 36.6% reported that the e-portfolio was generally easy to use, however 39.8% of all students disagreed or strongly disagreed with this statement. Almost half (48.9%) of all respondents reported that they agreed or strongly agreed that they had sufficient support to use the e-portfolio tool. Technical issues remained a significant impediment for students, with 34.8% of all students agreeing or strongly agreeing that technical issues limited their use of the tool. Very few Internship respondents reported dissatisfaction with the level of support: only 5.1% (n=3) Internship students disagreed or strongly disagreed that there was sufficient support. However, more Internship respondents reported that the e-portfolio was NOT easy to use (40.7%, n=24), than reported that the e-portfolio was easy to use (33.9%, n=20). Therefore, for these students, the perception of support has not translated into increased perception of ease of use.

Many comments reiterated concerns about the perceived difficulty of using Mahara, for example:
“the layout is very confusing and not user friendly at all. I don't see how it is more useful than blackboard.”
When filtered to explore differences between the cohorts for these first questions, the COMP respondents were much more likely to disagree with these statements than the other students:

- 50% (n=10) of COMP disagreed or strongly disagreed with Q2.1
- 55% (n=11) of COMP disagreed or strongly disagreed with Q2.2
- 60% (n=12) of COMP disagreed or strongly disagreed with Q2.3
- There was only one COMP response for strongly agreed in Q2.2, no responses for strongly agreed in Q2.1 and Q2.3.

The EDUC respondents found Mahara very useful for collating their work for assignment submission:

- 72.5% (n=11) agreed or strongly agreed
- Only one student (7.1%) disagreed. No respondent strongly disagreed.

Question 4 asked students to select as many options as appropriate to indicate the types of support used during the trial. Results are presented in Table 4.

Table 4: Types of support

4. Which types of support did you utilise in learning how to use the tool?		
Answer Options	**Response Percent**	**Response Count**
Online instructions about the site, such as the user manual	44.0%	40
Online discussions with other users	11.0%	10
Individual guidance (email or phone) from the unit convenor	23.1%	21
Individual guidance (email or phone) from other students	16.5%	15
No support used – I just worked it out for myself	50.5%	46
Other (please specify)		9
	answered question	**91**

Approximately half of all respondents (50.5%, n=46) did not use support, instead working it out for themselves. Relatively few respondents (11.0%, n=10) used online discussions. A majority of COMP respondents (73.7%, n=14) and EDUC respondents (71.4%, n=10) worked it out for themselves. In contrast, only 37.9% (n=22) Internship respondents used this method. It appears that all other Internship respondents (63.8%, n=37) used the online instructions, and almost half of these students (25.9%, n=15) also utilised the individual guidance (email or phone) from the unit convenor. This question had a very different pattern of participant responses compared with semester one, 2010. Many more respondents worked out how to use the tool by themselves (50.5% in S2, compared with 18.6% in S1). This change was predominantly driven by the COMP students who may have been more confident overall in exploring technology.

In Question 5, respondents were asked about how helpful they found the types of supports they used, as indicated in the previous question. Results are presented in Table 5. N/A responses have been removed, so that percentages reflect only those who have responded to the question.

Table 5: Helpfulness of the supports used

5. If you did use these supports, do you agree that they were helpful? (n/a responses removed)						
Answer Options	**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**	**Response Count**
Online instructions on the site	13.7% (7)	**43.1% (22)**	25.4% (13)	13.7% (7)	3.9% (2)	51
Online discussions with other users	7.8% (3)	**39.5% (15)**	36.9% (14)	10.5% (4)	5.2% (2)	38
Individual guidance from the unit convenor	21.7% (10)	**45.6% (21)**	21.7% (10)	6.5% (3)	4.3% (2)	46
Individual guidance from peers such as other students	9.3% (4)	**53.5% (23)**	27.9% (12)	4.6% (2)	4.6% (2)	43
Other (please specify)						1

For each of these answer options (categories of support), more students have reported an opinion on how helpful the support was than the number of respondents who reported using the support in the previous question. Although we can only speculate, this may suggest that some respondents were reporting about what they thought would be helpful.

Overall, students reported finding the support options to be helpful:
- 56.8% (n=29) of all students who have reported an opinion on the online instructions agreed or strongly agreed that the instructions were useful. Only 17.6% (n=9) disagreed or strongly disagreed;
- 47.5% (n=18) of all students who have reported an opinion on the online discussions with others agreed or strongly agreed that the discussions were useful. Note that this is more students than reported using the online discussions in Q4;
- 67.3% (n=21) of all students who have reported an opinion on the individual guidance from the unit convenor agreed or strongly agreed that this guidance was useful;
- 62.7% (n=27) of all students who have reported an opinion on the individual guidance from peers such as other students agreed or strongly agreed that this guidance was useful.

Question 6 asked respondents about the overall impact of the technology on their learning in the unit, as presented in Table 6.

Table 6: Overall impact

6. Overall impact of the technology								
Answer Options	**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**	**N/A**	**Rating Ave**	**Response Count**
Overall, the e-portfolio tool was helpful for my learning	9.7% (9)	**40.9% (38)**	16.1% (15)	16.1% (15)	17.2% (16)	0.0% (0)	2.90	93
I consider it a useful experience learning how to use the e-portfolio tool	7.5% (7)	**38.7% (36)**	21.5% (20)	14.0% (13)	18.3% (17)	0.0% (0)	2.97	93
I think the e-portfolio tool will have other application	7.7% (7)	**38.5% (35)**	31.9% (29)	7.7% (7)	11.0% (10)	3.3% (3)	2.86	91
Other (please specify)								4
							answered question	**93**

Half of the respondents (50.6%, n=47) of all respondents agreed or strongly agreed that the e-portfolio tool was helpful for their learning, however 1/3 (33.3%, n=31) disagreed to a greater or lesser extent that the e-portfolio tool helped their learning. Of all respondents, 46.2% (n=43) agreed or strongly agreed that learning to use the e-portfolio tool it was a useful experience. Roughly one third (32.3%, n=30) disagreed that it was a useful experience. Just over 46% (n=42) of all respondents agreed or strongly agreed that the e-portfolio tool will have other applications. Of all respondents 31.9% (n=29) took a neutral stance towards this question, and 18.7% (n=17) disagreed or strongly disagreed.

Some of the comments raised the issue of apparent duplication, for example:
"I think Mahara is a good idea, however with Blackboard in place there is already an internet platform for students and Mahara seems a double up and confused me in which platform to use. "

No respondents from the COMP unit reported that they strongly agreed with any of these questions. Instead, a disproportionate number of COMP respondents reported that they strongly disagreed with the statements:

- 40% (n=8) strongly disagreed that it was helpful for their learning. This becomes 65%, n=13 when combining students who disagreed and strongly disagreed;
- 45% (n=9) strongly disagreed that they considered it a useful experience, which becomes 60%, n=12 when combining students who disagreed and strongly disagreed;

- 30% (n=6) strongly disagreed that the tool will have other applications, which becomes 35%, n=7 when combining students who disagreed and strongly disagreed.

The EDUC and Internship students were generally much more positive.

The next question asked respondents what they thought the priorities for the University should be when choosing an e-portfolio for wider use across campus. Results are presented in Table 7.

Table 7: University priorities

7. The following are considerations for the University in choosing an e-portfolio tool for wider use. Please indicate your agreement about whether it is very important that the tool:							
Answer Options	**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**	**Rating Average**	**Response Count**
Is simple and user-friendly to use	22.0% (20)	**31.9% (29)**	18.7% (17)	19.8% (18)	7.7% (7)	2.59	91
Works well with the other Uni online learning tools	16.3% (15)	**31.5% (29)**	22.8% (21)	22.8% (21)	6.5% (6)	2.72	92
Can be used after I leave the Uni	12.0% (11)	28.3% (26)	**29.3% (27)**	21.7% (20)	8.7% (8)	2.87	92
Lets me upload a variety of file formats	19.6% (18)	**51.1% (47)**	25.0% (23)	1.1% (1)	3.3% (3)	2.17	92
Enables me to share my learning with my teachers	18.5% (17)	**47.8% (44)**	26.1% (24)	5.4% (5)	2.2% (2)	2.25	92
Enables me to share my learning with other students	20.7% (19)	**51.1% (47)**	20.7% (19)	5.4% (5)	2.2% (2)	2.17	92
Enables me to share my learning with others outside Uni, such as prospective employers	15.2% (14)	22.8% (21)	**44.6% (41)**	10.9% (10)	6.5% (6)	2.71	92
Other (please specify)							6
						answered question	**92**

Most of the respondents (71.7%, n=66) agreed or strongly agreed that an e-portfolio tool should enable sharing of learning with other students and 70.7% (n=65) agreed or strongly agreed that it should support a variety of upload formats. Sharing learning with teachers was also important with 66.3% (n=61) agreeing or strongly agreeing with this statement.

The two potential priorities that elicited the highest proportion of neutral responses both referred to the use of the e-portfolio tool outside of the university context. It seems that many students have not made firm opinions as to the utility of the e-portfolio tool outside the context in which they have used it so far (i.e. within university units). A higher proportion of Internship respondents (56.9, n=33) agreed or strongly agreed that the e-portfolio should work well with the other university online learning tools, compared with the COMP (30.0%, n=6) and EDUC respondents (35.7%, n=5). Very few respondents disagreed or strongly disagreed that the e-portfolio tool should allow upload of a variety of upload formats (4.3%, n=4), and enable sharing of learning with teachers (7.6%, n=7) and other students (7.6%, n=7).

The final question in the survey asked about the overall unit they had studied, as reported in Table 8.

Table 8: Experience of the unit in general

8. These next questions ask you about your overall experience of the unit. Please indicate your agreement with the following statements.							
Answer Options	**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**	**Rating Average**	**Response Count**
The unit provided clear aims and objectives	26.1% (24)	**54.3% (50)**	14.1% (13)	5.4% (5)	0.0% (0)	1.99	92
The unit content was structured in ways that assisted my learning	30.4% (28)	**44.6% (41)**	16.3% (15)	7.6% (7)	1.1% (1)	2.04	92
The learning activities were useful for building up my understanding of this unit	24.2% (22)	**48.4% (44)**	16.5% (15)	8.8% (8)	2.2% (2)	2.16	91
Assessment tasks were set at an appropriate level	25.0% (23)	**48.9% (45)**	20.7% (19)	4.3% (4)	1.1% (1)	2.08	92
I received timely feedback that assisted my learning	26.1% (24)	**35.9% (33)**	16.3% (15)	13.0% (12)	8.7% (8)	2.42	92
Innovative teaching approaches were used	25.0% (23)	**35.9% (33)**	23.9% (22)	10.9% (10)	4.3% (4)	2.34	92
					answered question		**92**

Table 8 suggest that the respondents are satisfied overall with their units. There is not a strong relationship between responses about perceived helpfulness, reflection, integration from question 2 and the level of satisfaction towards each of these components in the unit.

Discussion and conclusion

The e-portfolio tool Mahara was trialled to determine its effectiveness in scaffolding students in reflecting on their learning and to gauge its potential to be rolled out more widely across campus. This paper reported the results of the second phase of the study. The results suggest that, while most respondents (88.8%) were able to access and use the system very successfully or quite successfully, some still struggled with these essential functions.

When compared with the results from semester one, 2010, there were higher scores in all three sub-questions for question 2, indicating the respondents were more positive about the tool having helped them to collate their work for assessment, reflect on their learning and make connections between things they have learned.

The results for semesters one and two are overall quite similar, even with the negative perceptions reported by the respondents from the COMP unit. However:

- A greater proportion of respondents in S2 agreed or strongly agreed that that the e-portfolio tool was helpful for their learning (50.6% in S2, compared with 40.2% in S1)
- A greater proportion of respondents in S2 agreed or strongly agreed that they found it a useful experience (46.2% in S2, compared with 37.7% in S1)

In the case of the Internship unit, the increased perceptions of the utility of Mahara may reflect the refinements the unit convenor made in the student instructions for using Mahara and the assessment tasks as a result of Phase One. Experience from the first trial also informed improvements to the training and support offered to the convenors from the other units, which could have contributed to the more positive student perceptions overall.

While more detailed analysis is yet to be undertaken, the results suggest some themes relating to Collis and Moonen's 4 E's Model (2001) and the Gosper et al. CICTO framework (2007) that will affect the University's decisions about whether to implement an institution- wide e-portfolio system.

The importance of *integration* with the existing university environment is a feature highlighted by Collis & Moonen (2001) and Gosper et al (2007). In order to justify an institutional rollout, the e-portfolio system needed to integrate seamlessly with the current LMS environment and offer additional functionality.While the Mahara e-portfolio was chosen for exploration in pilots as it was most easily integrated with the current and future LMS and had functions that were desirable for several stakeholders, neither of these characteristics were confirmed in the results. Some students expressed overall satisfaction with Mahara, however many had issues with its usability, and the need for its use. The need to learn how to negotiate a different system from the LMS was raised as an issue by some respondents, and in particular the duplication between the LMS and e-portfolio environments. This concern was echoed by some participating unit convenors, who also found that the assessment administration processes were more cumbersome in Mahara than in the LMS and offered reduced functionality in some areas. For example, there is no auto-receipt function and staff need to notify students individually that they assignments have been received. One key point of difference of e-portfolios over the current LMS was its potential as a space for students to capture and exhibit their learning for audiences other than the university, however this was not rated as important for many students. The *personal engagement* advocated by Collis and Moonen (2001) as important for effective uptake was not evident.

The results regarding respondents' satisfaction with support levels have implications for the potential rollout of an e-portfolio system across the University. In the semester two trial, many respondents acknowledged satisfaction with the levels of support they received yet still found that the tool was not *easy to use*. The Internship students had the highest level of support in that they had compulsory on-campus training sessions and assessment tasks designed to scaffold their use of the e-portfolio tool. They had all their online learning delivered through Mahara and the unit convenor perceived it as essential that they could use the tool effectively while in their placement settings. Their training had also been refined by the convenor after the first iteration in semester one. While the refinements to how the e-portfolio tool was used and the training provided did lead to an overall improvement in student satisfaction, many of these students did not agree that the Mahara e-portfolio system was easy to use. This suggests that there is still some streamlining required before it can be successfully rolled out across campus.

Both academics and students are time-poor. In order to allocate time and effort to learning any new technologies, they need to be convinced that the new tool will be *effective* for their learning context. Academics and students need to see the potential for the tool in order to allocate time and effort toward changing from their current behaviour. Around half the students perceived the Mahara system as benefiting their learning, which is a positive outcome. However there were significant differences in student perceptions between courses. For example, the participating final year Education students undertaking a capstone unit saw the benefit of the Mahara system in helping them develop the portfolio they need as part of compliance with NSW Institute of teachers requirements. Conversely, first year Computing students did not see the value and therefore did not see the need for the effort of learning a new system. For these groups the notion of a self-fulfilling prophecy emerged. If the students saw the need to focus their efforts they were more likely to find the tool useful, as suggested by one of the respondents' comments:

> "There needs to be consistency. If it is going to be 'optional' then there is no motivation to really use it as a way of connecting with other students, otherwise it merely becomes a drop box for assignments".

Overall, the study involved a diverse group of cohorts to capture a range of staff and student opinions: first year technology-savvy students, final year capstone students with a need to demonstrate their learning in e-portfolio format and internship students in work-place settings. All cohorts had higher levels of support for their use of the e-portfolio system, which in many cases would be unsustainable in the wider university context. Some had on-campus training sessions and some had tutorials dedicated to using the system. Despite this optimal context for the pilot, the results are not encouraging for wider rollout since the crucial requirements of integration with the current environment, personal engagement, ease of use and educational effectiveness were not evident in the results. In the next phase of the study, several themes from the trial will be explored in more detail, in particular the needs to focus attention on adapting learning and assessment tasks to target the capture of reflection and evidence of learning. This emphasises one of the supposed strengths of e-portfolios compared with an LMS, and may contribute to perceptions of educational effectiveness. The results suggest that students and staff need support to use the e-portfolio tool effectively, however further trials will be undertaken to explore the links between the assessment tasks and the need for an e-portfolio tool. The adapted tasks will be delivered in units using the forum and reflection tools available in the current LMS. An alternative pilot focus will be the student selection of tools to capture the evidence of their learning separately from the university systems, with a report provided for assessment purposes.

Another of the issues to be explored is the need for an overt program-wide approach to portfolio-based learning. If a program wide approach is adopted, this takes some pressure off individual convenors to introduce and manage this change in isolation in their own units and can be spread across several units. Among the changing demands is the need for a culture of encouraging the collection of evidence by students about their learning across their whole program. While the broader institutional policies advocate the integration of learning in capstone units and reflection by students on their development of graduate capabilities, institutional culture can be slow to change. Ideally, the tasks in the units need to be structured to scaffold students in capturing evidence of their developing expertise as they progress through their whole program, in graduate capabilities and their discipline learning. The next phase of the study will explore a focus on assessment tasks design as an independent issue from technology in order to inform the decision about what system ultimately to implement.

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Engagement at the Epicentre

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Following the February 22nd, 2011 earthquake in Christchurch, Learning Advisors observed what happened to an institution forced to suddenly confront significant damage and loss of physical teaching space and infrastructure on only the second day of the teaching Semester. The university's struggle to restore and deliver its teaching programme and care for the welfare of staff and students, was a laboratory for observing lecturer interventions that contributed to maintaining student engagement and good pedagogy. This is a record of our observations from a case study sample of lecturers and their courses.

Keywords: student engagement, pedagogy, crisis, e-learning, Moodle, course design

Background

On February 22nd 2011 a major earthquake struck Christchurch forcing the evacuation and closure of Canterbury University. The institution was forced to suddenly confront significant damage and loss of physical teaching space and infrastructure on the second day of Semester One. As in many other tertiary institutions (Meyer& Wilson, 2011) there was no plan for academic continuity in place, yet it was necessary to adopt strategies for delivering courses and supporting students online from a city with severely damaged infrastructure. As Learning Advisors, we wanted to take advantage of a rich source of data that presented itself in the period following the earthquake to obtain insights into lecturer and student engagement. Although we could not be certain that the observed changes in engagement came about because of particular lecturer interventions with their students rather than the effects of the earthquake itself, we felt that it was worthwhile. In this concise paper we document lecturer reactions and strategies using technology to compensate for the loss of physical spaces and subsequent opportunities for face-to-face interaction with students. To frame our investigation we posed the question: How did lecturers engage students in a time of crisis and did it show good pedagogy**?** The observations of student engagement in this context were explored through the lens of the lecturers' reaction to the situation and their perception of the students' engagement.

Methodology

From a constructivist perspective, fostering student engagement is essential for learning in a social context, so a single-case design was chosen as the methodology for exploring and giving in-depth description of a social phenomenon (Yin, 2009). We wanted to examine contemporary events where, as Yin suggests, it is not possible to manipulate all the relevant behaviours, a contemporary phenomenon can still be investigated within its real-life context. Conole and Oliver (2006) acknowledge the richness and contextually located value of case studies in describing the details of particular pedagogical interventions, but warn of the difficulty of re-purposing or adapting them to other contexts. We felt that particular teaching interventions uncovered by our snapshot could identify useful strategies for engagement in hazardous circumstances alongside other studies which took place where disasters have occurred and where higher education institutions have continued to provide access to education (SchWeber, 2008). Following approval by the university's Ethics Committee, three learning advisors recruited twelve lecturers and conducted semi-structured interviews with a set of agreed-upon questions. The lecturers chosen were a purposive sample of those who had worked with the learning advisors, and demonstrated the implementation of a variety of interventions.The validity of our findings was strengthened by triangulation of additional sources - from Moodle server logs and statistics of access and use, particularly Moodle tools such as News, discussion forums, group functionality and resources including audio and video files.

To help us to identify student engagement strategies and look for signs of good pedagogy, we used existing learning models or frameworks. We identified practices that enhance engagement such as: encouraging contact between students and faculty (Chickering & Gamson, 1999); providing mechanisms for interaction with teaching staff and other students (Marshall, 2010) and incorporating activities which demand that students devote time and effort to purposeful activities (Kuh, 2008).We were conscious of the limitations of applying only elements of these frameworks to the behaviours we observed. Time was of the essence however and we wanted to capture rich data before there was a return to face-to-face teaching opportunities on campus. We wanted to capture a slice of lecturer activity in (re)design of courses and gain insight into lecturer interventions. These frameworks were helpful in benchmarking our observations using recognized criteria.

Findings

Issues

The immediate concerns of lecturers interviewed revealed a tension between a need to prioritize the validity and integrity of the course and a strong concern for students' welfare. Issues to be dealt with included the viability of a course in which "previous experience showed that face to face contact was really important" (L5, interview, 19 May). Meeting the challenge of teaching during this crisis was helped by the extent of teaching experience, particularly with the subject matter. A lecturer commented that they had taught the course for the last five years so found the changed format very rewarding but felt that if they had been in their first year of teaching the course, they "would have freaked out" (L10, interview, 6 April). Removing the opportunity for physical contact with students brought anxieties for lecturers about how this element of their course could be replicated virtually and how their course as a whole might translate to the changed environment. Two of the interviewees felt that the physical separation of students and staff created a sense of isolation. Several lecturers commented on the importance of student engagement and how the loss of on campus physical space made this more difficult. One lecturer provided a physical space in their home where the students could gather to learn. The provision of tent space also provided challenges which forced the lecturers to adapt. The tents were seen as a flexible space opportunity by two lecturers. The furniture here was moved and the usual lecture time was used instead for discussion and problem solving sessions using content already delivered online.

Communication and community

The interviews also highlighted particular interventions that lecturers put into place in order to re-start their courses. Some lecturers who already had course sites developed for on-campus and distance students, felt prepared. "I knew my Learn [Moodle] site was ready… Everything was there … and we just switched to distance" (L7, interview, 13 June). Most lecturers though weren't prepared, and endeavoured to develop alternative teaching strategies which were more student-focused and encouraged deeper, more active student engagement with the course content. The creation of community was seen as important because students were not only dealing with their learning but struggling with personal issues post-earthquake. The university's Moodle learning management system (LMS) played an important role for all those interviewed. Although Moodle was used in different ways, common trends were observed. "The big tool was Learn [Moodle] for getting in contact with the students and to coordinate the resources" (L10, interview, 6 April). Regular communication with students via two-way discussion forum posts or one-way news forum posts was common.

News forum posts (3,790) between February 23 and March 31 2011 increased 88.4% compared with the same period in 2010. Lecturers used the online communication tool to engage students and express concern for their welfare. One lecturer expressed this in reminding students that the most important point to remember for online learning was to engage. “So do respond as it will allow us to develop and change as we proceed” (L1, Moodle News post, 10 March). A strong concern for student welfare was expressed in a News post which said:

> [We] are thinking about you during this terrible week, especially those of you who have suffered loss and damage, and those for whom this was the first week at University and away from home. The first priority for you all is to take care and look after family and loved ones. If there is anyone who is struggling please let me know and I can arrange for support and any guidance.”
> (L3, Moodle News post, 25 February).

Negotiating a way forward with students and sharing personal circumstances strengthened the faculty-student relationship in an environment where most lecturers had not yet had an opportunity to meet their students face-to-face. One lecturer expressed this need to connect with and engage students online instead by urging them to personalize their profile in Moodle by adding a photograph. “I think it's nice to be able to picture who we are talking to, if we can't physically sit around a table looking at each other” (L4, Moodle News post, 13 March).

Content Delivery

For some who already had much of their course content available on their Moodle site, the focus became supporting and encouraging students to engage with that content. Several methods were described as being successful. Many lecturers considered that organization was a key in helping students. Communication, anticipation of student queries, and clear, well organised Moodle course sites helped to provide structure. Clear directions, overviews, outlines and summaries within the sections of the Moodle site, as well as considerable scaffolding and modelling of tasks by lecturers, were also successful strategies in keeping students focused and in guiding them through the course content. A weekly course format in Moodle was favoured by several lecturers. One chose to call their section content the ‘Weekly directions’, in view of the need for students “to focus on the week at hand” (L3, interview, 19 May). This format was thought to make it easier to continue teaching following any further interruptions due to aftershocks. This format was used elsewhere to help students stay focused, “Every week or so I put a comment up ‘You should be doing this, you should be doing that’ and I’ve interacted with them during the week” (L7, interview, 13 June).

Lecturers who had already begun to develop their use of the online environment as a part of their teaching strategy, were in a better position to engage their students in a pedagogically sound way through the use of Moodle. For some lecturers the focus was on making sure the course content was available for students to engage with off campus. The lack of access to traditional resources such as library books and textbooks led to more resources being put online. Lecturers were not only concerned about student ability to access online content so none was disadvantaged, but also their ability to deal with an overwhelming number of resources put online. Course content was made available in combinations of text, video and audio formats.The strategy of using audio files to accompany *PowerPoint* slides was developed by several lecturers interviewed as a better strategy for on-line delivery than video recording a 50 minute lecture. Video recordings which were used were much shorter in duration, and focused on particular difficult concepts or were designed to direct students to engage in active learning at points during the recording. For some lecturers a “live” component of their teaching was preserved through the use of *Adobe Connect*. “If I had this live session where they could see me, and hear me, and chat, and chat privately to me that would be a form of [digital] ‘hand holding’” (L6, interview, 24 May).

Tutorials and Assessment

Material usually shared in tutorials was made available within the Moodle course sites. One lecturer whose ‘hands on’ tutorials were an essential part of the course created videos that captured essential information presented on *PowerPoint* slides along with a physical demonstration of the concepts. In several cases, tutorial group work was translated into the online environment to encourage active student engagement. Face-to-face group work was replaced by forum posts, and engagement may have increased because students had “more pressure on them to put the effort in” (L5, interview, 19 May). Lecturers commented on the way in which the quieter students in their courses were able to contribute more through forums, and be recognised for the value of their contribution. Once tutorials were online, engagement and participation needed to be assessed differently and this encouraged innovation. Some lecturers incorporated the content of students’ discussion forum posts into their assessment. “I give them feedback every week on their discussion participation” (L6, interview, 24 May). “Under the system I had set up, all of these [forum posts] count as contributions to their assessment.” (L5, interview, 19 May). One lecturer felt that the pedagogical intentions of traditional group work were successfully replicated online, so with the core of the course becoming more tutorial-focused, they assessed tutorial responses rather than relying on the exam. The students in this course chose their own groups, topics and forum posts to be submitted for assessment. This lecturer felt that the transfer of responsibility for learning to the students was the reason for what was perceived to be more thoughtful and better quality responses than expected from the students in the online tutorials,. A change to assessment was another intervention introduced by many lecturers. On-campus assessment, particularly when it was scheduled for early on in a course, was most often removed and alternatives put in place. “I dropped off the test because that is usually a source of anxiety.” (L11, interview, 10 May). Lecturers developed alternative assessment which made allowances for students who were now unable to complete all the planned work due to lack of resources and a compressed semester. These alternatives included ‘take home’ assessments, online quizzes and assessment of tutorial and forum contributions.

Student Reactions

General impressions of student engagement within courses, and student feedback obtained by lecturers from student forum posts and post-earthquake teaching sessions, were predominantly positive. “My sense is, because of the level of thinking that I'm seeing in the discussions, that they are doing a really good job, and that they are enjoying it” (L6, interview, 24 May). The students involved in the course taking place in a home, were very positive about the experience. When an opportunity arose for them to have a learning space back on campus they chose to stay where they were instead. Students reacted more positively to approaches which in past semesters would have been unpopular. One lecturer made the comment that if they had tried to have one out of every two lecture slots as a question time session in a traditional academic year, it would have fallen flat. Circumstances had forced students to work on their own and the opportunity to discuss questions together was deemed important. Another lecturer noted that students used an online glossary activity more often. It was thought that the students felt overwhelmed and this feature allowed them to find succinct answers quickly to common questions. While some courses were cancelled, student numbers in other courses increased after the earthquake, by up to 39% in one case. Because of the availability of course content and the online record of much of the class interaction, students who enrolled in a course late were able to catch up and complete their work alongside their peers. “[They] could then access the readings and the conversations from before they entered, [and] felt connected” (L5, interview, 19 May). Students also seemed to appreciate the quick responses they received through forum communications from lecturers, and fewer students attended scheduled lecturer ‘office hours’ in some cases. They reacted positively to material being placed online and the feedback received in one instance was that the material was well paced and “they liked being able to stop the audio and replaying it” (L10, interview, 7 April). One lecturer observed that attendance at face-to-face lectures, once they re-started, was down to about two thirds of those enrolled and thought that the addition of audio files to augment *PowerPoint* presentations could have been a contributing factor.

Positive outcomes

Comments in the interviews revealed some positive outcomes of the earthquake for lecturers. One vowed to “keep all the adaptations, because I think I’ve learned how valuable the [Moodle] site is” (L7, interview, 13 June). Lecturers found many of the interventions they implemented had appeared to enhance student engagement and they would choose to use these in future iterations of their courses. Interviews highlighted structured forum discussions, the use of discussion forums for smaller groups of students within a course, adaptations to assessments, and the recording of lectures as successful strategies to be retained. The use of audio with *PowerPoint* could, in future, supplement the face-to-face lecture, especially for challenging topics, “amplifying certain points and clarify[ing] certain things that might not be immediately apparent from the *PowerPoint* themselves” (L9, interview, 7 April). One lecturer commented that the use of audio files provided the opportunity for students to review and engage with their learning and to accommodate clashes with other courses or commitments. Lecturers reported feeling more of a connection to their students. “I think I got to know the students who posted between the earthquake and when we met up face to face, really well” (L5, interview, 19 May).

The crisis had encouraged some lecturers to think more about pedagogy and the need for students to take more responsibility for their learning, as well as providing the opportunity for lecturers to reflect on their teaching. The necessary course modifications had encouraged reflection and made lecturers aware of the need to reinvigorate their teaching. “I've had to really think very carefully about my teaching and learning objectives, and they’re a lot more precise now” (L6, interview, 24 May). A lecturer who was already prepared for teaching some of their students at a distance commented that they had, “an emergency system in place that we weren’t expecting to become an emergency system, and yet it worked well.” (L7, interview, 13 June). Reflection also involved “thinking much more clearly now about ‘first principles’” (L1, interview, 23 May) and about what was working and what wasn’t. A lecturer who felt that their course content had not essentially changed but evaluation of its pedagogical intent had, felt that:

> the earthquake [was] in a sense a great laboratory in which… I've now had to both think both about the theory and [practice] …getting to the goal in a more positive way… I feel that more students are actively engaged. (L2, interview, 19 May)

In a number of interviews lecturers expressed relief at a return to spaces that allowed them to meet with students regularly. Online and face-to-face aspects of the course working together as a blend was seen as valuable.While all lecturers interviewed said they would continue developing the online aspect of their course, they also mentioned the continuing importance of face-to-face interaction with their students and not just student interaction with the course content.

Conclusions

There was a need to focus on student engagement and maintain it in spite of changing from a face-to-face course to a blended or completely online one, one day after the teaching Semester began. We felt that because of the earthquake disruption lecturers gained sometimes revelatory insights into their course design and teaching strategies. The crisis situation forced lecturers to review course delivery strategies, focus on maintaining learning outcomes and recognise the need to engage students and maintain or re-create the physical environment in the virtual space. Some lecturers came to realise that engaging students was not confined to meeting them in lectures and tutorials but had more to do with a willingness to engage with students. Within the laboratory situation, which required risk-taking, came the freedom to re-negotiate the course's essential elements. The need to re-work face-to-face tutorials for an online format was a major catalyst for innovative changes to courses, as was the incorporation of increased formative assessment. There was not only more reliance on Moodle tools (especially the communication tools) but more recognition of the role of online learning as a blend, evidenced in the desire expressed in lecturer interviews to retain elements of the redesigned course format in future offerings of the course. Lecturers were using technology to facilitate student engagement, rather than the physical teaching space. We hope to build on what we have learned from the impact of the Christchurch earthquake on our institution and the way it encouraged affordances of teaching pedagogy that might not have occurred but for the crisis. A situation such as this, demonstrates the importance of establishing and maintaining student engagement as a centre-piece of course design. We felt that engagement at the epicentre saw us through.

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The surprising truth about how metaphor motivates e-learners

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Abstract

Motivation and engagement is hard to maintain in e-learning. Metaphor entertains and motivates participants in virtual environments. After teaching and researching several courses designed around metaphors, we examined its effect on intrinsic motivation in a course based on a virtual soccer tournament. Using a qualitative methodology to investigate students' use of metaphor in communications, the Cognitive Evaluation Theory (Deci, Koestner, & Ryan, 2001) served as framework to analyse the relationship between the metaphor and intrinsic motivation. We found that there was more copious use of metaphor in the online social discussions, and that it was used for targets of immediate importance and emotional value. Scarce metaphors in reflective journals mapped onto the learning experience. Social constructivist course design required engagement from students that supposed motivation. Unmotivated students were passive, and disrupted the activities of others. Disengaged students can erode motivation of others who become helpless, lose autonomy and feel incompetent.

Keywords: Motivation, metaphor, engagement, competence, autonomy, facilitation

Introduction

Methods to motivate e-learning students is a key issue in higher education, due to poor persistence and completion rates (Morris, Wu, & Finnegan, 2005; Terrell, 2005). Skinner's (n.d.) behaviourist approach to entice students into productive studies has long since fallen out of favour, being replaced by social constructivist and cognitivist learning theories (Anderson & Dron, 2011) that bring learning closer to the individual and his social connectedness. Nevertheless, the notion that rewards drive performance is still alive and well in education with grades the ubiquitous carrot on a stick. Dan Pink dashed the motivational value of rewards in the workplace and the classroom and brought it into the popular domain (2010). He postulates that in cognitively challenging tasks, rewards undermine motivation, and proposes "the surprising truth about what motivates us" which corresponds loosely with cognitive evaluation theory (Deci et al., 2001) . Solid research from academic psychology suggests that this theory influences motivation in an educational setting (Ryan & Deci, 2000).

Since Aristotle teachers used metaphors to explain new and difficult concepts. Metaphor is a useful pedagogical tool by virtue of its ability to elucidate new and abstract concepts (MacCormac, 1985). For students new in teaching and learning with technology, the online environment is just another new concept that should be explained through metaphor. Therefore we have incorporated metaphors in the design of course over a number of years and studied the effect of the metaphor on student motivation and engagement. The nature of the metaphors we used had different effects, in some aspects beneficial, and in others less positive. All the metaphor-clad courses were part of a Masters in Education degree for students that specialised in teaching with online technology. Web technology was both the topic as the delivery medium of the courses. Over the years we observed that using vivid metaphors in a course inspired students and lecturers. Some of the questions regarding the "how" were still unanswered. In this paper we report on a fully online course that was designed around a virtual soccer tournament metaphor. We compared how students used the metaphor in different types of online communications and sought to uncover the function of metaphor in those kinds of communication.

The research questions are:

1. How do online students use metaphor in different communication media?
2. How does the use of metaphor indicate and influence motivation?

Literature

Motivation

There are several theories about what motivates people. In education, the well-known ARCS motivational model by John Keller (2000) represents the conditions of attention, relevance, confidence and satisfaction that need to be satisfied for students to be fully motivated. Instructional designers often use this model for systematic design of learning events.

Dewey's Practical Inquiry model as operationalised in the Cognitive Presence of the Community of Inquiry Framework (Garrison et al., 2000) proposes four phases, namely Questioning, Exploration, Integration and Satisfaction in a reflective inquiry process. This presence in conjunction with the Social and Teaching presence creates a meaningful learning experience. Comparing ARCS with the Community in Inquiry's Cognitive presence (Garrison, Anderson, & Archer, 2000), shows similarities. The ARCS Attention resembles the CoI's Questioning while its Satisfaction resembles CoI's Resolution. These similarities suggest a strong cognitive component to Keller's motivation model.

Ryan and Deci's Self-determination Theory (SDT) proposes that the most basic needs of belonging, competence and autonomy should be satisfied for people to be motivated and to experience well-being (Ryan & Deci, 2000). Deci, Koestner and Ryan (2001) re-examined the detrimental role of external rewards in education and the nature of intrinsic motivation, as formulated in the Cognitive Evaluation Theory. This theory states that "the innate psychological needs for competence and self-determination" underlie intrinsic motivation (Deci et al., 2001, p. 3). The element of competence that is central in the psychological models corresponds to the Confidence in the ARCS model.

Recently, Pink (2010) adapted the Deci and Ryan theories to explain why people excel in the workplace. He proposed three conditions that motivate people to be innovative and extend themselves: autonomy (engagement); responding to challenges that lead to mastery; and a sense of purpose that makes the world a better place. Pink's autonomy and mastery correspond to the SDT and Cognitive Evaluation Theory's autonomy and competence as prerequisites for motivation, and his sense of purpose to Keller's Significance. The most enduring themes in this brief dissection of the most popular motivation theories can be described as feelings of competence and autonomy.

Events that undermine perceptions of self-determination, will undermine motivation, like rewards with a controlling function (Deci et al., 2001). When students perceive an element of controlling through rewards, factors like evaluations, deadlines, competition, externally imposed goals and the typical classroom atmosphere, decrease intrinsic motivation. Keller (2000) proposes the use of tangible extrinsic rewards to produce satisfaction and motivation, whereas Deci and co-workers found that tangible rewards tended to be felt as controlling, and decreases motivation. Verbal rewards in the form of positive feedback received in a supportive climate, was experienced as intrinsically motivating, particularly for college-age students. Deci and co-workers propose that educators should increase intrinsic motivation through provision of "more interesting learning activities, to provide more choice, and to ensure that tasks are optimally challenging…to promote creative task engagement, cognitive flexibility and conceptual understanding" (Deci et al., 2001, p. 15).

Metaphor

Educators use metaphor to elucidate foreign, unknown or abstract content. A few words or an image evokes a wealth of information. Metaphor also allows expression of what is otherwise hard to express literally; when it is hard to find the right words, or describe a feeling. Metaphor allows one to describe something in terms of another that possesses the qualities one wishes to convey (Kövecses, 2003). Metaphor means to transfer or to carry over and is essentially a comparison between a vehicle or source (a known entity) and a target (the unknown) (Ortony, 1975). For successful application the listener should have a good understanding of the source or vehicle (Lakoff & Johnson, 1980). Qualities of the source (entailments) are transferred or mapped onto the topic or target (Kövecses, 2003). The learning value from a metaphor resides in these transferred qualities or entailments. In conceptual metaphors the target is an abstract concept and the source a concrete or physical concept. Metaphors are unidirectional, meaning that the process typically goes from the more concrete to the more abstract but not the other way round.

According to Lakoff and Johnson (1980, p. 454), "most of our ordinary conceptual system is metaphorical in nature", implying that we seldom recognise all the metaphors that surround us. Figurative use of language comes "closer to experience and is consequently more vivid and memorable" (Ortony, 1975, p. 53). Metaphors supply compactness, inexpressibility, and vividness. "The function of a metaphor is to express succinctly what can only be said very circuitously if, indeed, it can be said at all" (Ortony, 1975). Compactness of metaphors allows large chunks of information to be constrained or bound together and transferred (Ortony, 1975). The inexpressibility of metaphors offers insight, guide future actions and reinforces experiential coherence (Dodd, 2002). As conceptual transfer is never complete; this hypothesis also enables one to present a concept in a deliberately more acceptable light; thereby adding reinforcement or deliberately hiding aspects of the target concept, as in euphemism (Lakoff & Johnson, 1980). The vividness of metaphors capture the brightness of a unique experience; they conjure up perceptual and sensory images and emotions in the listener (Ortony, 1975). Intense emotions lead to copious metaphorical use when describing feelings because metaphors also indicate emotionality (Fainsilber & Ortony, 1987). Figurative language is part of the way people express emotions, or evoke emotions in others (Gibbs, Leggitt, & Turner, 2002).

Both visual as extended metaphor improves online learning by enhancing success and motivation.

> It would seem, therefore, that placing learning materials for adult learners in a pre-packaged instructivist learning shell, such as those that are currently winning popularity, may create an empoverished learning environment in which the creativity and imagination remains unchallenged. The main contribution of the strong use of familiar metaphors in the examples shared here show that, in Internet-based distance education, covering distance is not as important as enhancing contact (Cronjé, 2001, p. 155).

Research into the use of figurative language in e-learning, showed that students used it "to express the social dimension either to refer to the self, feelings and emotions, or to conceptualise the components of the virtual learning setting" (Delfino & Manca, 2007, p. 2190). They confirmed that the use of figurative language accompanied meaningful and critical events, with more use when emotional involvement increased (Fainsilber & Ortony, 1987). Game-based online courses are particularly vivid and inspirational, producing more successful students who were positive about their courses (Burguillo, 2010).

Background of the study

The history

For many years the University of Pretoria has implemented and researched metaphors (Cronjé, 2001; Cronjé, Adendorff, Meyer, & Van Ryneveld, 2006; Cronjé & Clarke, 1999) that were used in the design of courses in an online Masters in Education programme for students of computer –integrated education. These courses acted as a laboratory for innovative teaching practices in order to explore and exploit new ICT's for teaching. Metaphor had to stimulate creativity, motivation and collaboration (Cronjé, 2001).

We follow the tradition of development design described by Tom Reeves (2006). Lessons learnt from previous courses informed the design of subsequent courses. Some metaphors used in the previous courses were more successful than others. The background to the present study included analysing the previous courses presented in this programme that were designed around metaphor. The initial analysis (not given in detail) used the characteristics of metaphor (Lakoff, 1993; Lakoff & Johnson, 1980) to judge the suitability of each particular metaphor. The previous research on different aspects of these courses provided ample documentation to study the students' experience of each course, as well as the success rates of those courses. Table 1 summarises the characteristics of some of the best-documented course metaphors. The benefits and drawbacks formulated in retrospect indicate how well the online class represented a stimulating and supportive environment conducive to learning.

Table 1: Metaphors previously used in M.Ed (CIE)

Metaphor	Benefits	Drawbacks	Motivation
Virtual classroom	Easy to design and adapt	Classroom replicates real classroom, lecturer centred. Little student interaction	Controlled environment, little autonomy
Rag carnival procession	Highly individualised artefacts	Little collaboration	Autonomy
Virtual opera	Collaborative	Less familiar	Autonomy, little belonging
Halloween party	Original	Culturally objectionable	Autonomy, no belonging
CyberSurfivor game on a virtual island	Game was interesting and inspiring	Voting students off caused undue stress, high drop-out	Controlling undermined autonomy, little competence
Soccer World Cup tournament	Extended metaphor, supports collaboration	Sport not generally accepted in all cultures	Less control, more autonomy, more belonging than previous courses

From the documented student experiences, it was possible to form an impression of whether the elements of motivation theory (Ryan & Deci, 2000) were present in each course as shown in the last column of table 1. Superficial analysis suggested that suitability or failure of the metaphors might influence course success and motivation of the students.

All metaphors were vivid and accomplished their goal of catching attention and motivating students to engage with the course activities. Even though they served as stimulating or contentious themes for assignments, the Halloween Party was an unsuccessful metaphor, judged by the students' reactions. It was culturally alien to the South African students, who were mostly conservative with traditional values; students were particularly offended by the Halloween theme, and trashed the undesirable web pages. Describing their reaction in terms of motivational theory, students did not "belong" in this setting. The metaphor displayed the vividness and compact characteristics of metaphor, but did not explain any unfamiliar terrain, being unfamiliar itself.

Other metaphors also had limited benefits, as neither the classroom nor the Surfivor Island successfully supported an online learning community. Games have huge motivational value; in the virtual environment even more so (Burguillo, 2010; Rieber, 2005). Some students persisted in the highly challenging online course which was based on the Survivor reality television show, because the vivid game metaphor increased their motivation and curiosity through the elements of challenge and fantasy (Cronjé, 2006). On the other side, the course was highly competitive, with the metaphor that threatened students with expulsion off their virtual islands. Therefore few students persisted, and everybody reported excessive anxiety. It is known that competition and control decrease motivation (Ryan & Deci, 2000), and subsequently, persistence. The findings of the background study informed the teaching approach and suggested the characteristics of the metaphor for the present study.

The course

The objectives of the post-graduate course described in this paper were for students in Education to learn how to design an online course and facilitate learning. They had to explore the teaching possibilities of a learning management system, as well as open resources that are useful for teaching, like online games, polls, blogs, personal websites, repositories of resources and many more. The most effective way to learn about learning on the web was to be students in a fully online course with communication limited to web-based tools. The course included theory for which students had to compile online content. Each week had a peer-review activity wherein two peers reviewed each posting and provided formative feedback. After the theoretical part of writing and peer review, students had to apply the theory in practice by creating suitable web-based teaching artefacts. In order to stimulate interaction, they worked in 3 different teams on week-long collaborative practical assignments. Online facilitation played a central role in the course, as the course simulated students living in all corners of the globe.

We designed the course around a non-threatening game-based metaphor, encouraging students to participate actively in their course. A game is an excellent metaphor to foster interaction amongst students and down-playing the dominance of the instructor (King, 2002). At the point of course design, South Africa was preparing to host the 2010 World Cup Tournament, and on the hype of enthusiasm for soccer we selected a World Cup Soccer Tournament as metaphor. The metaphor would unite the multicultural student group. Like Manca and Delfino, we aimed to show that figurative language helped students to understand their online environment better.

This course lasted for eight weeks, and was delivered via WebCT and a selection of open web resources without any contact classes. We used the metaphor, "*ONLINE LEARNING IS SOCCER TOURNAMENT*" and aimed to transfer characteristics from *Soccer Tournament* as vehicle onto the target or unknown domain of *online learning*. The course wherein students experienced the stress of web-based learning followed constructivist pedagogy. For everybody's benefit all online communication took place via the WebCT™ platform.

Each student represented a country that participated in the real soccer world cup tournament. Each student had to tailor all web artefacts and assignments to reflect the personality, culture, colours and language of his/her country. The online discussion forum was the hub of the learning activities, designated as the "pitch" or "stadium" with weekly posts and peer feedback on designated topics, as "matches". The social forum was not moderated, and provided an informal discussion on topics of choice, called the "gym" or "practice field". It yielded important communications that portrayed the climate in the class. The online facilitator followed the model of *guide on the side* (Collison, Elbaum, Haavind, & Tinker, 2000; Mazzolini & Maddison, 2003), and was portrayed as "coach or referee", depending on the situation. For the collaborative group assignments (Johnson, 2001; Panitz, 1996), teams had private discussion forums and chatrooms " gyms". Students hosted their learning blogs on the open web, and re-used the reflective writings from the blog as source for their final reflective essays. Numerous assignments and tasks required web design either in the LMS or the open web, or on an experimental server in the Faculty. Students found those tasks very challenging, and had to contend with erratic servers and unreliable connectivity, situations that are ever-present in this part of the world (Unwin et al., 2010).

The students

The students were all South African, mostly in full-time teaching, with a few employed in the e-learning industry, higher education or library sciences. The majority of the class lived within a 100 km radius of the University, with three in other provinces. Being a fully online course made it possible for the remote students who only needed one or two subjects to complete their degree. The majority of the students were female reflecting the demographics of the teaching profession in the country, and their ages ranged from in their twenties to nearly fifty. Language-wise the group was very diverse, with six English first-language speakers. For one-third of the class who were black, English was a third or at best second language in which they had little formal schooling. Open communication was therefore a challenge in this very diverse cohort. Seventeen students (80%) completed this course.

Methodology

In-depth analysis of an online course that represented a virtual soccer tournament as metaphor followed an interpretive approach (Hatch, 2002). From the artefacts created by the students during the duration of the course, we present analysis of the following primary documents: 1353 student discussion postings (we filtered out the facilitator posts) seventeen blogs that were created on an open blog site outside the LMS, and the reflective essays that students submitted as part of their end-of-course examination. Those documents were analysed qualitatively with the aid of Atlas Ti™ computer-based qualitative analysis software. In the first round of analysis, we identified metaphoric expressions relating to the soccer tournament metaphor used in the course and coded them deductively according to the metaphor target they referred to. In this process, we took the context of the expressions into account, as revealed by the particular task the students were occupied with at that stage, information from other contemporaneous course documents and the facilitator's documented observations. These codes were then grouped into themes that reflected what the students meant to express by their use of metaphor. A simple tally of metaphorical expressions in the different types of documents reflected the importance of those themes. In the second round of analysis, only metaphorical expressions were considered, and analysed inductively according to the constructs of Deci and Ryan's theory of motivation (Deci et al., 2001; Ryan & Deci, 2000). All coding and analysis was performed by the first author, which contributed to reliability, as did several revisions of the coding.

In the Discussions, we use the following code to track participants: w=white,b=black, f=female, m=male, l=local, d= distant, e=English, a= Afrikaans, o=other African language

Findings and Discussion

Metaphors were part of the vocabulary of the course, as described by this student in a reflective essay:

> "I love the use of metaphors – it's part of my own learning style to associate, compare or tie new knowledge and concepts with something I already know. In this game the use of a metaphor is taken a step further – not only to explain a new concept, but rather to create context and to make the 'playfield' interesting and interactive" [wfle]

Table 2: Comparing the numbers of metaphor-containing messages in discussions and narrative essays

Code	Number of metaphors in Social Discussions	Number of metaphors in Narrative essays
Class, co-learners	11	4
Student problem	10	0
Technical problem	10	1
Falling behind	9	2
Facilitator	8	4
Course work	7	12
Competition	2	7
New metaphors	0	6
	57	36

Students also used the metaphor for other topics than originally given, as shown in table 2. We compared the use of metaphor in the social discussion posts and narrative essays by sorting salience of the leading codes in discussion topics in descending order. The most fertile ground for using the soccer-related metaphorical expressions occurred in the social discussion forum. Students often addressed each other or wrote about other students as *players, team mates, opponents;* the facilitator as the *coach, referee, team doctor*; technical problems like programmes, online tools, connectivity, firewalls and falling behind as *injuries, being on the bench, receiving a red/green/yellow card*, *being in sick bay*. In the discussion that follows, we show illustrative selections from the discussions in quotation marks.

Metaphor in online social discussions

Table 2 shows that the highest frequency of using metaphor was for other students, whether just addressing them or referring to problems. The metaphors students used for co-learners in the first code, were positive and indicated feelings of belonging, as shown in the typical quotation.

> "Welcome to the team. It's good to have a fresh player on board (as the coaches say, 'A fresh pair of legs!')" [wfle]

The second code targeting student problems showed that metaphor was used when students did not wish to describe the peer's conduct in literal terms, and soften the criticism. Metaphor allowed them to let off steam, mostly when those students did not engage sufficiently in peer review or group activities.

> "both of my opponents did not arrive at the stadium in time for the kick-off" [wfla]

Those problems were always immediate, and caused fair amounts of stress, confirming that people used more metaphors when describing topics that cause emotional reactions (Delfino & Manca, 2007; Fainsilber & Ortony, 1987; Manca & Delfino, 2007).

Metaphors for technical problems indicate frustration and feelings of disempowerment, whereas metaphors indicating falling behind masked the embarrassment. The high use of metaphor in the iscussions therefore indicated the emotional content of the incidents they referred to.

> "but my ADSL line is soooo sloooowww!!I think at this stage you must regard me as a seriously

injured player!" [wfla]
"Ref/Coach I somehow get the idea that I am not fit enough to be selected for any soccer team at this moment! I think I should rather take up a managerial position" [wfde]

The described metaphorical expressions also corresponded to topics that can influence students' motivation. One can group the codes for class, co-learners and student problems and classify them as a theme represented by peers. In SDT, significant others can provide the conditions for self-determination, well-being and motivation, under the "belonging" construct (Ryan & Deci, 2000); conversely, rejection undermines motivation. Problem students posed a great threat. They posed the risk that others would not complete certain tasks optimally or on time, undermining feelings of autonomy, as they were helpless to force unresponsive students to contribute their required part. The effect of events feeling out of control (low autonomy) also engendered feelings of incompetence.

The instances where the facilitator was described in metaphor did not show a controlling, motivation-sapping persona. The facilitator as coach was more on the sidelines than on the field, a role of facilitation that was unknown to the students and felt strange in the beginning:

"Ref……the watchdog…..hope this one's not missing in this game"[wfla]

The unobtrusive style of facilitation caused students to assume more control in enforcing guidelines, correcting others, helping where they could. As students participated in the facilitation, it empowered them (Collison et al., 2000; Kettner-Polley, 2005), increased their feelings of autonomy and built up motivation.

Students owned the social discussion forum. They also owned their own intrinsic motivation to perform well in the course. Any course aspect that interfered with or threatened their intrinsic motivation caused stress, and many of those stressors were disguised in the discussions in metaphorical terms. Some students contributed very few metaphors or social posts, with erratic access to the online course. Crystallisation of students' posting frequencies with the content of their blogs indicated that some expected to obtain credits without real effort. A few were not sufficiently ICT literate. It was not surprising that students who started the online course with appropriate preparation and expectations were better motivated to participate in all aspects of their online studies and were more successful.

Metaphor in reflective essays

By the time the narrative essays were written at the end of the eight weeks of challenging, fast-paced coursework, the stresses and uncertainties had been resolved. Whereas the readers of their discussion posts were peers, who understood the metaphors, the readers of their reflective essays were not initially the students; they were the lecturers, the external examiner and the facilitator. Students were much more matter-of-fact about the incidents that caused such havoc during the course, not using metaphor to describe them.

"Working in a team online, there are still those who just don't get the meaning of the word team."[wfla]

Students used the metaphor to describe the coursework, as it had become the terminology used by everybody.

"we had to participate in certain activities to become "super fit virtual soccer players"[bflo]
"Assessing each other is another ball game! Doing a proper assessment is a challenge".[wmle]
"so we played soccer all over the topics and tools of the e-learning industry" [wfla]
"My first injury was on field… when I bumped into JavaScript!"[wmle]

Reflecting on the role of the facilitator was also easier to do clad in metaphor:

"I wondered whether the coach was also acting as team doctor or if they had, in the meantime, appointed a permanent team doctor" [wfla]

Students reflected on their learning process and what they achieved. Their use of metaphor also shows this shift in affect.

"What I liked about these is that the structure was fairly predictable. Like a 'set piece' in a soccer game (a pre-planned set of moves on the field), we knew what we had to do, and the format it would take"[wfde]

The dimension of competition came out much more strongly in the essays than in the discussions.

"I was always aware of the fact that I, too, was being closely observed by my opponents. I knew and they knew that I was always on the move to score a goal."[wfla]

In retrospect, many were quite emotional about how much they had learnt in such a short period of time, due to the high level of challenge that was maintained throughout and the amount of sacrifice that everybody had to make to complete the course.

> "My game plan was to learn as much as possible, to extend myself technically and go into extra time doing this."[bflo]

This was also evident in new metaphors they coined to explain the emotional content of the learning journey.

> "Experience is not always the kindest of teachers, but surely is the best! – A Spanish proverb"[wfla]
> "I'm no longer a digital immigrant. I'm a settler now"[wfla]
> "the 'Dreamweaver' could help me weave and reach the dream!"[wfde]
> "Looking back now, I am reminded about the three-month basic training done by new military recruits"[wmle]

In terms of motivational theory, the use of metaphors in the essays clearly indicated how optimal challenges contributed to feelings of competence (Deci et al., 2001), confidence and satisfaction (Keller, 2000), and resolution (Garrison et al., 2000).

Conclusions

We used a qualitative methodology to analyse students' use of soccer tournament related metaphorical expressions in an online post-graduate course on web-based learning which was designed to reflect a soccer tournament metaphor . The circumstances of the postings strongly dictated the frequency and targets of those metaphors.

The immediacy of the medium and the intended audience plays a large role in how students discuss issues. We found that there was more copious use of metaphor in the online social discussions, than in the essays. In the social discussion forum posts were not moderated and students were allowed to express their opinions and feelings freely. This is where social presence was evident and where a sense of community originated, where the highest number of metaphorical expressions was found. In this forum, metaphors often pointed to challenging events in the online course. Challenges included problems with other students who failed to deliver what was expected; technical problems; falling behind schedule. The spontaneous use of metaphor often indicated emotions regarding the topic, many times pointing to peers. In this forum, metaphorical expressions were also used for targets of immediate importance and emotional value, like technical problems and falling behind schedule. Analysing these metaphors through the framework of the Cognitive Evaluation Theory (Deci et al., 2001) shows the relationship between the metaphors and intrinsic motivation. Emotions caused by problems, whether students, technical or time constraints, contributed to feelings of inadequacy, and undermined a student's feelings of competence, and therefore intrinsic motivation. The importance of social presence is underscored by the metaphors for co-students, whether in a positive or negative connotation, as students intuitively realised how much they depend on peers for success in the online environment. Emotions regarding peers reflect students' feelings of belonging, or challenges to such feelings.

Students compiled an essay as part of their final examination, reflecting on the learning that took place in the course, and drawing from the blogs they wrote continuously during the eight weeks of the course. The primary audience for this essay consisted of the two examiners who did not participate directly in the course. While students often used the soccer tournament metaphor in the social discussions, there were notably fewer metaphors in the essays. Metaphor was most often used to describe aspects of the course and activities for which the soccer-related terms have become embedded. This finding illustrates that a successful metaphor describes a concept more vividly than conventional language (Ortony, 1975). Closer analysis and showed that metaphor use in the essays for coursework were unemotional, therefore the absence of emotion regarding the topic (Fainsilber & Ortony, 1987) removed them from indicating motivation.

We observed that the emotions online students experienced were often quick flare-ups of anger or frustration, caused by feelings of helplessness due to insufficient participation by co-students on whose contributions they relied, as well as helplessness in the light of communications technology that did not function as anticipated.

Research in e-learning emphasises the importance of social presence in online classes, with students forming distinct impressions of co-students and developing affective bonds with them (Garrison, Anderson, & Archer, 2010), forming a close learning community. Metaphor use show up a duality in the affective relationship with peers: a beneficial relationship wherein the student has a sense of belonging to the group and experiencing satisfaction in the learning relationship; and negative emotions of helplessness when online peers fail to perform as expected, or are absent from activities, undermining the student's feeling of belonging and hence motivation.

Social constructivist online course design includes activities that require ample engagement among students, which assumes sufficient and unwavering motivation. Unmotivated students are passive (Ryan & Deci, 2000), and in this course they disrupted the collaborative activities of other, more motivated students. Passive peers who disrupted and delayed activities with peers could have devastating effects on the motivation of diligent students, as they were helpless to engage the passive students, causing feelings of loss of autonomy. Incomplete or late completion of tasks involving others in peer reviews or collaborative activities also lessened feelings of competence. Highly motivated students therefore risked losing their motivation when forced to collaborate with passive peers.

We know that metaphor in a web-delivered class can support cognitive frameworks for understanding of content and the environment, can introduce opportunities for creativity and self-expression. A game metaphor can, through its vividness, contribute to general motivation as indicated in this essay excerpt: "The metaphor turned what is often regarded as monotonous and boring task into often exciting competition". Metaphor motivates online students in other, surprising ways. It can help students to address problems that would have been sensitive to address by literal names and vent emotions. Well-chosen metaphors can help online students to experience and express feelings of belonging in the class, to strengthen perceptions of autonomy and engender feelings of competence, as those feelings need to foster and safeguard students' intrinsic motivation.

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Learner-generated content as a pedagogical change agent

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While the affordance of Web 2.0 tools in enhancing learning and teaching is well documented, effective use of these tools still eludes most practitioners. New technologies are simply used to recreate the hierarchical structure present within the four walls of the classroom and that signifies power and control online. The apparent ease at which technology is able to situate itself with the old and contemporary pedagogical practices is perhaps its biggest weakness and hinders effective use in learning and teaching.

The paper reports on the findings from six projects where learner generated content was made explicit in course outcome. These projects where carried out between year 2010 and 2011 (some projects are still on-going) in the faculty of Technology and Built Environment (TBE) and Te Puna Ako at Unitec New Zealand and involved students and staff from various courses ranging from levels 2 to 7. An overview of the six projects and the Web 2.0 tools used in the courses is given and the implications of making learner generated content an explicit course outcome is discussed.

Keywords: Pedagogy 2.0, learner-generated content, Web 2.0, social constructivist, learner-generated context

Introduction:

Sam Seidel (2011) in his video on Vimeo (http://vimeo.com/22591307) talks about Hip Hop genius: remixing high school education. Seidel (2011) starts by reflecting on his experience teaching a group of youths in a juvenile prison. While Seidel (2011) found that there were many factors that separated him from the youth he was teaching, 'Hip Hop' was the one element that every student in his class could relate to. Thus this became the main force driving learning and teaching in his class, where he observed disengaged students emerge as 'leaders and experts' (Seidel, 2011, 0:28). The Hip Hop culture stems from creativity and innovation, where resources are limited and hard to come by, thus often unused or redundant resources such as a family garage became the evolution platform for people to perform and practice (Vargas, 2003). However other barriers such as finance and correct equipment did not stop the Hip Hop culture from advancing and entertaining millions. Seidel (2011) thus defines the ethos of Hip Hop as Hip Hop genius and calls this: 'creative resourcefulness in the face of limited resources' (Seidel, 2011, 1:41) which would be referred to in the Hip Hop community as 'flipping something out of nothing' (Seidel, 2011, 1:47).

Seidel (2001) draws an analogy to education and what educators can learn from the history and evolution of Hip Hop. Seidel (2011) outlines that for a Hip Hop artist to maintain freshness, he/she has to mix and remix the old with the new. The artist has to be innovative, creative and has to blend different approaches while working within the constraints of resources available to create, capture, engage and maintain the attention of the audience and the followers (Vargas, 2003). Educators around the world face similar issues, thus educators have to find a platform(s*)* that enables them and their students to perform within the institutional limitations and barriers that exist (McLoughlin & Lee, 2008c; Robinson, 2003). The educators have to mix and remix the old with the new to maintain currency and engagement. They need to move away from the traditional paradigms of learning and teaching to a mix that serves the students needs in the current time. Because of the need to engage students in the process, empower them and understand them, creativity and innovation has to become the focus of learner development and teaching.

Web 2.0 and learner-generated content

The notion of Hip Hop aligns well with the ethos of Web 2.0. Flipping something out of nothing takes shape as Web 2.0 allows innovation and creativity at no cost since most Web 2.0 tools are free to use. However there is a need to reconceptualise learning and teaching before innovation, creativity, learner empowerment and engagement can take place (Chen, 2002; Robinson, 2003, 2011).Web 2.0 tools provide educators a platform that enables students to take 'charge' of their own learning. This could be learner driven while giving the educators a platform to mix and remix the old with the new pedagogies to facilitate a learner-centered experience and practice contemporary pedagogies that serve the needs of a student in the digitally evolving world. Web 2.0 tools have the potential to be the fundamental platform and a catalyst that leads innovation (McLoughlin & Lee, 2008b), as did the unused garage and other equipment in the evolution of Hip Hop that reflect the imagination, collaboration and ownership of the creators. Likewise Web 2.0 offers affordances that enable collaboration and creation that the students and teachers could own and use in their learning or teaching (Anderson, 2007; Luckin, 2008; McLoughlin & Lee, 2008a, 2008c).

McLoughlin and Lee (2008b) espouse the 3ps of pedagogy (Pedagogy 2.0) for use of Web 2.0 tools in education. (i) Participation – collaborative environment that allows for co-creation, sharing of ideas and learner participation in the wider online communities (ii) productivity – active engagement of the learner in creating knowledge and understanding collaboratively or individually and (iii) personalisation – the learners choice of content and community that is conducive to its own learning. Pedagogy 2.0 allows for innovation, creativity and student-centredness by leveraging off the affordance of Web 2.0 tools that enable user-generated content either as an individual or as a community (Bruns, 2007; McLoughlin & Lee, 2008c; Sener, 2007). Web 2.0 tools offer students control in their own learning and allow them to give learning their own flavour and colour – ownership – as the evolution of Hip Hop did for a certain group of people to express their own interest. The adherent social nature of Web 2.0 thus has serious implications on how learning happens and seems to lend itself to social constructivist pedagogies (Anderson, 2007; JISC, 2009).

In traditional learning paradigms where the teacher is solely responsible for scaffolding the learner in the zone of proximal development (ZPD) (Vygotsky, 1978), contemporary pedagogies through the use Web 2.0 tools place the focus on how to enable the learner to achieve the knowledge and skills needed through collaboration, guidance and assistance from other students, the teacher or an expert who is now accessible through the use of the Web 2.0 tools. Thus the focus in the ZPD when compared to traditional pedagogies is not on transfer of content to the learner, but rather on encouraging social/collaborative learning (Borthick, Jones, & Wakai, 2003). The interactions between the learner, teacher and external agents/experts through the use of Web 2.0 tools and technologies gives raise to learner-generated content and context (Anderson, 2007; Efimova, 2004; Luckin, 2008; McLoughlin & Lee, 2008c).

Methodology

A participatory action research (PAR) method, defined as "collective, self-reflective enquiry undertaken by participants in social situations in order to improve the rationality and justice of their own social practices" (Kemmis & McTaggart, 1988, p. 5) was used. This effectively led to the formation of a Community of Practice (CoP) with the staff and students. The practice within the community was focused on improving learning for students and improving teaching practices for teachers. The researcher's role in these projects was to meet with the staff and students on a weekly basis for pedagogical (staff) and technological support (staff and student) and to collect data from the participants (teachers and students) that emerged from regular feedback and reflections in the CoP. Pre and post student and staff surveys were conducted; data was also elicited from blogs and reflective videos which were created as a part of the project and the course. The data collected outlined the developmental journeys of both the student and teacher for the duration of the projects/courses and produced the findings. These transformational journeys documented by the data gathered, captured the changes in how and why learning for students was changing and in what ways making learner-generated content an explicit course outcome impacted on teacher pedagogy and curriculum. The feedback and reflections gathered in the CoP on a weekly basis formed the facilitation and design of learning activities for the following week.

Project overview

Context

Te Puna Ako is an academic development unit at Unitec Institute of Technology that provides teachers/lecturers academic support on programme design, effective teaching, assessment design, and learning and teaching in general. The unit also provides support to staff who are keen on exploring technology in learning and teaching. The researcher is an academic advisor (learning technologies) at Te Puna Ako, who undertook these projects in collaboration with other faculties, departments and staff.

Certificate in Autotronics (Level 4)

The students in this course had to attend a four-hour lecture four days a week. The remaining hours in the day were used for practical workshops for building circuit boards and doing other experiments. Learning was confined to the four walls of the classroom and the teacher was perceived as the sole source of knowledge for students to learn from.

The researcher started working with the staff teaching the course early in 2010. Working alongside the teaching staff, Web 2.0 tools such as Google Doc, Blog and Google Buzz were introduced to the staff and students in semester 1, 2010. The affordance of the Web 2.0 tools was modeled to the staff and students and learner-generated content was gradually embedded in the course as an outcome in negotiation with the teaching staff. The teaching staff were introduced to YouTube and with this knowledge of using Smartboard, videos were made introducing each topic that was previously covered in lectures. The Smartboard videos outlined the key learning outcomes of each topic and the students were required to explore the concepts further with the help of the teacher as and when required. Google Buzz was used to form a student community and used as a platform for students to share resources and ask questions after watching the introductory videos. Google Buzz was used by the teacher to provide scaffold where needed by the students and to start discussions on new topics in the course. The four-hour lecture time was now used to engage students in discussions from questions arising on Google Buzz and the teacher allocated time for one-to-one sessions for students to book if they needed help. Students are using Blogger to build an eportfolio as part of the course assessment. Two staff members were involved in this project teaching 30 students.

Table 1 – Observed impact of LGC on learning and teaching in autotronics level 4 course

<table>
<tr><td>Web 2.0 tools</td><td>Technologies</td></tr>
<tr><td>Google Docs, Google Buzz, Blogger</td><td>Student owned Netbook/laptop, departmental flip camera, Smartboard</td></tr>
<tr><td colspan="2">Impact on learning and teaching</td></tr>
<tr><td colspan="2">• Teachers see themselves as facilitators/guides
• Teacher focuses on affective aspects of teaching
• Transition in pedagogy (from delivery to social, collaborative and adaptive learning) thus lecture time is now used for discussion in class
• Learner Autonomy
    • Types of content/learning material, ownership, active engagement (learner generated artifacts), social and collaborative
• Formation of learner community
• F2F time when needed with the teacher
• Assessment had to be redesigned and is now portfolio based</td></tr>
</table>

Certificate in Boat Building (Level 3-4)

An authentic learning environment is used (Herrington, 2006), as students in this one year long course build two boats, each with different specifications and increasing in complexity and difficulty. While the authentic learning context offered effective learning opportunities for students, it was not fully utilised as the teacher played a leading role in ‘spoon-feeding’ the students throughout the course. Students were prescribed a textbook for the course and submitted a hand-written logbook at the end of the course for assessment. While the facilitation of the course had some aspects of learner-generated content, it did not however leverage off all the opportunities offered in the process.

At the start of semester 2, 2010, the researcher started a collaborative project with the two staff involved in teaching this course. A part of this process was to scaffold the staff into using Web 2.0 tools and also implement some Web 2.0 tools in the course for students to use. As a result YouTube, Blogger and Google Buzz were introduced and incorporated into the learning process. Students were asked to use their blog as a platform for creating an eportfolio and three flip cameras were bought for students to use in class to take videos and pictures. The researcher met the class once a week to guide and help the students who needed technological help and met the teaching staff regularly over the semester for pedagogical and technological input. This project involved one teacher and one technical assistant teaching a group of 18 students.

Table 2 – Observed impact of LGC on learning and teaching in the boat building course

<table>
<tr><td>Web 2.0 tools</td><td>Technologies</td></tr>
<tr><td>Google Docs, Google Buzz, Blogger</td><td>Student owned Netbook/laptop, departmental flip camera, Blackboard and chalk</td></tr>
<tr><td colspan="2">Impact on learning and teaching</td></tr>
<tr><td colspan="2">• Teacher sees himself as a facilitator/guide
• Transition in pedagogy (from delivery to social, collaborative and conversational learning)
• Learner Autonomy
o Access to types of content/learning material, ownership, active engagement (learner generated artifacts), social and collaborative, peer-peer feedback, support and scaffold
• Increased team work and formation of learner community
• Blurring of informal and formal learning context
• Merger of ‘theory’ and ‘practical’ as an authentic learning environment
• Assessment had to be redesigned and a marking rubric was co-created with students</td></tr>
</table>

Certificate in Marine Technology (Level 4)

This course was ‘taught’ to the students, the teacher provided students with pdfs, and PowerPoint's via Moodle (institutional LMS) and students attended a lecture every Monday for the duration of the course. The course was mainly teacher-centred with some degree of active student engagement. Students in the course attended workshops in the week where they created metal artifacts as a part of their assessment. A distinct boundary between theory and practical was noted. The teacher ‘transmitted’ his knowledge and content to the students in lecture and the students where to manifest this knowledge in the practical sessions through creating the metal artifacts.

Semester 1, 2011 - a netbook was made a minimum requirement for the course and students were provided with iPod’s (Gen 4, 1 per group of 5) to use for the duration of the course. Web 2.0 tools were incorporated in the course; students attended an orientation session where they created Gmail accounts and a blog on Blogger. An overview of Picasa, Youtube and Google Docs was given. Ongoing support was provided to the students and staff by the researcher. The researcher spent an hour in class every week to help students with any difficulties arising from the use of Web 2.0 tools and technologies. The researcher also met with the lecturer for the course regularly providing pedagogical and technological support as needed. This project involved one staff member and 20 students.

Table 3 – Observed impact of LGC on learning and teaching in the marine technology course

<table>
<tr><td>Web 2.0 tools</td><td>Technologies</td></tr>
<tr><td>Google Docs, Google Buzz, Blogger, YouTube and Picasa</td><td>Student owned Netbook/laptop, departmental iPod</td></tr>
<tr><td colspan="2">Impact on learning and teaching</td></tr>
<tr><td colspan="2">
• Teacher sees himself as a facilitator and lead learner
• Transition in pedagogy (from delivery to social and collaborative)
• Learner Autonomy
    • Access to types of content/learning material, ownership, active engagement (learner generated artifacts), social and collaborative, peer-peer feedback, support and scaffold
• Increased team work, engagement and quality of work when compared to student work from past years
• Blurring of informal and formal learning context and formation of learner community
• Merger of ‘theory’ and ‘practical’ as an authentic learning environment
• Assessment had to be redesigned and a marking rubric
</td></tr>
</table>

Certificate in Automechanical Engineering (CAME) (Level 2-3)

The CAME is a foundation level course that has no pre-requisite for entry. As a result, the course has a high number of students who are seeking another chance to a formal qualification. A high majority of the students who enrolled in this course dropped out of school probably because of the ‘boring factor’ and the passive role they played in the learning process, where learning is seen to be a spectator event. These students most likely fell victims to their own active social life where they played a more inclusive and active role.

Students accepted on the course were sent a letter stating they needed to have a Netbook with a webcam and wifi capability. Students who could not afford to buy one were loaned one from the institutional pool to maintain equity and to avoid disadvantaging any student due to their economical background.

The researcher was involved in setting up this course (Semester 1 and 2, 2010) mainly working with the 4 staff on the facilitation and assessment aspect of this programme. Web 2.0 tools such as Google Docs and Blogger were integrated in the learning process. And students were provided with portable digital cameras for use in the class and in field trips that were arranged by the teaching staff. This project involved four staff members teaching a cohort of 80 students.

Table 4 – Observed impact of LGC on learning and teaching in automechanical engineering course

Web 2.0 tools	*Technologies*

Google Docs, Google Buzz, Blogger, YouTube and Picasa	Student owned Netbook/laptop, flip camera and student owned devices (camera)
Impact on learning and teaching	
• Teachers see themselves as facilitators of the course • Transition in pedagogy (from delivery to social and collaborative learning) • Learner Autonomy • Access to types of content/learning material, ownership, active engagement (learner generated artifacts) within defined scaffold and guideline, social and collaborative, peer-peer feedback, support and scaffold • Increased team work, engagement, self-esteem and confidence • Blurring of informal and formal learning context and formation of learner community • Merger of 'theory' and 'practical' as an authentic learning environment, students build a cart as a part of embedded assessment • Assessment had to be redesigned into small manageable learning packs	

Certificate in Civil Engineering (Level 4)

In semester 2, 2010, a project was established to explore the affordance of iPads with the civil engineering students and two staff. The staff and students involved in the project were each given an iPad to use for the duration of the course. The project was originally designed to replace the mono-functional scientific calculator that the students were required to buy that cost them 450NZD. The iPad however provided other opportunities that could be utilised in the learning process. As a result, a set of Web 2.0 tools were integrated in the course. The researcher worked alongside the students and staff providing assistance at a technological and pedagogical level. Web 2.0 tools used in the course were Google Buzz, Google Docs, augmented reality apps Theodolite, Blogger and document editing and creation apps for the iPad such as Documents 2, which also allowed synchronization with online services such as Google Docs. 18 students were involved in this project along with two teaching staff.

Table 5 – Observed impact of LGC on learning and teaching in the civil engineering course

Web 2.0 tools	*Technologies*
Web Apps: Google Docs, Google Buzz, Blogger, Youtube and Picasa iPad Apps: Documents 2, Buzz, Theodolite, scientific calculator (m48),	Institutional iPad (Gen 1, 16G wifi model), portable 3G wifi modems
Impact on learning and teaching	

• Teachers see themselves as facilitators of the course • Transition in pedagogy (from delivery to social and collaborative learning) • Learner Autonomy   • Access to types of content/learning material, ownership, active engagement (learner generated artifacts), social and collaborative learning, peer-peer feedback, support, scaffold and ubiquitous access and connectivity, learner generated context (bridging the learning context) • Increased team work and engagement • Instant validation of result for students when out in the field • Blurring of informal and formal learning context and formation of learner community • Assessment had to be redesigned and an assessment rubric had to designed

Graduate Diploma in Higher Education (GDHE): Social Learning Technologies (SLT)

The SLT is a staff capability development course for use of technology in education. SLT before its redesign was taught as a block course, where staff attended a 4-day program delivered on-campus. The researcher was involved in the redesign of the SLT course (early 2010) and co-facilitated it in semester 2, 2010. This involved seven Unitec staff and one external student. Learning in the SLT course was facilitated by establishing an internal community of practice that focused on building relationships with/between students and enabling learner-generated content in the learning process through the use of Web 2.0 tools and mobile technology such as Twitter, learner created blogs and other Web 2.0 tools the learners explored on their own as a part of the course. All students in the course were provided with an iPhone 4 to use for the duration of the course. The full SLT course outline, requirement and assessment outline can be accessed here.

Table 6 – Observed impact of LGC on learning and teaching in the SLT course

Web 2.0 tools	*Technologies*
Web Apps: Moodle, Twitter, Wordpress, YouTube and Picasa iPhone Apps: Twitter, Mail, Safari and various other apps	Institutional iPhone 4 (16G), student owned laptop/Netbooks/mobile devices
Impact on learning and teaching	

• Role of the facilitator in the course was of a technology steward
• Learner Autonomy
    • Access to types of content/learning material, ownership, active engagement (learner generated artifacts), social and collaborative learning, peer-peer feedback, support, scaffold and ubiquitous access and connectivity, learner generated context
    • Full learner control and direction within the requirements and confines of the course.
• Increased team work and engagement
• Formation of PLN through the use of Twitter and blog
• Blurring of informal and formal learning context and formation of community of practice
• Learner-generated content as a pedagogical change agent (Cochrane & Narayan, 2011)	

Discussion

The six projects discussed in this paper provide a snapshot of the impact making learner-generated content an explicit course outcome had on the courses, learning and teaching in general. Figure 1 highlights the alignments that were observed and is discussed further in this section.

The six projects made use of a variety of Web 2.0 tools (Google apps, Twitter, Blog, iPhone apps, geo-tagging etc) and technologies (iPad, iPhone, iPod, flip camera, Netbook etc). The radical pedagogical changes noted in these projects were not because of the technology itself, but rather how it was used, thus pedagogy played an intricate role in the process. Because technology is able to sit comfortably even with old pedagogies is perhaps its biggest weakness (Reeves, 1997); technology alone is not capable of creating a transition in pedagogy, however it plays the important role of an enabler in the process. By making learner-generated content an explicit course outcome, the teachers in the projects had an outcome of their own to achieve which drove the entire process. 'What can I do differently to enable my students to create content?' became the main question for the teachers in designing and facilitating learning. This is where teachers involved in these projects started exploring effective use of Web 2.0 tools and alternative pedagogies for use with their students to encourage content creation and participatory learning. Due to the 'ease of use' factor and social and participatory nature of Web 2.0 tools, content creation can either be an individual activity or a social process, where content is created collectively through exchange of ideas and negotiated understanding. However, because Web 2.0 tools and artifacts created have open access, individuality slowly demises and becomes a social process.

The learner-generated content as a course outcome and the affordances of Web 2.0 tools coupled together became the pedagogical change agent. The six projects made a gradual transition from traditional lecture model learning and teaching to situating learning within social constructivist pedagogies. Making learner-generated content as a course outcome was noted to have an impact on all four teacher competencies (i) design, (ii) facilitation, (iii) assessment (iv) evaluation and the role, responsibility and engagement of the learner in the learning process.

The reverse engineering effect

The end goal in each project was to prompt learner-generated content, hence the teachers in the projects had to make radical changes to the previous course structure they had followed, in some cases, for years. A high degree of pre-planning was required to embed active learning components in learning activities that required students to think critically and work collaboratively. These design changes had an adverse effect on the facilitation of the course. Again because the students are creators, where the role is reversed, the teacher's role was observed to be that of a facilitator or a guide, who provided 'just-in-time' advice, motivation and encouragement. This reversal of roles also gave students freedom/autonomy and ownership (student video), thus the formal and informal boundaries of learning were observed to have been blurred, as students interacted with information, advice, people and content beyond the four walls of the classroom. In cases students undertook group activities at home over the weekend and in real work places, recording these situations using their own mobile phones or digital camera and sharing it on YouTube. This shows that given the opportunity, students can create a learning context (learner-generated context (Luckin, et al., 2008)) for themselves that is conducive to their own learning preference and at the same time creating authentic context (Herrington, 2006) for other students in the class to engage and learn from.

The learner's participation and interactions in these formal and informal learning spaces had to be considered, hence there were implications on how students were assessed. In all six projects there was a shift from summative assessment techniques to formative and these were mostly portfolio based using a blog. This is where student communities and personal learning networks (Siemens, 2005) were formed as students followed each other in the class and included subject experts from around the world on their blogs and in some projects using Google Buzz and Twitter. This also provided a platform for continuous interaction and an opportunity for peer-scaffold and feedback amongst students, as well as a platform for the teacher to provide feedback and guidance. The interaction between the students and the student and teacher using the Web 2.0 tools provided a platform for continuous evaluation for the teachers in the project to assess the effectiveness of the course and places where improvements were required. Normally courses are evaluated at the end of their duration, when students fill out a questionnaire that elicits student perception on how the course could be improved; in the six projects described, evaluation was embedded within the learning process and this happened regularly.

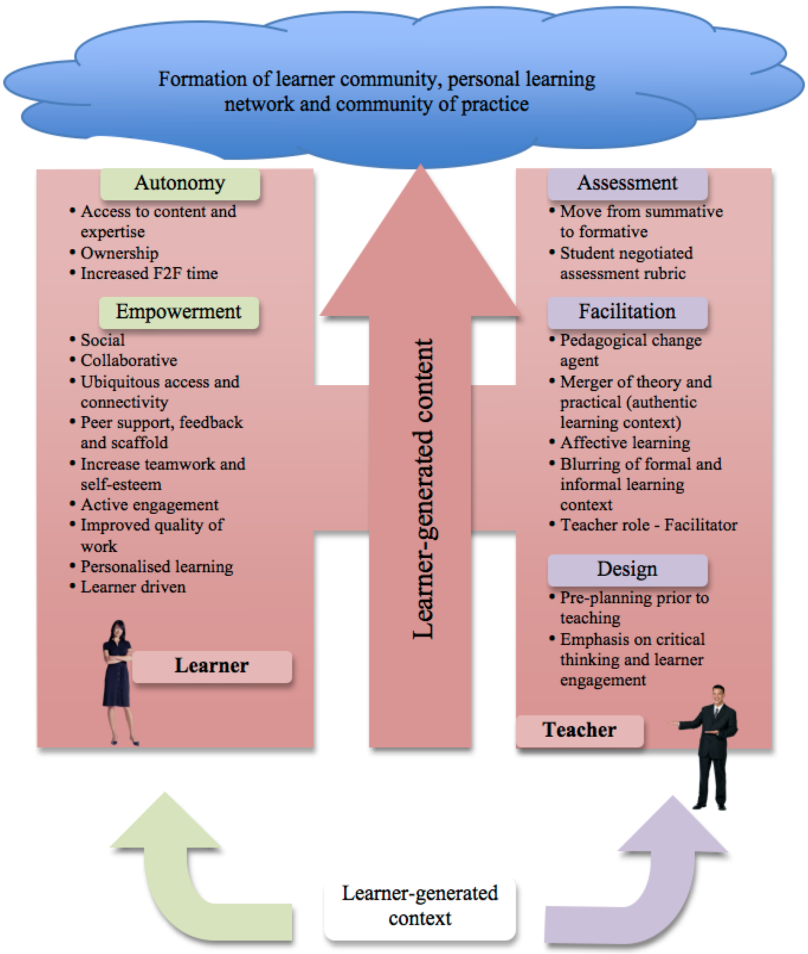
JISC (2011) project report titled "Transforming curriculum delivery through technology" outlines the impact integration of technology had on curriculum delivery as:

Table 7 – Impact integration of technology on curriculum

Efficiency gains and quality	*Learning and teaching enhancements*	*Transformation*
○ Streamlines processes ○ Quality improvement	○ Choice, access and flexibility ○ Authenticity and employability ○ Assessment and feedback ○ Participation, retention and achievement	○ Institutional change ○ Wider influence ○ Learner-centred landscape

While the report attributes these transformations to the use of technology, a deeper look into the projects that made up this report shows that it was rather how the technology was used that made the real difference. In several projects outlined in the report, technology was used to engage learners into creating content as a part of the course. Thus it is the overarching arm of participatory pedagogies that outlined effective use of Web 2.0 tools and technologies in the design of the projects discussed in the JISC report or simply learner-generated content as a course outcome.

Figure 1 – The impact of making learner-generated content a course outcome



Conclusion

Just as Seidel (2011), adjusted his teaching style to suit the interest of the students he was teaching by making Hip Hop the core driver of learning in the juvenile prison, the educators, using emerging technology, have to adapt to new practices and pedagogy to engage the students and make effective use of the Web 2.0 tools. Teaching is as important as learning, thus the learner and the learner's role and the teacher and the teacher's role are equally important and this needs to be reflected in the learning process. Traditional teaching paradigms place an emphasis on the teacher and its role; the learner's role is at a minimum or is as a 'spectator'. The findings from the six projects discussed, outlines that just the one small change of making learner-generated content an aim for the course can help align several processes and practices in learning and teaching. In all six projects learner-generated content proved to be the pedagogical change agent that brought into question many of the old (traditional) practices staff involved in the projects had used for years. This slowly brought about a transformation that not only impacted the teacher but also had positive effects on the students and learning and teaching in general.

While learner-generated content pedagogy or Pedagogy 2.0 was the core driver in the projects, technology played an important role, as the relationship between learner-generated content and technology cannot be differentiated. They formed a symbiotic relationship in the process. The willingness of the staff involved in the projects to try ‘something new’, the change in mindset when it came to learning and teaching and the researcher’s timely intervention with appropriate pedagogical and technological advice within the CoPs all played an important role and influenced the outcome.

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Benchmark yourself: Self-reflecting about online teaching

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Teachers need effective online teaching and course development skills to engage higher education students in meaningful, socially contextual, challenging and engaging learning experiences. To develop these skills, academic teaching staff typically attend professional learning activities, such as workshops to investigate online learning and strategies, engage in one-to-one consultations with online learning experts, and analyse practical exemplars. Online teacher/designers are often perplexed by the transitional conundrums between the modes of on-campus and online teaching, and grapple with how to endow online learning contexts with the same qualities of good on-campus learning contexts. Many online teachers and designers of online courses are self-taught whereas others rely on institutionally-provided courses, workshops and seminars to extend their online teaching skills. This paper reports on a utilisation-focused evaluation methodology (Patton, 1997) that was adopted to develop a self-reflection rubric tool to guide academic teaching staff in the evaluation of their own online teaching and course development skills.

Keywords: online teaching, self reflection, rubric, benchmarking, professional learning

The quality of online teaching

Are you a good online teacher? What makes you a good online teacher? Can you design an engaging online course? How would you know if you had designed a meaningful, challenging and engaging online course? How do you devise online learning environments that are socially contextual and imbibe humanistic qualities for both the teachers and the learners? These are some of the questions teachers in online or blended learning environments typically ask themselves.

The process of online teaching occurs within online environments which have been specifically designed for student learning to occur. A good online learning and teaching environment requires essentially the same qualities that exist in on-campus contexts, but the difficulties for teaching staff often lie with the successful transition between the two modes. Effective online teachers aim to improve their abilities in the art of transition by developing their own online teaching skills through a range of resources (Bright, 2007). To develop engaging online learning environments, teachers may utilise professional learning opportunities via workshops, pedagogical guidelines or exemplar courses, some of which promote the process of self-reflection and self-evaluation (Bell & Gayle, 2009). As it is with on-campus teaching, the process of reflecting on one's own online teaching and course development skills can engender a critical awareness of the characteristics of high quality learning environments. However, without some guidance as to what to reflect upon, the new or developing online teacher may face difficulties. Benchmarks may be required. It is not that online learning contexts require new and unique qualities, but rather ways in which to effectively bring these qualities from an on-campus to an online environment. To guide teachers in their design and teaching of online courses, a number of frameworks, guidelines and principles have been created (Herrington, Oliver, & Herrington, 2007; Kerns et al., 2005; Salmon, 2004; Van Duzer, 2002). Nevertheless, the quality of online teaching is also contextual; dependent upon the institution's staff, students, resources, values and goals. To promote the development of effective online course development and teaching skills, an institution would be best served by acknowledging advice from online learning experts *and* by tailoring such advice into a locally developed tool, designed to guide academic teaching staff in the self-directed evaluation of their own course development and teaching skills.

Background

The initial design of the MOOBRIC was driven by Avondale College of Higher Education's desire to provide reflective assistance to its staff and to move towards a better understanding of online learning within its particular educational niche. This change of direction enabled the institution to respond to changing demands of its students and staff.

Avondale College of Higher Education is a private, not-for-profit Higher Education Provider (HEP) of tertiary education in a Christian context. Avondale's educational delivery emphasises the balanced development of the whole person, including the intellectual, social, physical, aesthetic, and spiritual dimensions of the self. Its education is centred in ethical values, and seeks to inspire students with a vision of global and community service to make the world a better place. The demand for values-based higher education of the kind offered at Avondale is demonstrated by enrolment growth of over 50% since 2004.

Avondale's emphasis on high ethical standards is evidenced in documentation at all levels of the organisation. For example, a stated Graduate Attribute is that students possess high ethical standards including an orientation to service. This emphasis on high ethical standards is further evidenced in each School and Faculty's strategic plan with each unit outline including at least one outcome directly related to ethics. Further, all students in undergraduate coursework programs, whether in the Arts, Humanities, Education, Nursing, Science or Theology typically complete at least three units specifically concerned with ethical standards and related themes. These units are available in face-to-face and online mode and all teaching staff complete a self-reflection survey at the end of teaching period in which these units are delivered.

Avondale is seeking to extend its reputation for teaching quality via the development and application of innovative approaches to teaching and learning that include adopting best practice approaches in the use of appropriate technologies in program delivery. The initial development of a rubric tool that can be used to self-reflect on and self-evaluate one's online teaching and course development skills provides one current example of innovative teaching practices being explored by a number of teaching academics at Avondale.

This paper reports on the initial development of a rubric tool that can be used to self-reflect on and self-evaluate one's online teaching and course development skills. The rubric tool is intended to be both educative (assessment *for* learning) and evaluative (assessment *of* learning). Since the institution for which this rubric was developed uses Moodle as a Learning Management System, the rubric is termed a "MOOBRIC".

Development of the MOOBRIC

The MOOBRIC has been developed using a utilisation-focused evaluation methodology (Patton, 1997) which enabled the intended users of this tool to initiate and contribute to its development. The researchers became facilitators of the evaluation process which led to the construction of the MOOBRIC. The aim of the rubric is to provide a benchmark by which online teaching and course development at Avondale can be developed and evaluated. The development process of the MOOBRIC was driven by the needs of the academic teaching staff of the institution who requested guidance on how to recognise the qualities of an effectively designed online course and how to teach at a high quality within such courses. Teaching staff typically asked how to "marry a spontaneous teaching style with online learning that appears structured, static, frozen" and how to "replicate the warmth of the face-to-face classroom". Based on recent research conducted at Avondale (Northcote, Beamish, Reynaud, Martin, & Gosselin, 2010), effective online courses at this institution were deemed to be those that enable both the personalisation and humanisation of teaching and learning processes (Hudson, 2002; Jacobson, 1993; Keough, 2005) within a social community where the expression of teacher and student personalities is welcomed (Paxton, 2003; Richardson & Swan, 2003). These qualities were incorporated into the MOOBRIC which aimed to articulate how such qualities could be operationalised and situational (Patton, 1994).

Feedback about the original version of the MOOBRIC was gathered from some of the main stakeholders in online education at the College: administration and key faculty teaching staff. This feedback indicated that descriptors for each level of the rubric needed to be more succinct and less reliant on the users' understanding of educational terms. Furthermore, feedback at this initial stage provided confirmation that online courses at the College should continue to promote lifelong learning processes for both students and academic teaching staff.

The MOOBRIC is currently undergoing a second round of development, during which feedback data are being gathered from academic teaching staff at the College, colleagues from other national and international universities, and students enrolled at the College. These participants in the research process have been asked to provide feedback about the structure, content and functional application of the MOOBRIC. To date, feedback indicates that the MOOBRIC is valued for its potential as "a teaching tool for traditional classroom based academics moving to online environments" and for "getting staff to self assess and progress their development". An ongoing evaluation cycle continues to guide the development of the MOOBRIC.

Function of the MOOBRIC

The MOOBRIC supports teachers with varying degrees of online teaching experience and expertise, from beginning through to advanced stages. The MOOBRIC design identifies three levels of expertise or stages of development: the "Muddler" (early stage), the "Meddler" (intermediate stage) and the "Moodler" (advanced stage). The overall structure of the MOOBRIC is based on Mishra and Koehler's (2006) Framework for Technological Pedagogical Content Knowledge (TPACK). Drawing from this theoretical framework, the MOOBRIC includes statements describing the skills and pedagogical, content and technological knowledge effective online teachers and course designers could be expected to possess (see Figure 1).

		Muddler	Meddler	Moodler
1	**PEDAGOGICAL KNOWLEDGE**			
1.1	**Learning activities**	←	Purpose, Alignment, Student-centredness, Engagement, Variety	→
1.2	**Assessment and evaluation**	←	Information, Submission, Variety, Marking, Feedback, Evaluation	→
1.3	**Communication and interaction**	←	Strategies, Facilitation, Community, Expectations, Monitoring	→
1.4	**Support, guidance and mentoring**	←	Orientation, Guidance, Additional help, Trouble-shooting, Mentoring staff	→
2	**CONTENT KNOWLEDGE**			
2.1	**Presentation of content**	←	Organisation, Structure, Sequence, Teacher as learner, Metacognition	→
2.2	**Materials and resources**	←	Quantity, Quality, Currency, Guidance	→
2.3	**Multiple perspectives**	←	Multiple sources, Novice to expert, Expert voice	→
2.4	**Research**	←	Internal research, External research, Lecturer's research, Student research	→
3	**TECHNOLOGICAL KNOWLEDGE**			
3.1	**Management**	←	Site management, Availability, Format, Placement of resources and activities, Personal profile, Student numbers, Student monitoring, Backup	→
3.2	**Media**	←	Variety, Media purpose, Integration, Technical guidance, Development of digital literacy	→
3.3	**Choice of tools**	←	Resources and activity tools, Schedule, Feedback mechanisms	→
3.4	**Look and feel**	←	Aesthetic quality, Navigation, Teacher presence, Community	→

Figure 1: MOOBRIC Online teaching and course development self reflection rubric

Based on these three areas of content, technology and pedagogy, descriptive statements have been developed to identify knowledge and skills associated with effective online teaching and course design. These descriptive statements can be used to guide the online teacher's self-evaluation of their knowledge and skills, and to provide guidance about how to make the course more engaging for students. For example, the statements which inform the use of communication and interaction strategies, in the pedagogical knowledge component of the MOOBRIC, describe how online tools are used to share information, construct knowledge and discuss ideas (see Figure 2). The statements have been informed by the work of other online educators and educational theorists including Van Duzer's instructional design tips for online learning (2002), Biggs' theory of constructive alignment (2003); Salmon's advice about online learning and teaching (2004); and Herrington, Oliver and Herrington's constituent elements of online learning settings (2007).

1.3	**Communication and interaction**	**Strategies:** News Forum is used to distribute messages at times throughout the teaching period.	**Strategies:** News Forum is used at least weekly. Standard forums are used for sharing information, assessment and/or discussion. Some Web 2.0 tools (wikis, Facebook, Twitter, etc.) may be used.	**Strategies:** News Forum is used regularly. Varied types of forums and some Web 2.0 tools (wikis, Facebook, Twitter, etc.) are used for sharing information, assessment and/or discussion.

Figure 2: MOOBRIC descriptors of communication strategies

Within each Faculty and School at Avondale, staff will be encouraged to collaboratively analyse and utilise the MOOBRIC to gain a deeper understanding of how to develop effective online courses and how to facilitate learning within such courses. By identifying their own skills, it is envisaged that the MOOBRIC will empower academic teaching staff to drive their own professional learning processes by seeking out informal peer coaching and mentoring, and formal learning opportunities. As teaching staff begin to adopt the messages incorporated in the MOOBRIC, evaluation research and action research opportunities may also flourish in which teaching staff use the MOOBRIC to reflect upon, chart improvement paths and gather data to support their individual development plans and Faculty professional learning programs.

The future of the MOOBRIC

In the future the MOOBRIC will be provided online to give free access to other educators outside of Avondale. It is envisaged that the online version will allow for an interactive experience in which a participant can expand the areas that are of current interest to them and to leave the other areas collapsed, letting the plethora of detail remain hidden until required by the current user. A printable version will also be available to allow the user to take their current investigations away with them for later perusal and self-reflection.

Furthermore, the online version of the MOOBRIC will incorporate a function to gather feedback from its users to enhance future iterations of the tool. A questionnaire will be offered, giving opportunities for teachers and designers of online courses to comment on their use of the MOOBRIC, in particular how use of the MOOBRIC may have influenced their practice and, hence, engagement with the process of teaching, learning and course development in the online context.

It is envisaged that the MOOBRIC will be used as a self-reflective device (not a big-brother, top-down quality assurance imposition). It is intended that it will be a dynamic and iterative tool, whose attached examples can change and evolve in response to staff and users' feedback (especially in the online version). It is intended that, along with the more interactive online version, there will be a printable version in which all examples are expanded. The website may also offer an archive of past editions, in order to allow for comparison and the preferences of those who become attached to using a particular version. Additionally, a news section is envisaged, which will chronicle changes and the philosophies underpinning them. Therefore, the online MOOBRIC news section will serve dual purposes; firstly, to inform users of changes and reasoning; and secondly, it is expected that the MOOBRIC will be treated as a starting point which individuals and institutions may alter to suit their own needs.

A generic version of the MOOBRIC will be presented at the conference with opportunities for conference delegates to offer feedback about the tool's further development as well as to consider how the tool can be used in their own institution.

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The Role of the Tutor in Online Learning

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This study investigates the beliefs of online tutors who participated in focus group interviews to discuss issues that impact on positive engagement within an online Bachelor of Education Degree. Just as teachers engage students in discussions and learning activities on campus, so it is online. However, online teaching is not without its intricacies and complexities: students have rarely met one another or their teacher; communication is void of visual clues; the managing of time can be problematic; and there can be difficulties in monitoring individual learning. As in any teaching situation, the role of the online educator is crucial in ensuring effective learning outcomes. To be effective, teachers require much more than technical competence. They need to have an understanding of the dynamics of online communication and interactions and need to learn effective ways of facilitating and teaching online. This paper reports some initial findings.

Keywords: online learning; tutor training; role of online tutor; online engagement

Background

The School of Education at Curtin University has been preparing professionals for practice in a wide range of education-related fields since 1974, with a history of delivering courses utilising different modes: face-to-face, external paper-based, external online and more recently blended learning environments in the majority of the face-to-face courses. In 2009 a new delivery mode for the Bachelor of Education (B Ed), Primary Degree emerged whereby the course is delivered totally online with the exception of the professional practice components (Kuzich, Groves, O'Hare & Pelliccione, 2010).

The B.Ed course is offered in three ways with each having the same structure and units regardless of whether it is taught on campus, regionally or online. The units match in content and assessment and all use Blackboard Academic Suite as the Learning Management System (LMS). The online iteration is offered through Open Universities Australia (OUA), with open access to students for six of the eight first year units. Students from all states in Australia and internationally are attracted to the course and some units in particular attract enrolments of over two thousand students. These students come to study from a variety of backgrounds that are not necessarily typical of a first year university student cohort. Many have not studied for a long time, some have left school before completion of Year 12, some are in full-time work and looking for a career change, some have English language issues and in terms of the skills necessary for negotiation of Blackboard and an online learning environment, most are technologically inexperienced. Although for many of the online students, the LMS is the sole source of unit information, documentation submission of assessments and interactions between the students, the teachers and the content, considerable thought has been given to assisting student development in the use of technology and optimising the likelihood of active engagement. This has been done through a range of enterprise technologies such as Elluminate Live and Campus Pack blogs, wikis and journals as well as open source Web 2.0 technologies. Contrary to initial expectations, not all students demonstrate that they are technologically sophisticated. Indeed many students appear to be rather tentative—frightened that they could break something or lose information into cyberspace in some way—and generally nervous about learning technologies (Herrington, Schrape, Flintoff, Leaver, Molineux & O'Hare, 2010). Additionally, this course has a large teaching cohort of part time sessional staff, many of whom are new to this style of teaching. It is essential to ensure the quality of the teaching program. This paper outlines some of the relevant issues.

Introduction

Curtin University employs part-time tutors who act as a human interface between the university and its students. For the B.Ed primary online degree, each tutor is responsible for a group of approximately 75 students, giving content specific support for learning through a Blackboard site designed to encourage collaborative learning. Although studies have suggested that the ideal number for on-line tutorials is less than 25-30 (Anderson, 2004; Arbaugh & Benbunan-Finch, 2006), at Curtin this ideal teacher/student ratio of 1:30 is not supported by commercial reality. For this online course the tutorial groups have a tutor:student ratio of 1:75. These tutorial sizes of 75 students are something the course designers, tutors and students have to work with and around, but they do present an area of concern about how tutors are to maintain effective contact with their students and how to ensure that tentative students who are shy about using on-line communication mechanisms are not lost in the sheer weight of numbers. On one hand there is the formalized and structured LMS which guides students through weekly tasks and readings in much the same way as an on campus class would do and on the other, the desire to encourage students to learn through their interest in a developing community of practice (Wenger, 1999) where effective learning can be encouraged and developed. A community can only grow if there is effective interaction between various groups of people. Rogoff's (2001) research suggests that effective and deep learning occurs when instruction is focused on collaboration. Additionally, collaborative learning and working in teams is recognized as a key competency for students (Guo & Stevens, 2011). This study considers some of the issues involved in supporting effective online collaboration with large groups of students.

Background literature

The teacher of any classroom, whether it has solid walls or is virtual, has much influence in shaping the learning environment and outcomes and carries the responsibility for creating the conditions that encourage a deep approach to learning which demonstrates a dynamic and interactive "community of inquiry" (Garrison, Anderson & Archer, 2000). From the teachers' perspectives this means that they have pedagogical skills and content knowledge that allow them to manage a learning environment that develops and encourages students to think critically and to learn both independently and collaboratively. From each student's perspective, this requires higher-order cognitive processing that includes critical thinking and self-direction (Garrison and Archer, 2000).

For many staff as well as students, being part of an online learning community is a new experience. Newcomers face particular difficulties: many are new to study, many are new to this method of teaching, many are tentative about embarking upon a new endeavour and many are very nervous about their capacity to succeed. Within this online learning community, student engagement is highly valued. This has been defined by Coates as comprising "active and collaborative learning, participation in challenging academic activities, formative communication with academic staff, involvement in enriching educational experiences, and feeling legitimated and supported by university learning communities" (2007, p. 122). At Curtin, this active and collaborative learning is developed within the LMS and particularly through the discussion board where students are encouraged to support one another's learning through weekly discussion tasks.

Peer supported learning

Anderson (2006) believes that although teacher/student interaction is critically important for certain personalized learning outcomes it must be used judiciously if it is not to constrain access to formal learning through too high a cost. He sees a migration but not elimination of direct teacher-to-student interaction to student-to-student and student-to-content learning designs.

In a similar vein, and in contrast to the idea of master-to-apprentice interactions that are common in the education field, Lave and Wenger (1991) and Wenger (1999) have provided some useful insights into the apprentice-to-apprentice interactions that underpin peer learning (Juwah, 2006). Within a peer learning environment, there is no account taken of status and participants collaborate to learn with and from one another. The power of the teacher status and possible domination is removed. The key to peer learning is the mutually supportive learning environment where learners construct and express opinions, test ideas and offer and request help as required (Smith, 1983). However, this is not a process that can be left unmonitored. For learners to participate and gain positively from the experience, strategies need to be put in place to ensure that students are skilled in learning how to learn through information technology and be able to access, navigate and utilise what is on offer to develop meaningful learning (Juwah, 2006). Online tutors have a responsibility to ensure that the learning outcomes are clearly defined to allow students to take ownership of their learning, monitor their progress and evaluate their success.

Pedagogical implications for online discussion

Discussion boards and chat facilities are common tools in the online teaching and learning environment, but Mishra and Juwah (2006) found that this versatile tool is often not used to its full effectiveness and that not all students are comfortable in its use. The reasons given were cultural, linguistic or fear of inadequacy in language ability, or fear of a lack of effective skills in technology. Students in Mishra's and Juwah's study identified that they were self conscious about academic language ability; intimidated by others' better grammar and syntax; nervous of the permanence of the online written word; and lack of typing speed affecting the ability to get one's thoughts composed. Students also found that in many cases the posts on discussion boards were "irrelevant" and "unwieldy" due to the sheer volume of postings. This caused students to lose sight of the essence of the discussion (Mishra & Juwah, 2006). Unless discussions are structured properly, the online conversations can lead to little consolidation of an issue. If the online discussion is simply a forum where students share experiences without taking any account of others' opinions within their group, then the purpose of the interaction becomes more of a "read what everyone else says, but write what you think" (Wood, 2002) rather than a genuine opportunity to share, develop and consolidate ideas. Mishra and Juwah (2006) give some advice for tutors to ensure that students are given the best opportunities for successful interaction in their online discussions with the most relevant to this paper highlighted:

- Purpose, context and intended outcomes must be established
- Learners should be socialized in the effective use of a discussion board
- Links should be made to the intended learning outcomes to ensure that students are aware of the relevance of the discussion.
- Feedback, or more appropriately, feed-forward should be given in the form of a summary of the posts to assist in focusing of the learning
- When a discussion appears to be going nowhere or is irrelevant to the topic, the tutor should end that thread and create a new one steering the discussion in the right direction.

Additionally, Wood (2002) recommends the process within a Graduate Business School where students are 'required' to comment on at least two other students' comments, and are rewarded for the participation with a percentage of the overall grade.

Sense of community

Researchers have characterized communities in a range of ways often based on underlying social philosophies (Barab, 2003). A community provides a sense of belonging, identity, emotional connection and wellbeing (Rovai & Wighting, 2005). The need for belonging has been identified as one of the five human basic needs (Glasser, 1986) with a sense of place identified as being essential for online students (Brook & Oliver, 2003) perhaps even "crucial to their overall experience of learning" (Northcote, 2008, p. 677). When people feel that they are part of a strong community, they feel better adjusted, and supported, feel connected to others and share common goals that may be above their individual aspirations (Fisher, Sonn & Bishop, 2002). A strong sense of community is likely to support student learning if students feel that they are free to express their identities in an environment that diminishes feelings of loneliness or isolation (Rovai & Wighting, 2005). It appears that students have a need to feel that their individual contributions have value and can add positively to the discussion and ultimately the learning not only individually, but also the overall learning community. To have their voices heard, there needs to be evidence of reciprocal interactional activity. However, it is also important for tutors to have a similar sense of belonging. They too need to feel that they are given opportunities to contribute and that they can value add to the learning opportunities (Vlachopoulos, 2008).

The role of the online leader

As identified by Vlachopoulos, (2008) the role of online educator has been defined in a wide range of ways including tutor, teacher, facilitator, promoter, manager, discussion leader, negotiator, and E-moderator. Whatever name is given, the role is a complex one and the challenges should not be underestimated. Many tutors who are new to online teaching, without relevant background or experience of online pedagogy are often asked to contribute to the development and delivery of courses (Vlachopoulos, 2008). There is a real danger that these members of staff are being asked to run before they can walk without a clear picture of what the role looks like and whether it is very different from what they have previously experienced. VanLehn, Siler, Murray, Yamauchi and Baggett (2003) argue that learning opportunities are just that – opportunities to learn and that not all students learn when provided with those opportunities. Tutors have to establish whether a different approach is to be adopted or if their familiar strategies will be effective in the development of learning.

Many researchers offer contributions to the research of online learning. Salmon (2003) describes the process as developing over five stages: access and motivation; socialization; information exchange; knowledge construction; and development with each stage demanding different tutor skills. Collison, Erlbaum, Haavind and Tinker (2001) believe that the role of the tutor is to guide and moderate. Facilitation of learning rather than leading is developed through appropriate communications.
Berge (2006), identifies four categories: *social* (where students are encouraged in a friendly, social environment with teachers affirming and recognising input and providing opportunities for group cohesiveness to develop); *managerial* (provision of objectives, setting of timelines and defining of rules and roles); *technical* (ensuring all participants develop confidence in the network systems and software) and *pedagogical* (where teachers provide insights from their subject knowledge and experience using questions and probes to encourage student responses). Similarly, Hootstein (2002) suggests a model where tutors put themselves in four different "pairs of shoes" those of the *instructor* – providing informative feedback; *social director* – fostering collaborative learning; *program manager* – developing and providing study guides; and *technical assistant* – helping the learners to become proficient with the technology.

This research identifies what online tutors consider as the significant aspects of their individual roles specifically relating to interaction.

Methodology

A qualitative interpretive approach as described by Merriam (2002) was selected because the focus was on the perceptions of the individuals who shared the experience of online teaching in the one course. This approach allowed a focus on the nature of the experience of being an online tutor and how these tutors accounted for the decisions that they make to support engagement within their online teaching groups.

As identified earlier, many teaching staff are new to online pedagogy. To support them at Curtin University, training is provided before each or the four study periods. An additional training session is offered for those tutors who also coordinate units. These training sessions are set up to practise what we preach in that groups work together to provide peer support. Experienced tutors work with less experienced tutors being offered a range of experiences over a six-hour session. These include such things as presentations and discussions around the theoretical underpinnings of online pedagogy, strategies for being an effective tutor, technology support and specific information around the particular unit that they will be teaching within for the relevant study period.

A group of 52 tutors attended a training day three weeks before the start of study period 2, 2011. These tutors would all be teaching in a range of units for the coming study period. As part of the on going development of the training process, it was decided to ascertain what issues were pertinent to this group of tutors. Participants took part in five separate semi-structured group interviews that were audio recorded and transcribed. There were around ten members in each group. The transcripts were analysed using a content analysis approach whereby the common issues and themes were identified.

Findings and discussion

The 52 tutors came to this training session with a range of educational qualifications and experience. All were qualified teachers with 35 holding undergraduate qualifications, 12 with Masters degrees and five with

Doctorates. Ten tutors were just about to commence their first study period of online teaching and six tutors had already completed eight study periods, having worked in a range of units since the degree commenced. The remaining 36 had a range of experience ranging from two study periods to seven study periods.

Within their groups, tutors were asked to comment on their views of online learning and teaching. They felt that the job came with a range of ups and downs.

The highlights of online learning

- Autonomous but connected

Tutors were asked to outline the most positive aspect of their online teaching role. It was generally felt that the opportunity to stay at home autonomously, without having to engage in traffic, work meetings or the politics of attending a work place each day were favourable factors. The majority agreed that they enjoyed *"watching students grow and develop over a study period"* and that they were *"surprised"* at how "*close"* were the *"relationships"* and *"connections"* that they built up with their students. Additionally they were "*delighted" and "pleased"* at how well tutors supported one another within units. They considered that there was a *"strong collegial sharing aspect to the role"* with tutors "*happy to allow others into their discussion board"* to see how they had set things up and that they felt *"welcome to use other tutors' ideas and materials.* They also stated that they benefitted from the *"intellectual challenge"* of the role while "*learning new skills"*, and working out the answers to "*thought provoking questions*" while "*assisting people to achieve their goals*".

- Flexible

When asked why they had chosen this type of teaching, the comments were very similar with the majority of tutors agreeing that the flexibility of time and place of work offered opportunities related to income in that they can *"stay at home with the children while still earning", "travel and still be employed", "study without financial implications"* and *"earn extra income".*

- Continuous learning

Other tutors welcomed the opportunity to *"be involved in teaching without the issues of being in the classroom"* and to "*be semi-retired but still involved in education"* along with an ability to be *"kept informed of the latest trends and developments in education"* and to be able to *"work with adults instead of children".* The final comments suggest an interest in lifelong learning with tutors wanting to *"expand on my IT skills", "challenge my own abilities"* and to *"develop a pathway to academia."* It also offered *"opportunities to access current academic resources such as professional journals".*

The challenges of online learning

- Large numbers

Tutors were in agreement that the role was not without its challenges with the large groups of 75 students having an impact on many aspects of the work with the marking of assignments being a common problem area with many comments such as: *"the day to day aspect of the job is great, but there is a sudden increase in workload around marking time"; "marking such large numbers in the required time frame while ensuring that I provide quality feedback is a constant issue"*; *"marking is all consuming"*; *"the volume of marking means many hours of unpaid work";* and *"marking is always such a challenge".*

- Overcoming distance

Tutors were also concerned about the distance factor for both staff and students with feelings of "*being alone"*, "*isolation"* and *"trying to overcome the distance factor to ensure that each student feels special".* Distance also means time differences that can have an impact in *"maintaining the discussion", "keeping students motivated"* as well as causing problems in *"ensuring that students continue to engage".* Tutors found some difficulty in "*keeping discussions live, when students are posting at different times*".

- Work-life balance

Time management was an aspect of concern for many. Common responses were: "*I spend many hours developing relationships with my students"; "the hours of work impact on my family life";* and *" I have to work hard to ensure that the workload does not encroach on family time".* Tutors felt that that it is a *"constant battle to support students without spreading myself too thin"* and feeling that *"while I want to support my students, I have a family who want my attention too".* One tutor explained that although she had to set time aside each day to respond and support students it was also essential to *"compartmentalize the job so that it doesn't become all time consuming".*

- Feedback demands

Tutors were agreed that the balance between giving students the amount of feedback that they wanted and the realities of the job were hard to maintain when "*students want instant feedback*". One tutor explained that it was not unusual for students to send several emails over the weekend "demanding tutor attention". She felt that some of these students can make the job "*very stressful"* with "*really unreasonable expectations".* It was also agreed that many students are very *"needy"* and often appear not to read the posts or unit materials, preferring to *"email the tutor direct for an instant response".* Tutors felt a constant need to remind students to take their questions and issues to the discussion board. The dilemma for the tutors was to do this in ways that ensured that students felt "*supported*" and "*encouraged*" and also in ways that encouraged inactive students to engage.

Interaction and Engagement

Tutors were asked to share their understandings regarding 'interaction' and any significant issues. The majority of tutors felt that engaged students were successful students and that a large part of their work involved finding ways to ensure that engagement is established and then maintained.

All five groups responded similarly, commenting that *"interaction equates with success",* and that *"the more students interact, the more understanding they will have of the content".* Related to this viewpoint, many tutors also commented that interactions should be measured and rewarded in the form of marks for participation. Similar comments were "*participation on the discussion board should be worth at least 5%*" and "*if they have not interacted they have missed the plot and if we gave marks that would keep them on the board".* One group felt that the interactions could be *"peer assessed with the evaluations earning one or two marks".*

It appears that for the teaching of pre-service teachers in an online environment, for this particular group of tutors, there were three interlinked areas of interaction: interactions between the tutors; interactions between the students; and interactions between the tutors and their students. Perhaps because these tutors were involved in a range of units, there was an overall feeling that underpinning all of these interactions was the notion of the professional culture of teaching.

- Tutor interactions

It is recognised that the role of online tutor can be a lonely one and that it is essential that tutors feel supported. Within this online B. Ed degree there are three areas that offer tutor support:

1. Four training days are offered each year where tutors work together in a collaborative learning environment;
2. A blackboard site offers tutor training packages of interactive learning modules;
3. Every blackboard unit has a 'tutor lounge' that is only available for tutors working in that particular unit. This lounge is used as an avenue to ask questions of the unit coordinator and of one another to clarify issues, offer support in areas of concern and moderate student work.

The tutors discussed their ideas around these opportunities. They agreed that being together in a learning community was very powerful in that *"I love these training sessions, I always come away feeling energised with some new ideas*", and "*I learn something new each time I come to a training session",* along with *"I can see us all improving each time we meet up. I love being part of such a large group of people striving to improve what we do".*

They agreed that isolation was an issue to overcome. "*Getting us all together is so important. It can be very lonely out there. Collaboration is such an important aspect".* Supporting this notion, *"It is great to have opportunities to share with more experienced people. I know that I can feel comfortable to ask anything".*

- Peer interactions

Tutors reported that they believed the development of peer-to-peer interaction to be an important aspect of the job, but that it was not always easy to achieve. Their students often have busy lives outside of study and need to be shown engagement as an important asset to their learning. It is not about responding to emails.

> Many of my students just want a quick fix answer and want to get me to always respond to them by email. I work hard to encourage them to share on the discussion board. I try to stress the importance of contribution as a tool to learning.

> They have to learn that it is not about feeding them the answers

> Needy students seem to not want to be active participants. They don't realize that always getting the answer from me is not going to help with real understanding. If I can't get them active on the board, they stay needy students and are unlikely to be successful.

One of the tutors with a background in high school teaching felt that many of his students reminded him of some of his school students in that *"they are often too quick to say 'I don't understand'. They don't take the time to read things through or to practise pulling out the information that is there".* He felt that they needed to be encouraged to take the time to see what others are saying and to respond to that. He believed it was necessary to develop a *"culture that involves giving and taking constructive criticism from their fellow students".*
One tutor believed that *"For those students who have difficulty articulating their thoughts"* it was essential that she *"try to encourage a supportive, safe environment".* This was strengthened by a need for students to *"demonstrate understanding and realize that it is not about regurgitation. Conversing with their peers is how they will get to this understanding".* Another tutor recognized interaction as an avenue of supporting and developing his students who did not have English as their first language with "*the ESL students really benefit from conversing online. They discover that other students support them and correct them".* It was suggested that opportunities need to be created that are more like an on campus workshop where the conversation is on going and everyone *"jumps in when they want to contribute".* In this way students are able to "*feed off one another's ideas and develop*". However, because students and tutors operate within different time frames around Australia as well as overseas, it was agreed that asynchronous discussion was not particularly conducive to student to student collaboration, with many tutors stating that they were investigating ways of creating synchronous opportunities for engagement.

- Links to the professional culture

Some tutors felt that *"teachers are only part of the learning"* and therefore *"those students who engage with one another on the discussion board develop skills in collaborating around the content".* This group also believed that these *"collaborative skills would be essential in the development of professional attitudes and behaviours".* They felt that if teachers did not *"learn to work in teams while they were studying",* then they may well *"struggle when they had to be part of a school team".* As part of their professional development that had to learn to *"take feedback"* and to "*develop professional skills".*

> Teaching is a culture…and they have to understand what this means. When they collaborate on a discussion board with peers who come with a range of experiences this supports the development for them. It can't always be got out of a text book. They have to learn to bounce around their ideas to come to a shared understanding of the issues. This is what they will need to do in the school setting.

It was felt that some students wanted *"spoon fed",* and that this was not a good way to develop the independence that they would need do demonstrate as teachers.

> They have to learn to work out what is being asked of them and develop strategies for problem solving. I keep throwing it back to them. 'When you are responsible for a group of 30 children, there will be no one to ask how do I do this'. They need to start working out how to do things for themselves.

- Interactions between students and tutor

Several tutors highlighted areas of concern around how best to relate to and support their students. *"I feel that many of the first year students needed a lot of tutor guidance before they can be successfully engaged". "They need so much help with interpretation…and need so much direction". "Some students are so nervous of technology that it holds them back". "…they just want everything handed to them… …they need to learn to* *keep to guidelines and the repercussions of not doing so".*

Tutors discussed ideas of what it should look like and gave some common responses agreeing that the newer students were the ones who probably needed the most support.

> It is not about feeding answers…it should be about trying to create a workshop setting where everyone feels comfortable about 'jumping in'….give fewer choices to students in the beginning…and increase the choices as confidence grows… they have to learn to work together…contribute and complement one another…learn to take constructive criticism.

One tutor explained that often it was not anyone's fault that the interaction was not as successful as it might be because sometimes the tasks that students are asked to do *"mitigate against quality interaction".* He was supported in this by a range of responses. *"The tasks need to encourage interaction rather than just posting ideas about something". "We need to be offering more open ended tasks…asking them to work out what is the best way". "…make professional judgements...use of Bloom's taxonomy". "…bringing it back to how this might work in the classroom"* and *"…I like to give examples of what I did in the classroom".*

A number of tutors also felt that the LMS set up was not conducive to the interactive process with *"too many posts taking too long to read"* and forums being too *"cumbersome".* One tutor felt that perhaps in the *"maze of posts"* some important messages get missed. He felt that as an on campus tutor, the relaying of important information was more successful in that

> You stand out in front of the class and tell them, 'this is important information' and generally they sit up and pay attention. It is much trickier on line, and I have no real way of knowing if my message has been heard or understood.

It was also felt by some that clicking between discussion board threads was *"clunky and not user friendly".* Although tutors have the opportunity to create discussions boards to their own preferences it was felt that "*the set format impacted on opportunities for innovations"* that they might want to experiment with.
It was also felt that perhaps many tutors actually expect more collaboration than many students are able to give in that

> The equivalent face to face cohort attend a two hour class for each of their units, and do not have much engagement out of that time. Whereas the online students are expected to be online several days of each week, and if they are not, we are sending out emails asking them where they are. Perhaps this is an unreasonable expectation.

Some tutors believed that there could be a problem with mixed messages and that perhaps the OUA marketing team was giving students a different message about online learning than the reality presented in that

> When we look at the adverts it suggests that students can study 'anywhere' at 'any time' and take however long they like. When they get here they discover that it is not as flexible as they think. We have timelines, deadlines and expectations. Some of them find that really hard to deal with and they are not ready to commit to the amount of active participation that we expect from them.

Discussion and conclusion

Universities place a high priority on positive student experiences. These experiences are enriched by a sense of connection with the university as well as with fellow students. The building of a sense of belonging is important in fostering and enhancing engagement. However, engagement in a learning community is not always considered in positive terms. It can be thought of as just another chore to complete within a busy student's working life. To increase the likelihood of positive student engagement, both with their university and with one another, it is important to have teaching staff who understand how best to support and develop students through the use of a range of effective online teaching and learning strategies. This study is part of PhD research that investigates the online practices within a Bachelor of Education degree. This particular research investigated the beliefs and practices of the online tutors who are involved in the teaching of this degree. Several areas were identified.

It was generally agreed that tutors felt supported in their role, and valued the opportunities for collaboration and improvement of practice. Like most jobs, the work of an online tutor has plusses and negatives. Although tutors are able to work from home having flexible hours and conditions, they can have problems in separating work from home. For some, there appears to be difficulty in stopping the work life from taking over the home life. Because of an expectation of continuous engagement by students, there is also the expected continuous engagement of tutors with the marking of student work being a particularly stressful and all consuming period of at least four weeks out of each study period. Although most tutors agreed that interaction by students was conducive to success, there were some problems identified in how to encourage and maintain engagement that was of a high quality. Part of the dilemma was in the linking of theories to classroom and school practices while developing understanding around the culture of the profession of teaching.

The role of online tutor is an important one that demands attention. When Oliver and Shaw (2003) compared asynchronous discussions with and without tutor presence, they reported that the only contextual element that appeared to significantly influence engagement was the tutor (cited in Vlachopulos & Cowan, 2010). Garrison and Anderson (2003) argue for a strong "teaching presence" in online discussions. The quality of the tutors, and therefore their training, is an essential component of this online degree. It requires on going monitoring, development and sharing of good practice to ascertain which strategies maximize the learning opportunities for students. It is important to investigate how tutors make daily decisions that impact on learning. Further research and continued investigation is required to gain further understanding into how tutors are developing and what further support is required to assist this development.

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Equipping Lecturers for the iRevolution

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In this paper we explore several critical factors influencing educational technology adoption including teaching staff buy-in and the critical nature of lecturer professional development within educational technology adoption projects (Kukulska-Hulme & Pettit, 2007, 2008; Learning and Skills Network, 2009; Moser, 2007). The paper outlines and critiques the methods used to achieve this staff buy-in as the second phase of a larger longitudinal eLearning and mLearning participatory action research project (Cochrane, 2010). The overall project makes use of social constructivism as the underlying pedagogical theory driving and informing the changes taking place. A community of practice (COP) model (Wenger, 1998; Wenger, White, & Smith, 2009) has been developed as a means of guiding and supporting lecturers as they develop their eLearning skills together. Artifacts created through this process (boundary objects) were then used to bring the lurkers into the core group from legitimate peripheral participation into full participation within the project's supporting COP.

Keywords: iPad, Community of Practice, mLearning

Introduction

The key issues driving the implementation of this research project are explored in the following sections.

The modern student faces a complicated balancing act in order to succeed in tertiary study. Students are often under financial pressure, studying many courses at once while working part time. Rising prices for transportation, food and textbooks, all key expenses for students, are compounding those pressures. While this poses challenges for the students, it also poses significant challenges for those teaching them.

Business education in New Zealand is funded at a lower rate per student than many other disciplines. This causes both internal and external funding pressure for business classes to maintain large numbers; in many cases, these classes take place in tiered lecture rooms with a strong teacher focus. These conditions generally result in a didactic teaching process reinforcing instructivist pedagogy where the students are largely passive learners. Attempts to move beyond instructivist pedagogy and improve the situation by engaging students through group work, interactive discussion and activities are hampered by the layout, size and fixed nature of tiered lecture rooms that impose many challenges towards such attempts.

Within the context of business education, textbooks are often heavily relied upon as they provide a concise body of knowledge for students to build their foundations with. Lecturers tend to expect students to bring these books to class in order for the students to refer to the content and to complete exercises in a drill and practice approach. However, a quick glance around the classroom often reveals a greatly reduced number of textbooks from that seen in past years. Comments such as “the books are too heavy” and “I can’t afford it” are common reasons given when students are asked why they didn’t bring the book. In many cases and for many students, these reasons are absolutely valid. Textbooks costing below one hundred dollars are becoming rare; more often than not, prices come closer to two hundred dollars. And one has to question whether it is reasonable to expect and/or require a student weighing forty kilograms to lug ten kilograms of textbooks around with them. Technology is seen as one way of dealing with these two practical challenges (Deslauriers, Schelew, & Wieman, 2011), thus providing a potential catalyst for pedagogical change. The impact of the integration of mLearning technologies on teaching staff motivation is examined in this study.

A combination of the ‘wow’ factor generated by unprecedented consumer interest in the iPad, and its affordances of serious computing power combined with mobility, give this device the potential to be what many other electronic devices have failed to be in education: a game changer and capable of becoming a catalyst for pedagogical change bringing about the iRevolution. The iPad is much smaller and lighter than traditional tablets, while providing battery life better than the vast majority of competitors. It has an extremely intuitive interface, a large library of Apps and is very responsive thanks to its streamlined operating system and solid state storage. During the keynote address for the 2011 Worldwide Developers Conference, Steve Jobs announced that Apple had sold 25 million iPads in the fourteen months they had been on sale. Demand for the iPad comfortably out strips supply at the time this article was written. Despite a widespread lack of availability in New Zealand, a number of students bring their own iPads to class without any formal interaction with the devices. Media hype and vast sales indicate the extreme popularity of the iPad and this was one of the many reasons for its selection in this project.

This paper has two main goals: it attempts to answer the question of whether teaching staff will “buy in” to and see value in the idea of iPads in the classroom, and it proposes a model for the introduction, education and adoption of an eLearning technology (such as the iPad) to a group of teaching staff. Based upon the experience and reflection of the implementation of two semester-long student iPad projects within the Business Departments, and a longitudinal lecturer community of practice (COP) investigating and supporting the integration of the iPad into the curriculum, a generic model for technology adoption is proposed. This will be tested in further iterations of the project in the future.

Literature Review

The following sections discuss some of the foundational concepts of this research project: social constructivism, communities of practice, and mLearning.

Social Constructivist Pedagogy

According to social constructivist theory, assumptions exist around three core aspects of life. These relate to reality, knowledge and learning. It is assumed that reality is constructed purely through the activities of members of society. Knowledge is assumed to be socially and culturally constructed through interactions between individuals. Learning is assumed to take place through social activities where learners are engaged (Kim, 2001).

Social constructivism talks of the concept of intersubjectivity, where individuals form a shared understanding of ideas with others (Ernest, 1999). Intersubjectivity encourages members of the group to share their conceptions of content with the others (Vygotsky, 1978). Within the theory of social constructivism, there are said to be four general perspectives: cognitive tools perspective, idea-based social constructivism, pragmatic or emergent approach, and transactional or situated cognitive perspectives. Each of these perspectives provides a different approach to how learning is facilitated as part of the general social constructivism framework (Gredler, 1997).

The pragmatic or emergent approach was chosen for the community in this study. It is centred on the idea that there are some times when an individual approach to learning may be appropriate and other times when the collective approach will be more effective. The combination of the affordances of mobile devices and the nature of content covered pointed to this perspective as being the most appropriate. Members of the group were able to make the most of the mobility of the iPads and learn by doing on their own, or by reviewing the materials available to them. After gaining a grasp of how the devices and various applications worked, the members were able to discuss the pedagogical possibilities. This discussion, either face-to-face or electronically, generated new knowledge about how the iPads could be used in various educational scenarios. The social constructivist theory expects a significant part of the student's (and staff) learning to be achieved through group collaboration. Two key drivers in the user acceptance of technology based collaboration methods are training and social presence (Brown, Dennis, & Venkatesh, 2010). These drivers are achieved in this case through the use of the Community of Practice model discussed below.

Communities of Practice

'Communities of Practice' (COP) is a social learning theory. The concepts were proposed by Lave and Wenger (1991) while studying the apprenticeship model of learning. Wenger (1998) later further developed the concepts, and then simplified the concepts for wider contexts: "Communities of practice are formed by people who engage in a process of collective learning in a shared domain of human endeavor" (Wenger, 2005, p. 1). Though not originally intended as a pedagogical strategy or teaching technique, rather an analytical viewpoint on learning (Lave & Wenger, 1991), the concepts of communities of practice have found popularity within educational contexts. Learning supported by peers is seen to be particularly useful in a technological context as traditional centralized support structures are regularly overwhelmed and lacking in domain expertise (Sykes, Venkatesh, & Gosain, 2009).

COPs are formed by like-minded peers brought together by a common interest. The core of a COP draws in peripheral members into full participation over time, and the community's practice is reified by the production of boundary objects that can be used to broker participation within the COP with the wider community. While communities of practice often form organically and spontaneously, they can also be created intentionally and cultivated for specific purposes. Wenger's (2005) definition of communities of practice "allows for, but does not assume, intentionality" (p. 1). Intentional communities of practice share the same characteristics as organic communities of practice, but have a plan at their core, as described by Langelier (2005):

> Certain virtual communities of practice emerge spontaneously and effortlessly from the organization, while the organization intentionally creates other communities… In this instance, the organization defines and controls the community's objectives, initial activities and support and leaves it up to the community to organize itself and elaborate its own rules… Knowledge management is not left to the chance spontaneous emergence of "natural" communities but is, to the contrary, a deliberate, planned approach. (Langelier, 2005, p. 31)

The concept of intentional communities of practice has found many applications, often forming a juxtaposition between the organic nature of COPs and a specific foundational goal. Head and Dakers (2005) argue for the use of intentional COPs to form the basis for a new approach to technology education. The concept of intentional communities of practice is similar to semi-formal learning communities (Kukulska-Hulme & Pettit, 2008) but are of a more longitudinal nature, as can be seen throughout the length of the mLearning projects described herein. The concept was foundational in developing a support strategy for the research. Intentional COPs formed the hub of the collaborative mLearning projects throughout the research, linking the researcher as the 'technology steward', the course lecturers, and the students on each of the courses.

Mobile Learning

An ever-widening body of research exists in the area of mobile learning (mLearning). As with most theoretical constructs, there are many different variations on what mLearning is and what its most critical aspects are. mLearning provides the learner with an increased ability to take their learning environment with them as they move (Barbosa & Geyer, 2005). mLearning is said to have two distinct aspects to it: the use of mobile learning devices, and the mobility of the people and the knowledge themselves (Sharples, Taylor, & Vavoula, 2007). Sharples et al. (2007) provide the following definition for mobile learning: "the processes of coming to know through conversations across multiple contexts amongst people and personal interactive technologies" (p. 225).

Traditionally, the mLearning research field has centred on the use of mobile phone and PDA (Personal Digital Assistant) devices. Previous research into the use of these devices in an educational context has indicated that students can have difficulties using these devices due to their small screen size (Corlett, Sharples, Bull, & Chan, 2005; Waycott, 2004). Traditional keypad and stylus methods of data input have also proven to be restricting factors for students' use of smaller devices (Corlett, et al., 2005; Smordal & Gregory, 2003). Limited capacity memory storage is another constraining factor (Corlett, et al., 2005) identified in earlier studies, as small scale storage was previously very expensive and particularly limited in older devices. These limitations led to users finding innovative ways to overcome them (Clough, Jones, McAndrew, & Scanlon, 2008). The specifications of newer mobile devices have addressed many of these limitations, with smartphones now featuring specifications similar to desktop computers a few years ago, while adding significant unique affordances beyond fixed computing platforms (Cochrane & Bateman, 2010).

Increased flexibility and improved efficiency are two significant advantages of mLearning in its simplest form (Dellaportas, Perera, & Richardson, 2010). Students are able to carry far more digital information with them in the form of a mobile learning device than in a traditional format.

Findings of a 2005 study as part of the MOBIlearn project show that approximately half of learner's personal learning experiences occur outside of work, class and other formal learning areas. Thus, mLearning enables bridging the formal and informal learning contexts and brings opportunities for augmenting situated learning experiences (Cook, 2010).

Method

This section outlines the formation of the lecturer community of practice surrounding the iPad project within the Business departments.

Teaching staff in the two departments primarily responsible for teaching Business were offered the opportunity to use an iPad for three months over the summer of 2010/2011. Twenty one out of thirty staff opted to take part in the study, while the majority of the remainder were unavailable due to holiday and personal commitments. These iPads were the entry-level model, featuring 16 gigabytes of internal storage and wifi-only connectivity to the Internet and other networks. The iPads came with Apple's standard software, allowing staff to write emails, write notes, browse the Internet, store and play video and audio files, manage calendars, contacts and the ability to download new applications (Apps) or media. Physically speaking, the iPads were light-weight (680gm), featured long battery life (up to 10 hours of actual usage time) and were stored in simple slip-on cases. It is important to note that these iPads were first generation devices and did not include a camera.

The staff that took up the offer formed the nucleus of an informal community of practice. The staff were all based in the same building, although a number of tools were used by members to communicate with each other. In addition to face-to-face communication, members found the iPad to be useful for communication through email, Skype and discussion forums.

One of the authors assumed the role of Technology Steward within the community (Wenger, et al., 2009), supporting the members through regular drop-in sessions and via a customised Moodle learning management system course. The Moodle course included a variety of resources outlining the features, useful Apps and guides for the use of the iPads. It also served as the central point for communication amongst the community of practice.

Community members were introduced to a range of Apps and device use cases throughout their time with the iPads. Some related to communication, such as the use of Skype, email, polling (Poll Everywhere) and Twitter, providing the members with different options and encouraging them to explore these options in terms of their potential use with students. Others were about content consumption, such as iBooks, Newspaper Apps (NZ Herald) and PDF viewing (Goodreader). The group was also able to experience some Apps which are designed for content creation, such as image editing (Photoshop), blogging (WordPress) and mind mapping (Mindmeister).

Within a very short timeframe, a number of community members became confident with their iPads, and began helping the others. The informal drop-in sessions became a group activity, where time could be spent with others, sharing amongst the group the interesting things they had found, as well as the experiences and achievements they had made. This sharing spread beyond the community as the members found opportunities to discuss ideas and use their iPads around the campus, in classes, meetings, the staff room and places outside the institution.

At the end of the three month loan period, the iPads were returned to be used in other projects. Given the positive feedback of the staff involved, a full set of iPad2s were ordered for a future project and continued staff development, towards the goal of integrating the use of iPads in the Business School courses. All staff involved answered a questionnaire to capture their experiences, thoughts and perceptions of the use of the iPads. Five of the staff involved in the study were randomly selected to take part in a focus group to delve deeper into the positive and negative aspects of that experience.

Results

Survey Pre Results

An important factor to be considered in the approach of this study is the previous experience of the participants with mobile technologies. Significant experience with mobile technologies prior to the study should make the transition to the iPad easier, while limited prior experience means participants will likely have more to learn. Participants were given a questionnaire to complete at the beginning of the study to evaluate their starting point in terms of mobile learning. All twenty one of the staff participating completed the pre survey.

All staff involved in the study work with a computer regularly, either a desktop or laptop, used primarily in the office. All staff own a personal cellphone of some sort, the majority being a simple cellphone (57%) or cameraphone (33%). A small number (19%) own a smartphone, which likely share similarities with the iPad in terms of use and functionality.

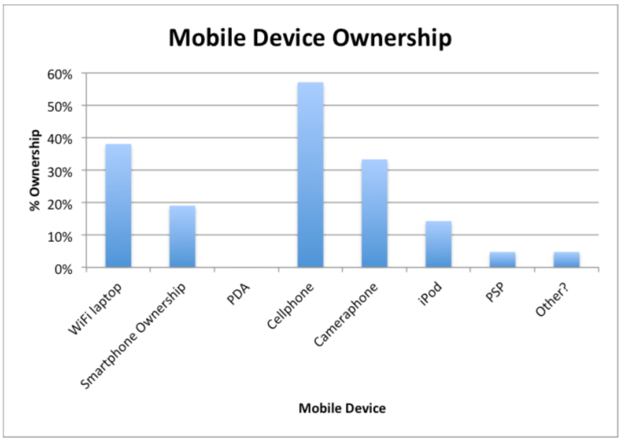

Figure 1: Participant Mobile Device Ownership

The participants' perceptions of the usefulness of the iPad are shown in the graph below. Over 80% of participants felt the iPad would be useful for productivity and collaborative applications: email, web browsing, contacts, calendars and video.

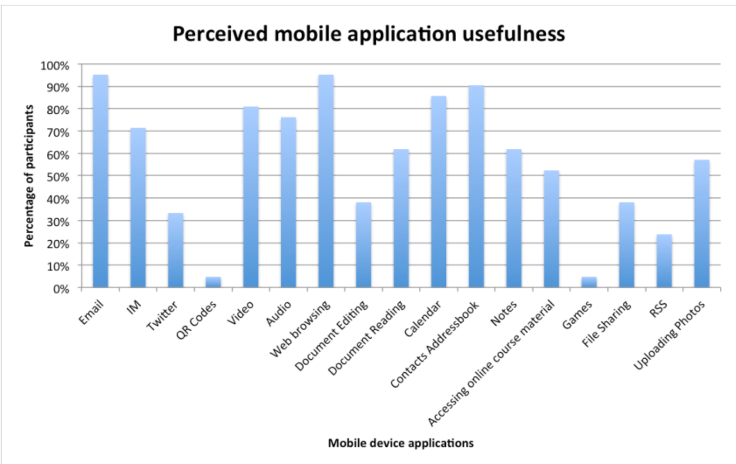

Figure 2: Participant Mobile Application Usefulness Perceptions

Overall, the participants of the survey appear to have a relatively limited experience with mobile devices to begin with.

Survey Post Results

At the end of the study the participants were asked to fill in a second questionnaire to gauge their usage and perceptions about the iPad and its affordances. All staff involved with the project completed the post survey, unfortunately a number of participants did not fill out the ID number portion of the survey. This made it impossible to analyse the change in their perceptions from the beginning of the trial to the end. All participants used the iPad at home and 91% used it at work outside of class. Only 64% of the participants used the iPad in class and 55% used the iPad while travelling. General feedback about the value of the iPad was very positive with 78% of participants either strongly agreeing or agreeing to further iPad use. The remainder of the participants were uncertain, with none of the participants ruling out further iPad involvement. More than half of the participants (64%) indicated that they would buy an iPad of their own, while several others indicated they felt the institution should be responsible for buying one for them. As part of this questionnaire, participants rated a number of iPad applications (or features) with a score out of 10. A score of 10 indicated that an App or feature was most effective and a score of 0 indicated it was least effective.

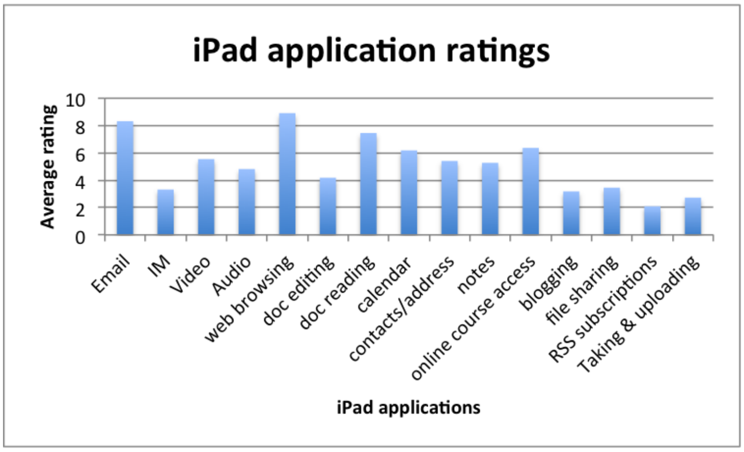

Figure 3: Participant iPad Application Ratings

Participants were also asked to indicate which of a series of mobile device factors they would find critical when purchasing a device. Cost and wireless connectivity were both found to be critical factors by 86% of the participants. Phone interaction (18%), operating system (18%) and ease of linking to a blog (18%) were all seen as the least important factors of the mobile device.

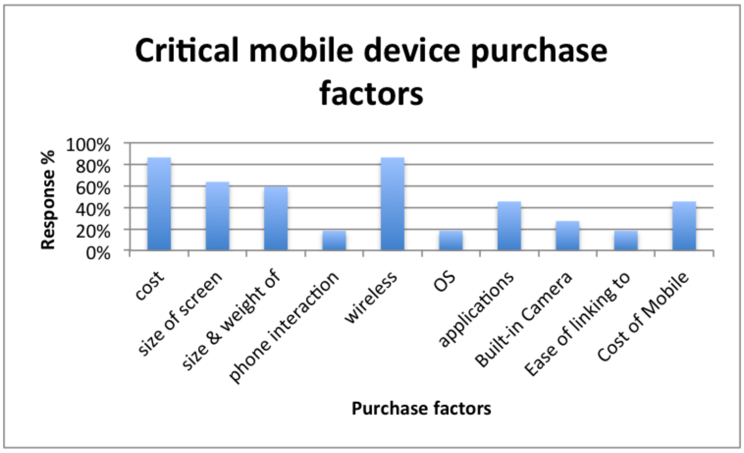

Figure 4: Mobile Device Factors Critical to Participants

All participants were given the opportunity to add comments relating to their experience. When asked how they used the iPad, some staff found it very useful for accessing content, others for creating their own material and some found it useful for interacting and sharing with others. The following examples give a guide to the responses of the participants:

> Taking relevant notes in class while attending lectures and then being able to email them, cut and paste into course assignments instantly has definitely enhanced my learning. In my lectures/classes I used the iPad to mark student presentations while they were underway and then used the marks immediately to upload into gradebook. (Participant, 2011)

> Use in meetings to keep notes, access material electronically. Google forms used on device to record interviews with students. Very effective and time saving access to all email accounts - has really streamlined my electronic life! (Participant, 2011)

> I used the WMD to facilitate in-class research projects and also to allow for Moodle based quizzes with instant results and feedback. (Participant, 2011)

Focus Group Results

Five participants of the study were chosen at random to participate in a focus group to gather a more in-depth perspective of their experience. The focus group was facilitated by an experienced researcher, unrelated to the project, in order to decrease the risk of interviewer bias. Participants were asked a range of questions relating to their previous experience with mobile technologies, their experiences with the iPads and their thoughts on the value that these devices can bring to education. Participants were asked how they had made use of the iPad over the three month trial period, they provided the following responses:

> In class I have my students negotiating via email and creating contracts with collaborative documents. So on one side the employer side is preparing a sample contract and then emailing it to my employee side and they then have to make amendments to the document and email it back, this forms the negotiation. The other useful thing for negotiation is that if somebody says "we simply can't afford this", or "this is required by law" then the other side can say, "well actually...", pull out the legislation and see that it is required. (Participant 1, 2011)

> I would use my iPad on average for 2.5 to 3 hours a day, and if I am teaching I would use it then too. As an example, if students are doing presentations I use the notes facility to mark them while they are talking and then email them back to myself in the office. (Participant 3, 2011)

> I decided when I got my iPad to completely give up my normal extras that I carry around with me. I normally carry around a red book about the size of the iPad. So with the iPad I decided to proactively use it for everything that I would use my red book for. So I used it for taking notes, photographs, emails, I used a lot of things. So it was ubiquitous, I just had it everywhere, I would take it everywhere. Sometimes I was actively using it and other times it was using me in the sense of reminding me things such as the calendar, which was a crucial thing. (Participant 5, 2011)

Participants were asked about the impact (if any) that the iPad has had on their teaching, they provided the following comments about the iPad use, providing indications of the beginnings of a pedagogy change:

> I think one of the key points there is that I don't think we have even scratched the surface on how we can use these things. That's what excites me. My gut feel is that with this I would get 90 minutes of work in to 60 minutes. (Participant 3, 2011)

> Perhaps we need to get beyond them using the device and taking notes, to them using the device and you encouraging them to use the device and designing your activities so that you are getting them engaged using the device. (Participant 1, 2011)

> I was quite disconcerted with students using laptops in class because I had a guest lecturer in and I sat at the back of the class and realised that half the students were using Facebook. So I stopped them. But then I thought from when I was a student, why wouldn't you let them take notes using these devices on the understanding that you are not on Facebook, you are not trading shares, you are sitting there taking notes. I have had a paradigm shift in my thinking, but it is about setting down the law at the beginning of the class. (Participant 3, 2011)

Participant's were asked their thoughts on the best way forward, towards developing their understanding and usage of the iPads:

> I think to me it's not about the training, it's about getting everybody practicing something and then getting everybody together sharing their ideas, so that you can get some inspiration "Oh that's what they are doing there, I wouldn't have thought of doing that". Which I find so much more valuable than someone saying here is everything you can do with it. (Participant 1, 2011)

During the focus group, when asked if there were any perceived barriers to the use of iPads in education, a number of comments were made relating to issues with the adoption of iPads:

> Infrastructure is the problem. The other thing is the cost side, and you compare with the sort of students we have in terms of affordability. Or is it freely available? If the institution buys it then it is a good way to get people to buy-in to the project, but if people have to buy it then support their studies then you need to provide them with a good cost benefit analysis. (Participant 4, 2011)

> I'm still using Mac, PC and iPad. But are our students requiring that much? For some of them they may need iPad and that is it. (Participant 1, 2011)

> I'm not really a social networker, I blog like crazy, but I find it difficult to use Tumblr. However, this is a machine that gets better and better every week because somebody comes up with an App, and I think that is fantastic. (Participant 5, 2011)

Discussion

The iPad as a device

Feedback from lecturers involved in the project suggests that the iPad, and perhaps other devices with a similar form factor, have addressed a number of the usability issues surrounding mobile devices evaluated in previous mLearning studies. The comparably large screen of the iPad was clearly favoured when it comes to reading content, such as email, web pages, documents and other course material. The iPad was also seen as a useful device for traditional mobile device applications, namely calendaring, contact management and note taking. Additional comments from participants showed they were impressed by the wide range of other features offered by the iPad in areas relating to their professional and personal lives. Powerful applications exist to support social networking and personal entertainment that have clearly had a strong and positive effect on the lives of participants. Being light-weight, having a very long battery life, and with immediate capability give the iPad some significant advantages over a traditional laptop or netbook in an educational context.

While it was generally accepted that the iPad is not the perfect device for all computing tasks, it is continually changing as new Apps are released regularly, many of which provide new and exciting ways to use the device. The second iteration of the iPad has addressed a number of issues found with the first generation device, including the addition of a camera and enhanced video and screen sharing capabilities, which were seen as crucial in an educational environment. In a short space of time, many of the participants found their own ways of integrating the iPad into their work and personal lives according to its affordances as they perceived them. The feedback from this project can and will be used to inform suggested workflows with the devices to deal with any issues perceived in the educational context.

Discussion of the model

The formation of a community of practice supporting and investigating the affordances of the iPads was critical to generating lecturer buy-in to the project. The various outputs from the COP formed reified experiences that became boundary objects, utilised for brokering the project beyond its core participants. A key in this model is the critical role of an appropriate Technology Steward to guide and support the COP, particularly during the tentative early phases of general familiarity and learning the tools, to assist in getting the participants into their comfort zones. Core boundary objects that achieved this included: participants' blog posts which formed honest diaries of their experiences and achievements, and the physical use of the iPads throughout their everyday activities, the Moodle forum, and lively discussions around their experiences.

The impact of the iPad on lecturer's pedagogy and student's learning experience

For the majority of the participating lecturers, this experience was their first serious foray into the realms of mLearning, and represented the first steps in appropriating the affordances of the iPad for pedagogical change. As Herrington and Herrington (2007) note, lecturers generally revert to their default pedagogies when first approaching the use of new technologies in their teaching, effectively translating tried and true assessment activities onto the new technology. Exploring the unique affordances of new technologies to reinvent pedagogy usually involves several iterations of implementation and reflection. However, some significant changes in pedagogy have been achieved with the integration of the iPads. For example: a significant focus upon student group activities has been achieved in the two courses where iPads were provided to students within the Bachelor of Business. A mix of formative and summative group activities were used, encouraging the students to form robust groups and to support each other's learning through conversation.

Outline of the plan for 2012 iPad adoption

The community is to be reactivated when a set of iPad 2 devices (on order at the time of writing) arrives for staff to continue their development. Comments suggested that participants felt they had "only scratched the surface" with what they can do with the iPads in the short time they had them. A general excitement exists within the staff surrounding the project and the potential of the new devices. The sharing of practice and experiences of members of the community was seen to be a critical and successful part of the community members' learning and development. A large proportion of staff had limited experience with mobile devices beyond a basic cellphone, which caused there to be a significant spread in the progress made with the devices across the community. The Moodle course was a useful feature for actively-involved members as well as those on the periphery. Additional material is planned, with a more clearly defined structure, to provide training support in a blended fashion. It is expected that this will help those staff with more limited previous experience with mobile devices, especially those operating on the periphery.

Providing that the staff continue to explore the potential of the iPads and their impact on pedagogy, the plan is to make the iPad a recommended device for all Business School students. Unlike the trial projects to-date and some initiatives in other institutions, it is envisaged that students will be responsible for purchasing and owning their iPads. As recommended by focus group participant 4, a detailed financial breakdown will be developed to help justify the expense to students. It is expected that the pedagogical changes combined with the affordances of the iPad will eliminate the need for text books in some courses, enable a change to cheaper eBooks in others, and drastically reduce the volume of printing required by students. Over time this change from traditional to eBooks will become easier as availability and the quality of the eBook offerings improves (Johnson, Smith, Willis, Levine, & Haywood, 2011). Beyond this project it will be helpful to extend the model to staff in discipline areas other than business to improve it's generalisability.

Conclusion

This paper focused on the experiences and reflections of members of a community of practice on the use of the iPad as an educational tool. Members of the community were encouraged to learn about the iPad using a social constructivist pedagogy with the intention that it will also prompt them to embark on their own journey towards educating through the same pedagogy. Overall staff enjoyed their experience with the iPads and want to continue using them beyond the initial three month trial. Some of the staff involved indicated the experience has already caused a change in their own teaching practice.

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Academic analytics in a medical curriculum: enabling educational excellence

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The developing field of academic analytics seeks to turn data from educational systems into actionable intelligence for the improvement of teaching and learning. This paper reports on the implementation of analytics in a new medical school with an integrated curriculum and clinical focus. Analytics addressed two challenges in the curriculum: providing evidence of appropriate curriculum coverage and assessing student engagement and equity while on clinical placement. The paper describes the tools and approaches used, and it outlines the lessons learnt. These lessons include the risk of a simplistic use of visualisations, their potential to generate important questions, the value of a flexible approach to tool selection, the need for relevant skills, and the importance of keeping the audience central. Although there is much further potential for the school to realise, academic analytics have already been a critical enabler of educational excellence.
Keywords: academic analytics, curriculum mapping, visualisation

Introduction

The field of academic analytics is concerned with providing actionable intelligence to inform strategies for the enhancement of teaching and learning in higher education (Campbell, De Blois & Oblinger, 2007). The use of data extracted from academic systems to create reports and visualisations enables educators to perform up-to-the-minute curriculum reviews and monitor the impact of changes and implementation of new learning activities. The Graduate School of Medicine (GSM) at the University of Wollongong has used academic analytics throughout the development and implementation of its innovative and integrated curriculum. Academic analytics has allowed the GSM to address two main challenges in developing the curriculum: the ability to ensure coverage of content in the curriculum, and the support of student engagement during regional/rural clinical placements. This paper is an implementation study of the reports and visualisations developed over the past four years and it reports on the lessons learnt. The use of academic analytics has proved valuable to the curriculum development and review within the GSM and work continues on the development of more customised reports to address specific issues and areas of future development.

Academic Analytics: A timely new field

The relatively new field of academic analytics has been increasingly discussed in the academic literature. Goldstein and Katz (2005, p.14) surveyed 378 higher education executives on their information and analysis needs, finding that the “primary applications of advanced analytics include modeling strategic decisions, studying enrollment trends, and measuring student retention”. They report that management commitment and staff skills, rather than technology, were the critical factors in deploying academic analytics.

Oblinger and Campbell (2007) note the increasing accountability requirements on educational institutions and the potential for analytics to improve student retention and graduation levels. Campbell, De Blois and Oblinger (2007, p.44) provide a helpful overview, noting that “with the increased concern for accountability, *academic* analytics has the potential to create actionable intelligence to improve teaching, learning, and student success”. They outline case studies using analytics for developing predictive models of enrolment and retention and identifying at-risk students. From these cases they highlight three critical success factors: leaders committed to evidence-based decision-making, staff with data analysis skills, and a flexible and effective technology platform. However, they also warn against oversimplification and raise a number of issues including privacy, faculty involvement, and data stewardship.

Norris et al. (2008, p.56) suggest a process to move from “a culture of information and reporting” towards the use of analytics to inform and enable action. They note the broad range of contexts where analytics can be applied: “clearly, one size does not fit all in action analytics. Most institutions begin predictive/dynamic modeling by focusing on admissions and retention… action analytics is like a smorgasbord of options, all aligned with institutional goals and strategies” (p.50). They also stress the importance of open technology architectures to enable analytics, as well as leaders who are committed to “build organizational *capacity*, change the organizational *culture*, and foster new *behaviors* that both enable and reflect evidence-based decision-making and action” (p.52). They identify four contexts in which these priorities apply: technology, information, analytics, and innovation.

Ellaway (2008, p.242), discussing academic analytics in medical education specifically, points out that “being able to account for the execution of medical education is both a professional and ethical concern”. She encourages a critical consideration of analytics’ impact on data collection and analysis, as well as the effort required. Arnold (2010) describes the use of analytics at Purdue University to turn institutional data into actionable intelligence, by identifying at-risk students and guiding them to helpful resources.

The field is set to continue growing, with the first International Conference on Learning Analytics and Knowledge held in February 2011. Most recently, the 2011 Horizon Report (Johnson, 2011) identified analytics as a technology to watch in the four to five year adoption horizon.

Fortunately, general awareness of analytics and visualisation grew around the same time as the medical school started. In November 2005 Google Analytics was released, showcasing complex and interactive analytics to many (Google, n.d.). In 2007, Dr Hans Rosling gave a popular TED talk demonstrating the power of visualisations to represent large datasets (Rosling, 2007), which developed into a BBC documentary. During the 2009 Web 2.0 Summit conference, Tim O’Reilly stressed that “data analysis, visualization, and other techniques for seeing patterns in data are going to be an increasingly valuable skillset.” (O’Reilly and Battelle, 2009). In late 2010, The Bill & Melinda Gates Foundation announced a $20 million initiative to address Next Generation Learning Challenges, one of them being “Helping institutions, instructors, and students benefit from learning analytics” (EDUCAUSE, 2010).

Background and Context

The Graduate School of Medicine at the University of Wollongong opened its doors to students in 2007 with a bold vision of an innovative curriculum that would seek excellence in medical education, with a particular focus on regional, rural and remote health. The curriculum is distinct from many other medical schools in its attempt to integrate all content in a spiral structure in which issues are revisited throughout the course with increasing levels of understanding and competence required.

Two elements in particular contribute to the curriculum’s distinctiveness. Firstly, the curriculum is designed around 93 presenting clinical problems and the body systems to which these relate. It is also driven by a set of learning outcomes grouped in four themes: medical sciences, clinical competencies, personal and professional development, and research and critical analysis. The clinical problems are covered in turn with the aid of specific clinical cases. For example, there is no pathology subject in the course but rather it is taught throughout the programme in the context of the clinical problems and body systems. This ensures students learn the various aspects of addressing patients’ presenting problems *together* and with concrete examples, rather than a disjoint and abstract manner through separate subjects of anatomy, pathology, paediatrics, etc.

Secondly, the curriculum has a very strong clinical focus, with students beginning hospital and general practice placements within the first six weeks of the course. The most significant clinical experience is a 12 month clinical placement in rural and regional areas of the state which starts mid-way through the third year of the programme. During this time students are based in a general practice and at the local hospital, but also attend other community health clinics. This allows them to experience and participate in the whole process of medical care. Further, it integrates their learning with practical experience across a wide array of real patients under the supervision of practicing doctors.

These two critical elements, however, introduce significant challenges to the delivery of the course. Firstly, it is necessary to ensure there is appropriate coverage in the course of the clinical problems, learning outcomes, body systems, as well as clinical and scientific specialties. This has been a critical issue in gaining and maintaining accreditation as a medical school. Further, each of the clinical specialty teams has an interest in ensuring proper coverage of its own area. Clear evidence of coverage is thus essential.

Secondly, the many external clinical placements might create a disjointed course if these are not integrated well with the campus-based teaching. Specifically, the year-long placement in a rural or regional setting far from campus raises considerably the level of support required by students. Their experiences need to be linked to the curriculum. A level of equity across students needs to be ensured in the number and type of clinical problems they experience, as well as the students' level of involvement.

In summary, these two elements create two areas of obscurity: what students are taught while on campus, and what they do while away from campus. It is unclear if the school's curriculum would be feasible without these challenges being overcome.

The GSM has used technology extensively to overcome these challenges and in turn implement its vision of excellence in medical education. The online learning environment has been recognised internationally with a 2007 ascilite Award and the 2008 IMS Global Learning Consortium's Platinum Learning Impact Award. Specifically, academic analytics combined with visualisation have made visible what the school needs to see both in its curriculum content and students' clinical placements. This is a broader use of analytics than the common applications in finance, research functions, retention, admissions and identifying at-risk students as reported in the literature (Goldstein and Katz, 2005; Norris et al., 2008; Arnold, 2010).

Simply put, analytics show what students are taught on campus, and what students do while away from campus. Although this paper focuses on these two areas, the GSM uses analytics more broadly in its delivery of the course. The school employs a Data Manager, charged with the collection and analysis of various datasets, including admissions, administrative and financial metrics. Further, the analysis and visualisation of student interactions in discussion forums has already been reported elsewhere (Dawson, Macfadyen & Lockyer, 2009; Dawson, Heathcote, & Poole, 2010; Macfadyen & Dawson, 2010).

Curriculum Content

The integrated and outcomes-based curriculum is supported with the use of a learning content management system called Equella. All learning and teaching resources are entered into this system and made available to staff and students. Four item types are defined in the system:

- Problem Blueprint: The detailed description of each of the 93 clinical problems, including the learning outcomes it covers as well as the clinical and scientific specialties and body systems that it relates to.
- Learning Activity Outline (LAO): A description of the learning outcomes, associated readings, and notes/audio from a session that students attend which is typically led by a presenter (e.g. lectures, clinical demonstrations).
- Resource: A digital asset with educational content (e.g. lecture slides, diagrams, readings, animations, movies).
- Case-Based Learning (CBL): Description of a clinical case and related resources.

Each of these is tagged with a common curriculum metadata schema with the following descriptors:

- Problem
- Medical Sciences
- Clinical Competencies
- Personal and Professional Development
- Research and Critical Analysis
- Body System
- Science Specialty
- Clinical Specialty

This metadata, together with Equella's flexible XML-based exporting, has allowed the school to generate powerful reports summarising the whole course. For example, Figure 1 visualises the coverage of learning outcomes (represented by the codes on the top row) for the first 18 months in the course. Each cell in the table represents a particular fortnight in the teaching timetable and learning outcome. The darkness of each cell represents the number of learning activities in that fortnight that relate to the learning outcome. The figure makes clear the strong focus on basic medical sciences (represented by the first few learning outcome codes) during this period.

The value in each cell can be seen by hovering the mouse pointer over it. Clicking a cell displays a list of the learning activity outlines represented by the cell. The viewer can then click on an individual learning activity outline to get its full details, including the presentation slides and recorded audio where applicable.

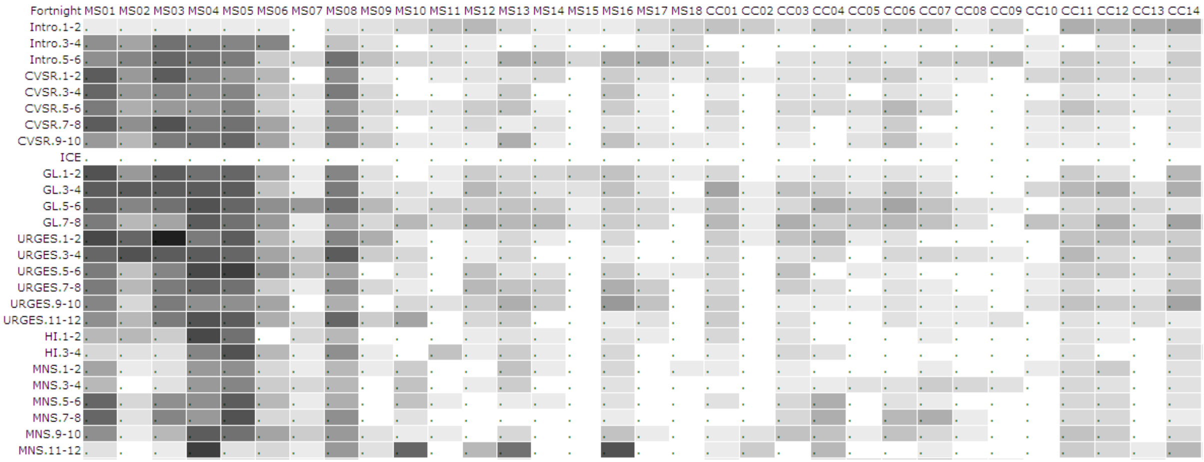

Figure 1: Coverage of learning outcomes in learning activities for each fortnight

Figure 2 is another example, showing the *change* in coverage from one student cohort to another. Black cells represent no change, bright green a large *increase*, and bright red a large *decrease* of coverage for each fortnight/learning outcome pair.

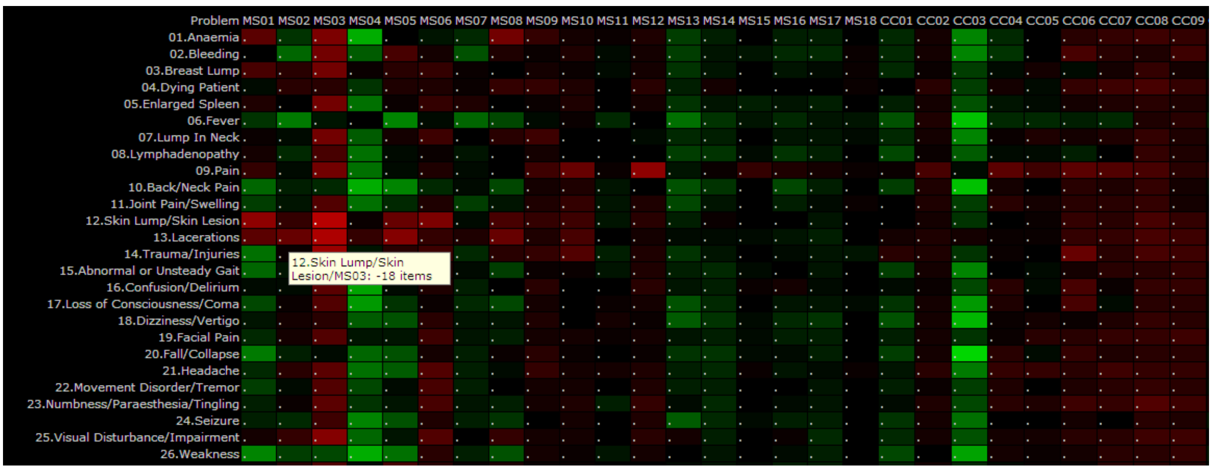

Figure 2: *Change* in coverage of learning outcomes in learning activities for each clinical problem

These reports were originally developed by using XSLT to transform the XML of the learning activity outlines' metadata (exported from Equella) into HTML. A newer release of Equella allowed for the use of BIRT (Business Intelligence Report Tool) to query the database and render the visualisations.

These visualisations provided evidence which helped the school to satisfy itself and its accreditors that appropriate coverage was achieved in its integrated curriculum. The fact that they are generated from the delivery system with data entered by the academics at the time of preparing the learning activity (rather than a secondary system with data collected long after delivery and in preparation for an audit) gives confidence in the quality and timeliness of the data. Further, the measurement of *change* in coverage is particularly relevant in a new school, where revisions to the curriculum are common and there is a need to analyse their impact. Review decisions can then be made based on evidence.

A moderation process applies to the contribution of LAOs into Equella, which progresses the item from initial entry, to review and approval by an academic coordinator, to a final check by the Educational Technology team, and finally to a live status on a given date when it's accessible to students. The item's progress is tracked, and thus analytics can be done at an aggregate level on this process. A moderation progress report was developed which counts the number of items in each of the above steps for each fortnight in the course. This allows academic coordinators to assess readiness leading up to each fortnight. Thus Equella can show the school's performance in delivering educational content to our students.

Clinical Experiences

GSM students have a range of clinical placements during the course's four phases, including fortnightly general practice and hospital visits during the first 18 months, seven hospital-based rotations over the next 12 months, a year-long rural or regional clinical placement, and lastly three six-week placements during the fourth phase in a variety of domestic and international settings. A web-based Clinical Log application was developed in order to allow students to record their experiences and reflections, as well as enabling the school to support them in integrating their experiences to the curriculum. It enables recording patients' gender and age, their presenting complaint (mapped to the curriculum's clinical problems), the location of the consultation (e.g. campus, general practice, hospital), their level of involvement (e.g. observation, history taking, or examination), and their confidence level *at this level of involvement* as a self-reported five point scale. Some reflection fields invite students to identify learning needs and required actions. A more detailed description of the Clinical Log can be found in Corrin and Olmos (2010). The free open-source Business Intelligence Reporting Tool (BIRT) was chosen to query the Clinical Log's relational database and produce a range of reports with specific audiences and purposes.

The *cohort report* aims to summarise an entire cohort's entries over a particular date range and includes a number of charts and tables, such as:

- Number of entries per month, and per confidence level
- Scatter plot of the date the student made the entry versus the date they saw the patient
- Confidence level distributions per students
- Confidence level across time for each level of involvement and location
- Number of entries per clinical problem for each age group, gender, location, and involvement

	Campus	Community Agency	GP Practice	Hospital	Other	Special Practice
01.Anaemia	23	18	577	535	6	60
02.Bleeding	31	17	872	1,056	6	89
03.Breast Lump	13	14	354	113		31
04.Dying Patient	16	55	166	373	33	53
05.Enlarged Spleen	2		93	82		9
06.Fever	73	9	1,683	1,336	16	42
07.Lump In Neck	18	6	598	230	3	43
08.Lymphadenopathy	39	7	809	296	7	44
09.Pain	211	89	5,036	[illegible]	50	245
10.Back/Neck Pain	87	23	1,875	738	19	83
11.Joint Pain/Swelling	132	78	2,835	1,455	23	137
12.Skin Lump/Skin Lesion	135	53	[illegible]	911	31	235

Figure 3: Distribution of clinical problems against location

The *dashboard report* aims to highlight potential issues and at-risk students and is designed to be generated regularly. It includes a list of entries with low confidence levels and students with no entries in the last week. Authorised staff can click on an entry to view the full details in the Clinical Log, including the student's reflections and identified learning needs. They can then insert comments for the student to read.

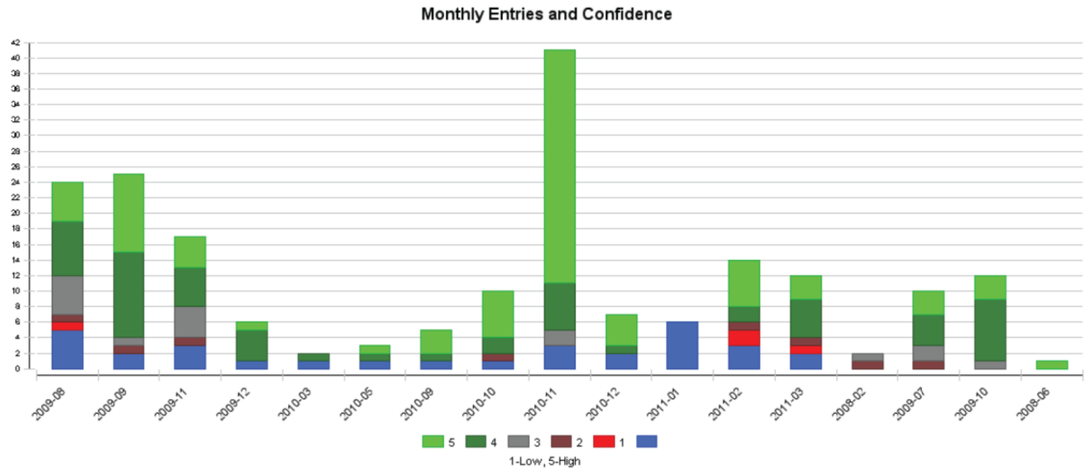

Figure 4: A student's number of entries per month, stacked by confidence

Lastly, the *student report* summarises an individual student's entries, reflecting the number and confidence level, and distribution across clinical problems, gender, age group, location, and involvement levels (see Figure 4). This report is made available to students to allow them to see their own experiences. Further, the report was integrated into an assessment involving discussion of specific clinical experiences and it was expected to become a valuable resource to facilitate the interaction between the individual student and their clinical supervisor. As Norris et al. (2008, p.48) noted, "The most powerful action analytics are learner-centric, focusing on issues related to access, affordability, and success for learners at all stages of their learning lives. Over time, these analytics will empower learners to take greater responsibility for their success, in collaboration with parents, teachers, mentors, and employers". For example, these analytics might empower a student to request exposure to specific clinical problems or higher levels of involvement from their clinical supervisors. Furthermore, they might use it to demonstrate their clinical experience at the start of a placement or beyond their course. Lastly, it was hoped that it would increase students' motivation to use the Clinical Log.

Motion Chart

Although the reports mentioned above are very helpful, there remained a challenge of visualising the dataset's multiple inter-related dimensions at the same time. These dimensions include entry date, frequency of entries, clinical problems, the student's level of involvement (i.e. observation, history taking, or examination) and level of confidence. Specifically, the mean confidence level across time is a natural focus but it needs to be looked at in the context of the level of involvement and the number of entries per period. Further, it's good to compare how the frequency of entries, confidence and level of involvement varies between students and cohorts as a whole.

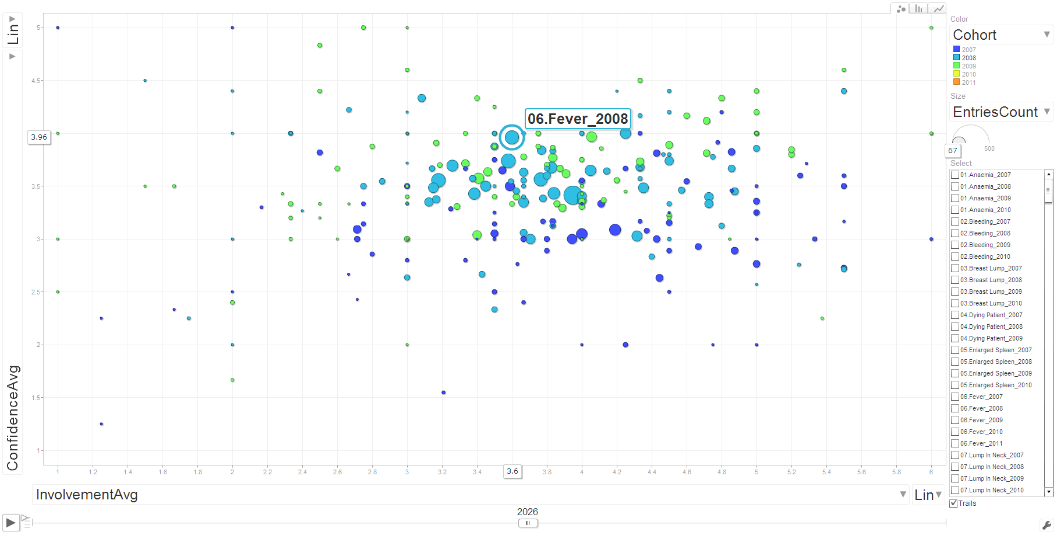

Figure 5: Motion Chart of clinical problems coverage

Google's interactive Motion Chart tool was used to address this challenge. Motion Charts, popularised by Dr Hans Rosling's 2007 TED presentation (Rosling, 2007), can render up to six variables concurrently (see Figure 5). Each bubble represents a clinical problem (Figure 5) or a student (Figure 6), with its size representing the number of entries for a given month and its colour representing the student cohort. Confidence is mapped to the y-axis, and level of involvement on the x-axis. The data's time is mapped onto the time of the animation. Motion Charts also have helpful interactive features. The time slider can be dragged back and forth, and a single student can be highlighted by clicking on a bubble, which will show the values for each of the variables.

Playing the animation can display a trail of the bubble's movements across time, thus showing a student's progress in involvement and confidence. Figure 6 highlights two students' different journeys through the course.

There are some drawbacks with Motion Charts. They can be somewhat complex to view, as some clarity is traded off to maximise the number of variables rendered. For example, it's generally best to render a single dimension to a line rather than an area. Thus representing the number of entries as the size of the bubble is not optimal. A simple bar chart would be better to display this single variable across time. Secondly, given that the dataset's time is mapped onto the animation's time, it takes time to watch them. If the pattern of a single variable across time is the focus, it is best to map time against the x-axis and use a simple line or bar chart. Lastly, bubbles representing just a few data entries can move quite rapidly in the chart as the means for each month change significantly, and paradoxically the viewer's attention can be attracted to these. Despite all these issues, the Motion Chart's core benefit of rendering multiple dimensions in one interactive chart remains. It's thus not seen as a replacement to standard charts but a powerful complement.

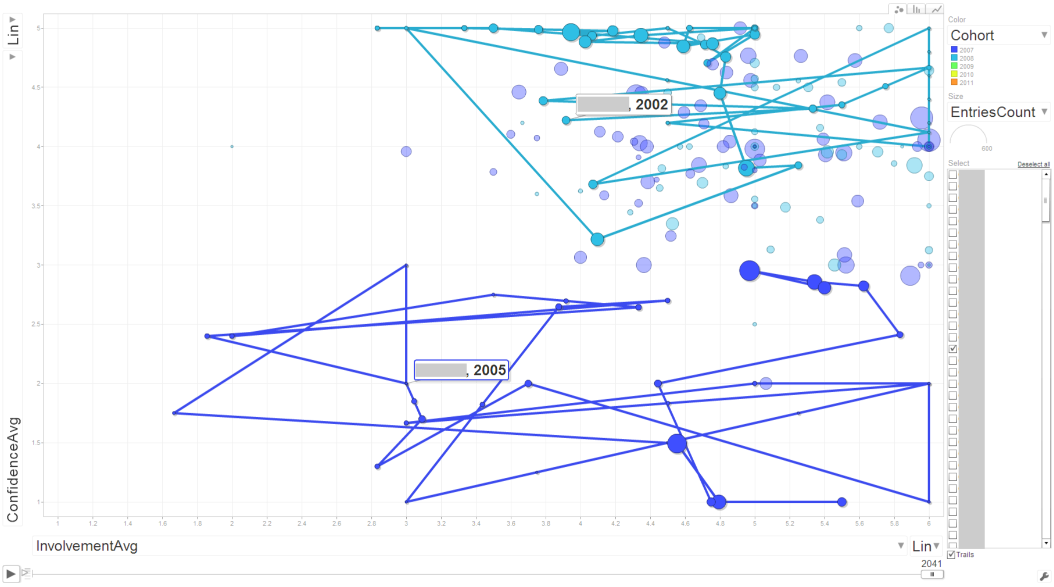

Figure 6: Motion Chart of students' paths

Tree Map

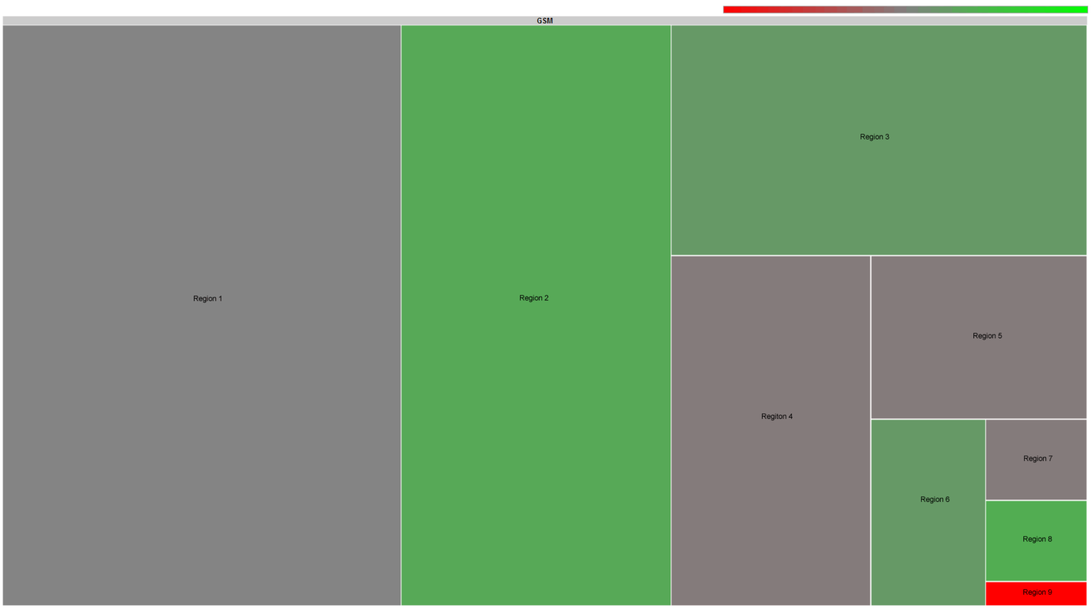

Figure 7: Tree map of entries per placement regions

The third phase of the course, when students disperse for a year-long clinical placement in rural and regional settings, is particularly challenging. . It is important to compare the medical practices, towns, and regions, as well as the students themselves. This is in order to answer questions such as:

- Are students in different regions exposed to different clinical problems?
- Do students in a particular practice have lower confidence or involvement levels?

However, this hierarchical and heterogeneous dataset is difficult to render using common chart types. Google's implementation of the Tree Map chart was used to render this data. It displays a set of rectangles with their size and colour mapping to the data, in our case the number of entries and mean confidence respectively. Each rectangle can be clicked to drill down through the hierarchy, from region, town, practice, student, and patient. The relative size and confidence level of each setting is clear at its own level in the hierarchy. For example, Figure 3 shows that Region 1 had the most entries, and its grey colour suggests the mean confidence wasn't high.

Due to the nature of the dataset, the treemap's utility was mixed This type of chart works best with hierarchies that are wide as well as deep. Often, there is only one general practice in a given town or a single student in a practice. The chart hasn't progressed onto wide use, but the experiment was worthwhile.

Lessons learnt

Several lessons have been learnt from the school's experience in using academic analytics and visualisations. Given this is an implementation study, our findings are somewhat unstructured. They are offered below as a small contribution to a growing and important field, with the caveat that they might not apply across all contexts.

Data quality is critical. The potential for analytics was implicitly considered while developing the GSM's systems and data repositories, although the final charts that would eventually be developed were unforeseen. An emphasis was placed on maximising structured data and having discrete vocabularies for important fields. For example, a set of clinical and scientific specialties was defined from which users had to choose rather than allow free text entry.

Explore and discover. This process was not started with a clear outcome in mind, nor a pre-determined process. The visualisations developed through experimentation from the large and structured datasets.

Be flexible and discerning with tools. There was no commitment to use a particular set of tools. Rather, the best suited tool was selected for each task out of the options available. Sometimes proprietary programs such as Microsoft Excel were used, and other times free and open tools such as BIRT, Gephi and Google's visualisation APIs were used. For example, the generic BIRT tool helped overcome one of the challenges of academic analytics: accessing multiple datasets from various sources (Norris et al., 2008; Arnold, 2010; Johnson, 2011). The free and open nature of these tools allowed experimentation without significant financial commitment. Further, a toolkit approach enables the best tool to be used for each step of analysis. For example, an analyst might extract a data set with BIRT, do some basic manipulation with Microsoft Excel, and then render it with Gephi or Google's API. Critically, the choice of tools needs to be guided by the *data, audience,* and *purpose*.

Just show the data. A simple approach of visually representing the data without sophisticated statistical summarising proved very effective. Although sometimes averages were used, the aim was to maximise the *data to ink ratio* (Tufte, 1983) by rendering on the chart as many data points as possible, relying on the viewer's pattern perception skills. As the Motion Charts demonstrate, a well designed visualisation can render a large dataset and remain clear: one such chart renders over 33,000 values which are themselves summarising over 337,000 database values. A well designed chart of a good dataset is very powerful, even without advanced statistical summarising of the data:

> Statistics can reduce large, complex data sets to a few numbers, but this reductive approach can also shear away much of the richness and subtlety in data. Statistical analysis that goes beyond the basics involves an erudite language spoken only by trained specialists, but visual analysis is accessible to a broader audience… In simple terms, information visualization helps us think. (Few, 2009, p.6)

Keep the audience central. Each analytic tool should be designed with a specific audience and purpose in mind and should be guided by the data available, so as to provide the evidence required to inform the decisions the audience needs to make. Indeed, different reports representing the same dataset may be required to serve different stakeholders. An attractive and technically sophisticated visualisation which doesn't inform anyone is of little use. Further, users may require some training in using complex visualisations.

Visualisations clarify the value of data. Both staff and students have informally reported finding the various visualisations helpful in understanding the value of the data that they contributed. Understanding the need for high quality data to produce quality analytics might help motivate them to contribute data, a task which can often be onerous without a clear payoff. Further, visualisations can themselves identify weaknesses in the data.

Maximise the audience. There is value in opening access to the data where feasible and appropriate. This not only maximises the benefit of analytics work, it also raises awareness of the importance of quality data and the value of analytics in general. Although sensitive data should be handled appropriately, our experience reflects Goldstein's (2005) finding of no significant adverse impacts of a greater availability of data.

Beware the treachery of images. A naïve consumption of the visualisations should be avoided. They are often compelling and attractive, but might sometimes be confused with the reality they're seeking to explain. They are representations of the *data*, which in turn may or may not represent *reality*. They should supplement rather than replace direct communication and fact-finding.

Analytics as a question-generator. Although these visualised analytics no doubt answer many questions, they are typically of a simple nature: when, who, how many. Their greatest value is in enabling the more complex and critical *why* questions. For example, the Clinical Log motion chart doesn't tell why a student's confidence suddenly drops, but the question might remain unasked without it.

Leadership support and technical know-how. The medical school's leadership has provided strong support for the development efforts. This was critical in sustaining what might otherwise have been seen as a 'non-core' activity. Further, having an in-house educational technology team was helpful in understanding *both* the technology's potential and the school's curriculum needs. Much analytics requires a level of technical skills out of reach of most faculties, yet a central (and therefore more distant) university-wide IT department might not see their value to the specific needs of an individual faculty. Goldstein (2005) found training effectiveness, leadership commitment, and staff with analytical skills to be the factors most strongly linked to success. Campbell, De Blois, and Oblinger (2007) also note a leadership committed to evidence-based decision-making and staff skilled in data analysis as critical success factors. Lastly, it is important to have some skills in information design to produce visualisations that provide insight while rendering large datasets. Although these skills are important, it is *not* critical to have deep expertise in each. Rather, a nimble and generalist approach has proven more useful. As Few (2009, p.2) argues:

> Computers can't make sense of data; only people can. More precisely, only people who have developed the necessary data analysis skills can… Ninety percent of the data analysis needed by most organizations can be performed using a simple set of skills that require only a basic and easily mastered understanding of statistics. These analyses involve a set of techniques that use graphs – visual representations of quantitative information – to explore numbers and discover meaningful patterns within them. Mastering these visual analysis techniques allows us to lift the veil that separates us from insight.

Track change and flows as well as stocks. Although a snapshot of current data is helpful, showing change across time provides a more sophisticated analysis. For example, the visualisations of change in coverage of learning outcomes or clinical problems from one cohort to another (Figure 2) have indicated how the curriculum is developing in its initial years of delivery. A sudden and significant drop in a student's confidence during clinical placements would be another important change to track.

Broad and deep application. Although there are areas to which the GSM hasn't applied analytics, there is indeed value in applying advanced analytics broadly, and specifically in analysing the curriculum. Goldstein (2005) reports this is uncommon, with most application in the areas of central finance, budget and planning, and institutional research functions. Indeed, analytics of the curriculum itself is not mentioned in the 2011 futuristic scenario. Moving beyond these can bring focus to areas closer to the core of students' educational experience.

Conclusion

This paper has reported on the initial implementation of academic analytics and visualisations within a medical school. More detailed research is planned, into the extent of their use and impact, as well as drivers and blocks to their adoption.

There is much the school can do in the future to expand and improve the use of academic analytics. For example, integrating assessment results with the Clinical Log dataset would reveal the correlation between confidence and competence. Mapping assessment in a similar way to content would make clearer the integration between the two. Sentiment analysis may prove valuable in analysing students' reflection comments in the Clinical Log. Although there has been great value in simply rendering the data, the GSM may be in a position to start developing more sophisticated statistical and predictive models given there is now one cohort who has completed the entire course. For example, identifying at-risk students while on their extended rural placement would be valuable. Improvements can be made to the availability of analytics to staff and students and its use for strategic decision making within the school, as well as benchmarking with other medical schools.

Academic analytics have played a critical role in enabling the GSM to deliver its vision of excellence in medical education. The wide application of these tools, beyond administrative areas and specifically to the curriculum and students' clinical experiences, have borne fruit at the core of the quality of students' learning experience, by providing evidence of curriculum coverage and a window into students' engagement with clinical experiences. This has helped the school assure itself and its accreditors on the quality of its curriculum and the support and equity of students' experience while on remote placements. Analytics have been invaluable in mining the considerable data produced by the educational systems. In turn, visualising this data has rendered data in an understandable way to a wide audience, so that the insights available become actionable. Together, analytics and visualisation have helped the school "lift the veil that separates us from insight" and *help us think* (Few, 2009, p.2, 6).

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Multidiscipline Multi technologies: How can technology support allied health students from multiple disciplines increase their access to clinical training?

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This paper describes the current progress of a federally funded project that is attempting to provide a multidisciplinary approach to increasing the clinical training capacity of undergraduate health students. Students from five disciplines: physiotherapy; podiatry; psychology; medicine and nursing from the one Australian multi-campus university are being encouraged to undertake a small component of their clinical placement in local hospital settings that are supported by the project and state government health networks. Using an exploratory case study approach this paper reports on the early stages of the project and highlights some of the issues in dealing with the myriad of stakeholders and how various technologies are being used to connect with students and provide supports and spaces to reflect.

Keywords: health, multidiscipline, online, placement, reflection

Introduction

It has long been thought of that patients in our health system can be better served by using a multidisciplinary approach to their care rather than the traditional doctor patient relationship. According to Pirrie et al. (1999) "Each therapist should be aware of the specific skills of others in order to achieve effective and cohesive collaborative working . . . The philosophy of integration should start at undergraduate level and can be progressed [sic] throughout the career development of all therapists". Various attempts have been made to try and encourage a more wholistic approach from a range of clinicians but health systems and the existing treatment cultures have limited or stifled these more inclusive treatment strategies. The education and training of health professionals in our higher education institutions also generally tends to follow this traditional model whereby students undertaking their clinical experiences on campus and in health training sites are exposed to this same scenario. In trying to achieve a multidisciplinary approach to the overall delivery of health care programs tertiary institutions continue to try and provide opportunities for their students to work with students from other health disciplines. This may be done through common lectures and/or tutorials, seminars or through the use of guest speakers. The success of these joint study opportunities may be limited by crowded curriculum requirements, physical constraints caused by multiple campus locations or often by traditional approaches to course delivery. Most tertiary institutions offering health care courses coordinate a range of clinical placements to support their programs in a variety of ways. The common approach to these placements is that each discipline tends to operate in isolation when placing their students in community-based hospitals, clinics and surgeries. For example, nursing students are placed in hospitals at various times throughout their course and at times during the year that are quite independent from other physiotherapy or medicine students from the same institution. The University of Western Sydney (UWS) is a multi-campus university with six campuses and the offering of health programs is distributed over a number of these. To support these programs in terms of allied health clinical placements students are required to attend a dispersed array of location across the local region and in some cases inter and intrastate.

The Problem

There have been attempts to try and change these clinical placements to allow students from different disciplines to be part of a health care team but problems of coordination and facilities being able to cater for this have proved to be some of the obstacles. The Increased Clinical Training Capacity (ICTC) Project was established to try and bring together groups of professionals and students from a range of disciplines to combine their knowledge, experience, perspectives and skills to target specific chronic diseases that are prevalent in local communities. This approach is considered to provide a more holistic, patient-needs focused service resulting in improved patient outcomes and a better trained, more effective and professionally interactive healthcare service. Preparing students for the dynamic changing global healthcare workforce requires an even more encompassing breadth of approach. (Frenk et al. 2010) This study is exploring how various technologies can be used to support a undergraduate students from the five healthcare programs of nursing, psychology, medicine, physiotherapy and podiatry who are taking part in an alternative clinical placement approach. A project team of academics, clinicians, administration staff and educational development consultants was setup to manage and coordinate these quite diverse groups of students and provide access to teams of clinicians at a number of training sites at nearby hospitals. Of the four sites planned one is fully functional with the others at various stages of development.

The Approach

Students from these disciplines have been given the opportunity to volunteer to attend a number of specialised clinics at these sites and work along side the clinicians. The complex nature of the environment in terms of the people and varied locations together with time restraints, lends this research to use an exploratory case study methodology (Stake, 1995). A range of technologies is being explored and monitored to support these students before and during their attendance at the clinics. A number of data gathering techniques have been employed in order to gauge the success or otherwise of these support mechanisms. These include pre clinic surveys, mixed discipline focus groups, and final exit surveys, using a combination of collection methods including paper-based, online and collection via mobile devices. This work in progress looks at the technologies that are currently being used and also those that may be used to provide alternative forms of support for the students.

Current use of technology

As well as providing students with access to a multidisciplinary experience it was envisaged that they would also be exposed to new technologies that are being used in health care. Depending on the nature of the training site and the associated health service, the scope for using these technologies has at this stage been limiting. Part of the Project plan has been to provide the students with access to the Internet to allow for research and exploring the background of patient conditions that they encounter. Hospital networks are very restrictive and providing this access has been a challenge. It was fortunate that the current operating site has had previous collaboration with students from the university and therefore access to the outside world, from within the hospital, has been facilitated by allowing the students to use their normal student identification details to authenticate via a proxy server. It was also hoped that there may be wireless access in the hospitals to allow students to use their own devices but due to security issues stated these have not been made available.

Various forms of communication have been used in order to contact and brief students on the requirements for the clinics. This process has been inhibited by the broad range of students involved from the five disciplines who also may be at different stages of their course. The University’s learning management system – based on Blackboard, does not easily allow for cross course communication and therefore this was not convenient. From an expression of interest to take part in the Project students are contacted by their preferred email address, as well as their university email. Due to the changeable nature of the clinics and associated patient numbers last minute changes must be communicated with the students. To assist this the placement coordinator has resorted to using *SKYPE* to SMS students. Once a commitment has been made to be involved students are manually given access to a specially designed site in the LMS that is being used as a one-stop shop for project and hospital requirements.

One of the important outcomes of the Project is to gauge the benefits of providing students with a multidiscipline experience in order to gain an awareness of the contribution of various members of the health care team. A number of methods are being utilised to gain feedback and provide and a space where they can share their involvement in the clinics. After each clinic a quick paper feedback is collected to obtain a snapshot of the experience. An online community sharing space has been setup for the purpose of allowing students to engage with each other using the social network tool *NING*. In health communities Parboosingh (2002, p.1*)* suggests that they allow participants to *interact with peers and mentors to frame issues, brainstorm, validate and share information, make decisions, and create management protocols, all of which contribute to learning in practice* It was decided to use an environment external to the university's LMS that was easily setup and managed but also provide a more 'Facebook' look and feel. Students are invited to join and comment on general involvement in the Project but also encouraged to provide brief snippets of their clinic experience via the inbuilt blogging tool.

At this stage of the Project the student use of this space is sporadic. Students have made initial comments but are slow to make additional contributions. Members of the Project are varying the layout and content to encourage increased engagement. An example of a student's comment from this site shows promising positive feedback in these early stages of the Project.

> *"From the perspective of a nursing student, I found this clinic session invaluable as it forges an appreciation of various disciplines that I had previously taken for granted within the hospital. Furthermore, it facilitates greater learning of "discipline specific" terminology. Overall, fantastic and can't wait till my next clinic"*

Most of the students involved are doing so on a voluntary basis and as such a formal assessment is not required. The nursing students however, are able to gain placement credit if they complete a designated number of hours. As the NING social space does not allow for private comments an alternative mechanism to collect journal entries at various stages of the students involvement will be created within the LMS site using the personal blogging tool (Learning Journal).

Planned use of technology

As the Project develops there are plans for providing students and the clinical staff involved access to resources and technologies that will enhance the experience. The students coming from different perspectives and stages of their courses will be provided with printed material covering the process and procedures but it is hoped that basic clinical knowledge and resources will be supported using various technologies and online materials.

A series of **online modules** will be produced that will give students an awareness of the roles and clinical approaches that they may encounter while attending a clinic. For example access to "Intro to Podiatry" will give non-podiatry students an understanding of some of the terms, techniques and treatment plans that a podiatrist may use in their clinics. These modules will be produced using a variety of online tools that will allow for quick development of stand-alone resources by the Project's non-technical educational consultants who are liaising with both the clinicians in the community and the discipline Program coordinators on campus. The modules, based on existing templates, will use a variety of multimedia components to deliver a *SCORM* compliant package. Access to these modules will initially be via the LMS but they may also be available to students on mobile devices in the clinic settings. One of the challenges in the development of these modules will be to produce meaningful modules with appropriate content that may also be available to the clinicians. Various software tools will be used to produce the videos (interviews) and audio content for inclusion in the modules.

Each of the clinics is being supported with a **range of equipment and technologies** that will provide students with an engaged and authentic experience. Some of the clinics, for example "Fatty liver disease" clinic require sophisticated equipment for diagnosis and treatment. The Project needs to balance the operational needs of the clinical together with providing the students access to the use of these technologies.

An important component of a students' placement will be the need to interact with the various patient and **clinical practice management software.** At least two of the sites will be provided new forms of this software that will allow students to be aware of the complexity of data that is obtained on patients from within the clinics and from external sources such as pathology results. Using these tools is complicated by the fact that students will need basic levels of access in order to comment on their interaction with patients. Investigations are being made to see if student contributions of clinical notes can be input from mobile devices and then 'signed off' by the clinician.

The environments where these clinics have been or will be setup are varied and often require both the clinicians and the patients to move from one area to another. The patients may see a range of professionals depending on their health issues. This mobile nature of the scenario will be explored using a range of mobile devices that will facilitate the treatment of the patient and be able to expand the educational opportunities for the students. This will as described by Olney & Lefoe (2007) give *Personal access to mobile technologies providing learners with opportunities to be flexible in the way they collect, store and share information to support their problem solving*.

The practice management software being investigated will allow for the entry of patient data via a mobile tablet that communicates with the local installation of the software.
The use of tablet technologies will be further introduced into the Project through the piloting of the use of a number of **iPads.** Initially this will be done by setting up the iPads with a range of medical and allied health related applications to provide students, and possibly staff, with immediate access to these resources. These will include MIMS, Harrisons Medical Manual of Medicine and Epocrates. The second phase of their use with students will be to use these devices to take notes and record evidence from the patients (and clinicians) that will help them contribute to a health care plan for the patient. Students will use various applications such as Note Taker HD, Notability, ChainR and Popplet for this purpose. One of the important procedures that students will be able to contribute to will be the multidisciplinary debrief at the end of a clinic session. It is hoped that these devices will connect to an HD television will allow them to visually explain their understanding of the cases and their suggested treatment plans. Where appropriate the iPads will also be used in an innovative way through the use of a wireless hand-held microscope and its associated app. The app will display the vision of the microscope and allow for patient viewing of the live feed, freezing of the frame in view and capturing images that can be used to assist diagnosis or inform the patient. This hopefully will allow the students to become more engaged with the patients.
Due to the disperse nature of the clinics the Project may also explore the use of low level video conferencing between students and clinicians using these devices with applications such as *Facetime* and *SKYPE*. As mentioned the limitations provided by the hospital environments will also pose problems for the use of these devices where they are required to communicate with the each other and the outside world. It is expected that there will be technical issues with the iPads including connectivity problems but this will be reduced through the use of 3G cards and thus avoiding wireless networks. It may be possible to setup a dedicated *ICTC wireless network* for this purpose.

Conclusion

It has long been considered that better outcomes can be achieved through a multidisciplinary approach to health care by allowing patients to be treated by a range of health care professionals. It has also been the desire of educational institutions involved in the delivery of medicine and allied health programs to be able to bring together teams of students from different disciplines and give them a more rounded and wholistic experience while undergoing their courses. This paper reports on a work in progress of a Project that is endeavouring to use multiple technologies in an effort to support this approach. The current use of technologies is evolving and the planned usage to provide students with increased access to clinical training will need to be flexible to cater for the multiple environments both at the training sites and online.

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Working collaboratively in a group assignment using a Mediawiki for an architecture and construction management undergraduate unit

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This paper describes an architecture and construction management unit which implements Mediawiki in teaching and learning. The main objective of using the Mediawiki is to engage students to work collaboratively online in a group assignment. It also aims to further develop student information technology skills and thus enhance their learning experience. One of the learning objectives of the unit is to develop the ability to communicate the results of student research in construction technology using appropriate digital media from which Mediawiki was chosen. This paper outlines the challenges and issues faced in the implementation of Mediawiki as a collaborative tool in a group assignment of an architecture and construction management unit. It also discusses how academic staff and students were supported through the process of learning to use the Mediawiki. Finally, potential future directions of using Mediawiki in teaching and learning are explored based on students' comments and feedback.

Keywords: Mediawiki, wiki, group work, collaboration, web 2.0, digital media

Introduction

In the 21st Century teaching and learning is no longer based on traditional means of imparting knowledge. Web technologies have evolved and play an integral role in everyday life including education. University students use the Internet to engage with study. Unlike Web 1.0 which is static, Web 2.0 is the new generation of the Internet that takes it far beyond isolated web pages (Teehan, 2010). Social software emanates from Web 2.0 and relates to social networking, including blogs and wikis, as well as other applications such as sites dedicated to social networking (Jurian, 2010). It is based on user participation that encourages open communication, allows for data to be controlled by many people and inspires teamwork (Teehan, 2010) and permits "all to participate in the conversation of learning and knowledge making" (Rosen & Nelson, 2008, p.213). Aspects of Web 2.0 software that enhance interactivity amongst participants include the ability of individuals to collaboratively create material and make it publicly available; to allow the distribution of the created materials to selected individuals, and community based websites where a range of social interactions and communication occur among a group (Rosen & Nelson, 2008).

Mediawiki also referred to as a 'wiki', is one of the Web 2.0 technologies. It is a web-based application where the concept is very similar to Wikipedia. It allows multiple users to work collaboratively on the same documents. Users are able to view the history of documents with the ability to instigate further changes. Wikis have been defined by Augar, Raitman and Zhou (2004) as "fully editable websites" (p.95). Augar, Raitman and Zhou (2006) suggest in wikis participants can access, interpret, and reorder material, including images and wording as they think appropriate in a medium encouraging participant proprietorship where individuals have autonomy to develop material and the form in which it is presented. Slotter (2010) suggests wikis are characteristically constructed according to their substance, not a sequential form, while Lamb and Johnson (2007) distinguish wikis as a unique form of social media exemplifying "cooperation, interdependence and synergy" (p.57). Neumann and Hood (2009) note the purpose of a wiki is to involve those contributing to it to collectively and routinely generate original material which has the ability to also be hyperlinked.

This paper describes the use of Mediawiki as a tool for assignment submission and outlines the challenges and issues faced in its implementation. It also discusses how academic staff and students were supported through the process of learning to use the Mediawiki. Finally, potential future directions of using Mediawiki in teaching and learning are explored based on students' comments and feedback.

Use of Mediawiki in an educational environment

The potential use of Web 2.0 technologies such as blogs and wikis are established in an educational context by Bonk, Lee, Kim and Lin (2009) where concepts associated with "situated cognition, cognitive apprenticeships, and cultures of learning" (p.1) have now been realised. Bonk et al. (2009) reflect knowledge acquisition may be radically changed from a situation where learning is passive through the utilisation of wikis.

The suitability of wikis as learning tools with their basis in a co-operative educational model is suggested by Slotter (2010) where an environment can be created in which teachers can aspire to eliminate the "digital divide" (p.40) separating them from their students. Parker and Chao (2007) conclude that wikis enable students to operate in groups to assist one another's acquisition of knowledge through their incomparable ability to allow individuals to work together on commonly developed intelligence.

Bradley, Lindstrom and Rystedt (2010) suggest that wikis facilitate peer feedback in contemporary educational settings unlike previously established practice where teachers were responsible for providing comments on student work. They chose a wiki as a vehicle to augment the collaboration of students in a group undertaking where students were writing and providing feedback to one another. Bradley, Lindstrom and Rystedt (2010) note the wiki's appropriateness for the activity as it has the capability of allowing users to change the text readily and accurately, as well as clearly representing which individual has edited the page, thereby indicating clear responsibility of the contributor.

Widespread use of wikis is noted by An (2010) in varied activities including, "brainstorming, knowledge construction, project planning, problem solving, resource sharing, case libraries, assignment submission, presentations, and community building" (p.3). Jones (2010) notes specific instances of the extent and capability of wikis to enhance online participation of students as well as provide the ability for them to engage collaboratively in ways that are limited by other modes of online communication such as email and asynchronous discussion boards.

About the unit and Mediawiki

Mediawiki was introduced as a group assignment in one of the core units for students of Construction Management, Architecture and associated combined degrees at Deakin University. This unit provides further understanding of construction technology through a systematic examination of the design and construction of low-rise commercial and industrial buildings, assembly principles and the behaviour and adequacy of structural components. Emphasis is placed on the selection of the appropriate systems, theoretical and on-site aspects and the detailing of components. The unit was taught through a series of lectures, group assignments and an end of trimester examination. There were two assignments in this unit which were to be submitted in one Mediawiki which contributed fifty per cent of the final grade. Each assessment element was designed for students to develop understanding of construction technology through complementary learning methods.

One of the learning objectives of this unit is the development of the ability to communicate the results of the students' research in construction technology using appropriate digital and physical media, hence Mediawiki was chosen. The architecture and construction wiki assignment included experience of peer learning where students were expected to work collaboratively to develop communication and team skills in a process reflective of that described previously by Boud (2001) as "learning from and with each other in both formal and informal ways" (p.4) where focus is placed on the act of knowledge formation and assistance students provide to individuals is seen to be equally important to the specific activity undertaken. In referring to assessment contexts Boud (2010) suggests "access to learning peers" (p.162) can provide a supportive environment and be valuable for individuals to test meaning, generate varied options in approaching activities, locate further resources and provide a range of thoughts, opinions and feedback. Furthermore, the group assignment was also aimed to develop the Deakin Graduate Attribute of working effectively as part of a team as outlined in the *Deakin University Higher Education Courses Operational Policy* (Deakin University, 2011). Employers and professional organisations perceive team work as highly desirable and this assignment was designed to promote it. The principal purpose for choosing Mediawiki as the digital media tool for a group assignment submission is that Mediawiki is not only an excellent vehicle to collaborate and communicate ideas but also it engages students in cooperative learning activities (Teehan, 2010). Using Mediawiki also represented a move from the traditional paper-based submission of assignments towards a sustainable environment. Moreover, as there is no standard format in Mediawiki, this allowed students to explore possibilities of being creative in presenting their work for example by embedding other tools such as media files.

180 students were enrolled in the unit and to complete the group assignment students were divided into 18 groups with 10 team members in each group. The purpose of this particular group size relates to the "real world" of a construction company where the teams may be vast, requiring varied skills. Each group was assigned a team member as the "project manager" for the project. The "project manager" was responsible for monitoring the progress, facilitating contribution of the other team members and overseeing the content of the project. Each group was assigned to one Mediawiki which only teaching staff and the members in the assigned group could access. Students accessed the Mediawiki through the learning management system. Students were allocated 10 weeks to complete the assignments. The tutorials for this unit were designed to reflect an authentic professional consultation with the "client" (the teaching staff). The groups were given 20 minutes each week to consult with the clients on progress of the project. From the "History" page of the Mediawiki, teaching staff were able to observe the students' progress as well as an individual's contribution to the assignment. It provided teaching staff with an opportunity to provide feedback to students as they worked on their assignment and the means to encourage the group members to demonstrate their participation and to ensure they were conforming to the requirements of the assignment. A self and peer review marking rubrics also formed part of the marking criteria for group members' participation. Individual marks were given according to the individual's contribution to the assignment to credit each group member appropriately and fairly. Each group member's contribution was assessed by their team members using a self and peer evaluation (SPE) marking form where the members evaluated themselves and their peers. The final marks for each member of the team were based on their SPE where the group marks graded by the teaching staff were factored with their SPE marks. The self and peer assessment marks were then compared against the contribution in the discussion page.

Supporting staff and students

Like any new project or technology it was expected that there might be issues relating to initiating work in the wiki. Ebersbach, Glaser, Heigl and Warta (2008) suggest wiki technology, with its low technical access hurdles, is ideal for web-based group processes where it does not require extensive training. However the self organisational processes that make wikis so appealing can be challenging though the fundamental principle of the wiki technology is simple (Ebersbach et al., 2008). Lecturers in research conducted by Rifkin, Righetti, Longnecker, Leach and Davis (2010) articulated a range of possible difficulties in using the "new media" (p.11) which included wikis. Their reservations noted the time-consuming process of acquiring competence with new tools and developing and assessing student tasks; lack of certainty of how to evaluate the tasks and that all students have equal opportunity to utilise the online environment; whether this type of medium provides an effective learning platform; and issues relating to relative benefits of team assignments (Rifkin et al., 2010).

In the wiki assignment, support was provided by staff from a central group at Deakin University providing teaching and learning assistance. They were readily available to help both teaching staff and students. Initially, the staff member teaching the wiki assignment was provided a one-to-one hands-on professional development training session in using Mediawiki. The session included an overview of Mediawiki; step-by-step demonstrations and authentic practice activities; discussion of the benefits of using Mediawiki to enhance teaching and learning; and discussion of management, administration issues and tips for effective use of the Mediawiki. The session was based on a workshop developed to enable teaching staff to be equipped with some experience in using Mediawiki in their teaching practice, as well as to increase confidence in its use. Progressive support and assistance was available to the teaching staff member in the initial and the final stage of the design and structure of the assignment. Student support was provided in the form of a presentation overview of using the Mediawiki during one of the unit lectures, and a drop-in session was also conducted for students with queries relating to its use. Through feedback from students it was suggested the help guide linked to Mediawiki was a useful reference site for students needing assistance to begin the assignment.

What did students think about using Mediawiki?

As this was the first time Mediawiki was used in this unit, students were invited to complete a survey to provide feedback on their experiences, including issues encountered with using Mediawiki. Sixty-two students completed the survey. This represents 34.4% of students who enrolled in this unit where 32% of the students had previous experience using Mediawiki in another unit while the remaining 68% were first time users of Mediawiki.

Students were asked if they identified any advantages in using Mediawiki compared to paper based submissions. There were four common factors or advantages that were commented on by students in this survey when using Mediawiki; identifying individual contributions, ease of communication, flexibility of accessing Mediawiki, and learning from peers. Student responses are shown in Figure 1.

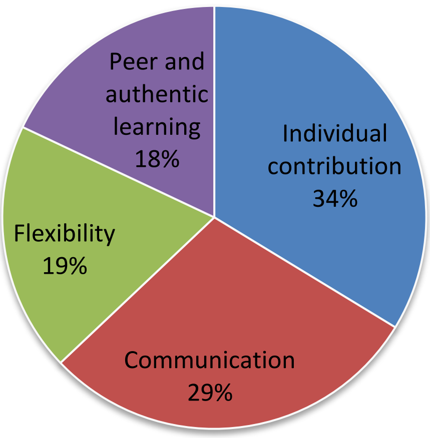

Figure 3: Advantages of using Mediawiki as viewed by students

Communication

Communication among group members was anticipated to be a potential issue in this assignment. This was due to group composition consisting of students enrolled in the unit from varied courses including construction management, architecture, associated combined degrees and civil engineering. Thus, students were encouraged to use the discussion page feature within the Mediawiki to discuss, exchange ideas or make suggestions in the "Discussion" page before choosing as a group the most relevant materials to be included in the "Submission" page. The benefit of using this page instead of exchanging emails to group members was that the group members could check updates without logging in to their emails. This eliminated the excuse of group members who did not receive an email message, or a student who does not check their emails regularly.

Feedback indicated a significant number of positive student comments on the use of Mediawiki to enhance group communication: "Mediawiki is a very handy way to work collaboratively in large groups, as the information can be edited by everyone simultaneously"; "[Mediawiki] built important team skills and organisational skills"; "members of the group can work independently and still be able to communicate with the rest of the group"; "Mediawiki did enable a large group of students to communicate and get to know one another better. This was the largest group I have worked with since starting university". In general, these comments from students confirm that Mediawiki is an effective collaborative tool for a large group of individual members and it makes communication among team members easier.

Individual contributions

Some students found the wiki advantageous for monitoring individual contributions of group members while others were more ambivalent in regard to this feature. One student commented that "all group members can [then] see each others' contributions and measure their work in relation to that"; while another appreciated the immediate availability of others' contributions "I think the wiki is a good tool for [a] group assignment as it allows people to put their stuff up and the others can see it instantly". As stated by one of the students, the wiki made individual members somewhat accountable for the work they carried out as it was obvious whether contributions were being made. A student concurred that the wiki could track individual work and monitor contributions, while another stated that the wiki was a good repository and provided easy access to others' work. Although some students commented that the Mediawiki was an excellent tool to "check" on the contributions of each group member, others expressed reservations about the wiki's capacity to do this, "an issue was that quite a few people struggled with operating wiki so the one group member who was experienced at it generally put work up for them, therefore it may have seemed like people did less than they actually did".

Student comments in regard to the intended ability of the wiki to enable participants to monitor individual contributions suggested in some cases it was useful, while others found it might not have been an accurate representation of an individual's participation in the group project.

Flexibility

Students' comments included "Mediawiki could be used from home and made doing the assignment as a group a lot easier"; "the wiki is easily accessible so it is useful for seeing the progress other group members have made. It is also useful for staying in contact with group members outside of emails and phones, as long as the wiki is regularly checked by everyone"; "all parties/group members can work on the wiki and collate work easily rather than relying on face to face meetings and deadlines to see each others' work".

As well as being able to contribute in the "Discussion" page, group members could also meet face-to-face to discuss their assignment at a convenient time as this is an on-campus unit. The face-to face discussion could then be uploaded into the "Discussion" page within Mediawiki so that the students who were unable to meet were able to see updates and contribute to the discussion as well. Students noted the "discussion page allows for quick and easy communication"; The Mediawiki allowed us to easily share this information via the discussion page"; and "one can easily talk about issues via the "Discussion" function".

Overall, these comments and observations from students indicate that Mediawiki is accessible by anyone, anywhere with Internet connections and hence making sharing resources easier among team members.

Peer and authentic learning

A student commented that "learning how to use the wiki means that we will be able to use it in the future, not only for assignments but as an actual life skill"; while another student reported it enabled group members to encounter a "range of different students from other courses, got to associate with them like the real world". Some students commented that Mediawiki is a good tool for sharing ideas with other group members and giving feedback on their contributions; "I found that working as a group we were able to share resources which was very useful". Thus, the wiki assignment was perceived by some students as a tool which assisted authentic learning among peers.

Challenges in using wikis in teaching and learning

In a study of student wiki use, Jones (2010) identified a high degree of dissatisfaction with the wiki tools which negatively impacted on the project as a whole for the students. Feedback from this study group indicated that for a significant number of students, using Mediawiki was not an easy task.

There were three main issues were citied by the students in the Deakin University architecture and construction wiki assignment. These included: skills required in using Mediawiki; the need for workshops on more advanced skills in using Mediawiki; and group dynamic and size. Students' responses are shown in Figure 2.

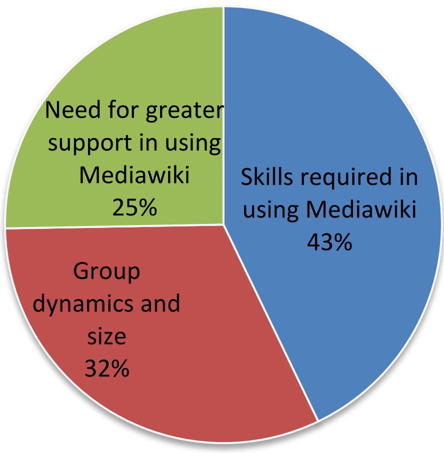

Figure 4: Main issues encountered by students using Mediawiki

Skills required in using Mediawiki

Lazda-Cazers (2010) noted in using a wiki with students in an undergraduate course that acquiring skills to work with the wiki posed a challenge for some students, while Ebner and Kickmeir-Rust (2008) suggest although a wiki is designed to use with easily accessible coding, a degree of computer literacy is necessary to contribute to it.

The Deakin University architecture and construction management students commented on the requirement of having necessary skills and knowledge of Mediawiki to be able to format, code and arrange information within the Mediawiki. Some students noted the difficulties of formatting Mediawiki compared to word processing software, as well as difficulty of arranging the layouts and knowing the codes used in Mediawiki. “It was hard to format our submission … not being able to put in tables … the format of Mediawiki will take some time to get used to”; “we found the formatting of the Wiki extremely difficult and time consuming”; “coding was problematic to begin with as everyone was new to the program”; “the biggest issues are having group members of varying skill, and also general teething issues yourself, it’s very hard to suddenly pick up an internet coding format when you're not used to it. Some students wouldn't feel motivated to learn it either, when they consider that they will never need it in their careers”; and “the use of Mediawiki is suited better to those who are well versed in coding and computer use. As we are studying architecture, I heard of, and know many people who struggled using this as a medium. Adding tables, changed text size/bolding/italics, adding pictures etc proved to be quite a struggle for some”. One student commented “when two people are working on Mediawiki at the same time, the first person’s saved work is lost when the second person goes to save their work. When two or more people are contributing at the same time, a lot of work can be lost”.

Students’ comments indicated that overall, a specific level of information technology skills and technical competency was required to be able to contribute successfully to the wiki.

Need for greater support in using Mediawiki

Some students suggested in their feedback the need for assistance with developing skills beyond basic wiki formatting in order to effectively complete the assignment: “[there] should be more instruction initially in how to use the site”; “having the tutorials focus more on the actual wiki that was being produced rather than on the group (maybe, get the wiki projected on a screen so that the group can go through parts of it with the tutors)”; “there should be more education and practice on Mediaiki before commencing the actual project”; “tutorial sessions should incorporate lessons of how to display information on wiki (drafting skills, detailed sections, good websites, common building knowledge)”. Other students suggested the need for more advanced workshops on Mediawiki “I think the wiki is a good idea and should be used in the future although all students need to be taught how to use the wiki to a fairly advanced level for it to be fully practical”; and “more on line video tutorials should be made available to ensure more things can be easily implemented e.g. formatting, how to insert a gallery for photos etc.... There is a lot the wiki can do but learning tools such as more video tutorials need to be provided so that we can learn to use the wiki facility to its fullest”.

Students’ requests for support and assistance suggest a minimum expertise requirement to be able to operate and contribute confidently to a group assignment using a wiki as the medium for interaction and collaboration. Further training in using wiki would have helped the students to work more effectively in that medium.

Group dynamics and size

The challenge with this assignment was not intended to be about Mediawiki as a technological tool but rather the level of responsibility of the students taken towards their contribution to the assignment and their attitudes towards fellow group members. Jones (2010) and Neumann and Hood (2009) observed in research on student use of wikis a degree of unevenness of participation of group members, although Jones (2010) suggested this situation occurs commonly in group collaborative contexts whether or not technology is utilised as the group medium.

Although the assignments consisted of a group mark and individual mark a similar situation was noted by some student participants in the Mediawiki assignment who provided feedback on group dynamics: “less group members. I feel that 5 members per group would be more beneficial with this assignment as it would be easier to determine a direction for the group and easier to determine individual tasks for group members. It was very difficult to organise the group with 10 members, 1 leader and no specific tasks set for individual members in the assessment brief. If you had members in your group who hardly contributed, like the group I was in, then the group mark will be low and an individual who put in lots of work for their nominated section of the assignment will be punished due to the poor contributions of other members in their respective sections”; and “good experience, worked with a lot of different students. It is really dependent on the group you get, I heard some other groups were really struggling with group participation”.

A significant number of comments were also noted that group size was too large to work effectively particularly in terms of group administration and should be re-evaluated in future teaching periods.

Future directions

Compared to the traditional paper-based group assignment, Mediawiki makes it possible for teaching staff to observe students’ progress as well as identify an individual’s contribution to an assignment. Furthermore, Mediawiki also allows students to explore possibilities of being creative in presenting their work, for example by embedding multimedia files. In ways outlined above, Mediawiki is a good collaborative tool especially for group assignments. However implementation of the Mediawiki assignment completed by groups of architecture and construction management students at Deakin University highlighted the need for some refinements to the assignment to be adopted for future similar group projects, as suggested by student comments and observations of the lecturer and educational support team.

Elgort, Smith and Toland (2008) suggest if the purpose of using a wiki in a learning context is to promote successful group cooperation then some degree of ‘scaffolding’ (p.207) may need to be established in the use of a wiki for a team assignment, as appropriate team behaviour cannot be assumed. There were a significant number of positive responses from the student survey conducted in terms of working collaboratively in a group assignment using a wiki. However the need to expand the skills of students in using this tool is suggested as essential for students’ learning in using the Mediawiki. In corresponding future units Mediawiki will be used in a co-requisite of this unit. To expand the use of this tool, Mediawiki will not only be used as a collaborative tool within the unit, it will be used as an interactive tool in a co-requisite unit of construction and structures and another unit in the same course which is a project based unit from a higher level. The purpose of this is to establish a peer learning exercise among the students in a different year level. For example, the students from the higher level will be able to collaborate and learn from the students in the co-requisite unit of construction and structures who have experience using Mediawiki. On the other hand, the students from the higher level could assist their peers on the content of the unit which they have undertaken in previous years. This will enable students to engage in cooperative learning activities within the same course but in a different year level.

In another future initiative after the due date of the wiki assignment, it is suggested the wiki could be made viewable to all students with none of the students able to make any further editing changes. The aim of this is to enable students to view what other students have completed for the assignment and learn from one another. It will also serve as revision for the final trimester exam.

Ebner and Kickmeir-Rust (2008) emphasise ease of use by participants of a program is a key element to its effective application, and this aspect is frequently neglected with wikis. To ensure that Mediawiki is successfully implemented in the future in this unit at Deakin University, it is suggested students are effectively prepared to use the wiki technology itself. The first tutorial of the unit may present a suitable opportunity to introduce Mediawiki to students where they could explore the idea of Mediawiki by browsing Wikipedia or a similar site. This will enable students to become familiar with navigating wiki sites as well as learning the basic syntax of a wiki. Providing students with a small wiki related task may increase their confidence with using Mediawiki. Karasavvidis (2011) in reporting on a study investigating problems encountered by undergraduate university students using a wiki suggested editing the activity with a wiki as a whole into progressive activities, and the adoption of innovative means of developing knowledge acquisition in teaching students using Web 2.0 technologies in order to reduce difficulties and enhance their positive use. Deakin student feedback in the wiki assignment noted: “I believe that using Mediawiki can be useful for group assignments, as not everyone can be at uni all at the same time, it can create problems if people do not know how to use a basic wiki. I know that there were some lectures and info sessions on how to use wiki, but maybe by adding a small practical assessment on how to use it, maybe something around 5-10 percent, it would give an incentive for people to learn”.

These suggestions could be addressed in future wiki assignments by providing more comprehensive training in using the wiki by students. Similar comments are noted in feedback from Higher Education students in a study on wiki use in a group assignment reported by Witney and Smallbone (2011), whose ideas for augmenting the use of a wiki related to learning frameworks provided for wiki use to be available during classes as well as assistance in the development of effective group interaction. Cole (2009) observed that the learning activity or project itself should be developed in the first instance with the wiki in mind, and to incorporate introductory activities relating to learning how to use a wiki. The former observation is reflected in a comment by one of the Deakin students who suggested the wiki “needs to be more deeply entrenched in the curriculum before students can stop viewing it as a hindrance”.

Conclusions

There is significant potential in using Mediawiki in teaching and learning to engage students in a group assignment. Mediawiki allows students to present their assignments or projects using different ways of submitting assignments other than a paper-based form which enable students to explore creative possibilities in presenting their work as well as working collaboratively in a group in an online environment with access to peer learning opportunities. Duffy and Bruns (2006) suggest “new technologies, such as a blog or wiki, make new demands on learning and provide new supports to learning, even as they dismantle some of the learning supports upon which education has depended in the past” (p.38). According to the wiki assignment outlined in this paper staff as well as students require appropriate support in implementing a wiki in teaching and learning in order for students to experience worthwhile learning outcomes in terms of accommodating group dynamics and working collaboratively with students from a varied course background. This may include incorporating some of the suggestions of students which included providing greater guidance in how to format and use a wiki in a group online assignment.

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Changing minds and transforming professional development...virtually

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Imagine a professional learning and development (PLD) approach designed to dovetail with what educators are doing in their classrooms and online – PLD that is accessible 24/7. Rather than asking educators to add another focus to their busy lives, this approach would support their teaching in a way that could rapidly enhance their students' engagement and achievement.

The Virtual PLD (VPLD) programme was trialled and evaluated in 2010 with 10 teachers from the tertiary, secondary and primary sectors, and is being piloted in 2011 with 20 teachers and principals. The findings from the 2010 in-depth evaluation have fed forward into the pilot, which in turn is providing opportunities to test the robustness of the existing model with a larger number and variety of participants. This paper will provide a description of the VPLD model, as well as an overview of some of the findings from the 2010 trial.

Keywords: professional development, community of practice, mentoring, eLearning.

Introduction

The Virtual PLD (VPLD) initiative was instigated in October 2009 by the NZ Ministry of Education, who also funded the project. The VPLD model and approach was trialled and evaluated in 2010 with ten teachers from the tertiary, secondary and primary sectors, and is being piloted in 2011 with twenty teachers and principals. All participants are in a variety of locations, as well as from a range of disciplines, and diverse backgrounds, ethnicities and cultures. Five principle objectives were to:

9. Focus on contextualised, personalised learning for educators;
10. Foster Communities of Practice (CoPs) that would encourage collaborative professional relationships;
11. Develop an approach to PLD underpinned by mentoring;
12. Raise student achievement of learning outcomes, partly by ensuring a strong student focus, as well as links to curricula and National Certificates of Educational Achievement; and
13. Be sustainable (financially and environmentally) and scaleable.

This paper will describe the VPLD model, as well as discuss some of the findings from the 2010 trial and associated research study. Further details of the study and results to date will be presented at the conference.

16. Insights from the literature

The VPLD model drew from a number of research findings, several of which identify factors that can have positive effects on teaching practice. Key ones include the design, duration, frequency, facilitation, context, and forms of the PLD, which affect the depth of assimilation and sustained influence on teaching practice (Ham, 2009). To encourage iterative cycles of reflection and evaluation, challenge assumptions, create formative cognitive dissonance, and to encourage shifts in practice PLD needs to be:

13. Integrated into what an educator is already doing (Timperley, Wilson, Barrar, & Fung, 2007);
14. Flexible enough to be personalised to an educator's own context. Context is important because educators can trial new approaches with their own students and receive feedback (Mayes, & de Freitas, 2004);
15. Provided in frequent short bursts over an extended duration – preferably three years or more (Fullan, 2008);
16. Built into existing roles and daily routines (e.g. preparing a session for students) (Shea, Pickett, & Li, 2005).

Above all, it is imperative to recognise that professional learning is a social activity (Salomon, 1993); therefore easily accessible, regular interaction with peers and mentors is paramount (Ham, 2009), as is the development of social spaces for building relationships. PLD that exploits the potential offered by Computer Mediated Communication (CMC) can enhance the formation of CoPs, especially where participants are encouraged to build personal online learning networks, while also asking questions, collaborating, discussing, and planning further actions (Sharples, 2000).

17. Description of the VPLD programme

The points briefly outlined in the section above are reflected in the design of the VPLD programme, which is conceptualised visually in Figure 1, and described below.

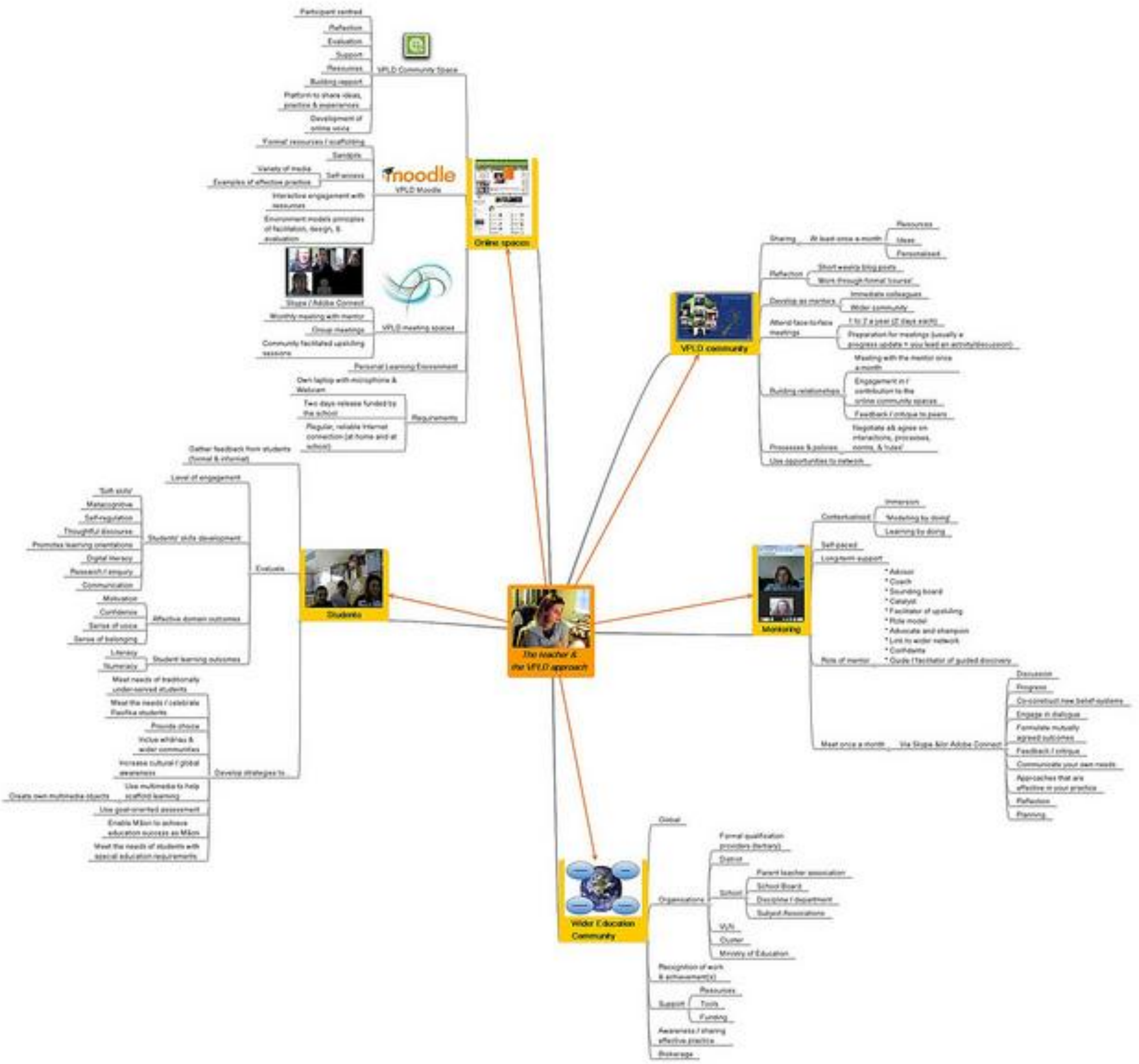

Figure 1: The education practitioner and the VPLD model (*please click* [here](#) *to see full size*)

The VPLD community

Prior to participation in the VPLD programme several teachers indicated that they felt isolated in their own school community, in part because of the apparent lack of support and understanding around what they were attempting to achieve with students. So, particularly important was the sense that they were part of a meaningful CoP. When CoPs are an integral part of PLD they can provide opportunities to develop supportive professional networks (Wenger et al., 2002), as well as a space to participate in conversations around learning and teaching and to share practices (Brown & Duguid, 2000). Because the VPLD online CoP has formed over time it offers a safe environment in which educators can discuss and challenge alternative points of view about pedagogy and practice - an aspect that appears to be enhanced by the participants' eclectic combination of disciplines and sectors. Social structures (including agreements about interactions, processes, norms, and rules) were negotiated and established by the initial ten educators - although they have since been re-negotiated, evaluated and altered as the CoP has matured and grown.

An integrated model of virtual professional development that relies on learning and working collaboratively is likely to be enhanced by an initial face-to-face meeting if possible. In part this provides an opportunity to establish working relationships (Milligan, 1999), and is especially useful as an aid to social cohesion, especially if educators are unfamiliar with participating in an online community and/or via CMC. As part of the VPLD 2010 trial there were two face-to-face meetings, whereas in 2011, due to growing numbers, only one face-to-face meeting is planned. Alongside the face-to-face meetings a variety of community building strategies are employed such as sending out a monthly newsletter that highlights conversations and contributions in the online Community Ning space, as well as showcasing the work of community members, and celebrating successes. There are also all-community web conferencing sessions, either to mark, for example, the end of the year, or with a specific pedagogical and/or skills focus, such as facilitating online webconferencing sessions.

Mentoring

The VPLD programme has no formal 'content'; rather participants develop their own learning goals around projects that interest them, within a teaching as inquiry process. Each participant is then partnered with a mentor with whom they meet online using Adobe Connect (a webconferencing tool that enables interactive synchronous communication), or Skype, once a month for between forty-five to ninety minutes. During monthly meetings a variety of subjects are discussed including pedagogy, what the participant has been working on with their students, student learning outcomes, and how their students have been reacting. The participant also identifies areas of support they need. This provides opportunities to encourage collaboration with the CoP as well as self-access to resources. However, where extra support is required 'just in time' tailored feedback, or upskilling (for example, by using personalised 'how to' videos or audio and written critique) can be provided. Currently there are three mentors employed within the VPLD team, but the model scaffolds and encourages participants to undertake mentoring roles in their own context(s).

Online spaces

The VPLD programme has three main online spaces 1) a community online social networking space (Ning), 2) a 'sandpit' area and access to self-paced resources via the learning management system, Moodle; and 3) Adobe Connect. The online spaces are used for a variety of purposes such as recording self-reflections, and offering comments, suggestions and encouragement. In addition, participants are encouraged to post a short monthly report (one-hundred-and-fifty to three hundred words) that gives an overview of their activities, reflections, and 'next steps'. As such, there is an awareness of needs, as well as opportunities for co-constructing new belief-systems about learning and teaching (Bishop, Berryman, Cavanagh, & Teddy, 2007).

However, during the trial in 2010 it became obvious that among the VPLD teachers there was not equality of access to the technology itself, or in the level of technical support. Previous studies have shown that external factors have an extensive impact on access to and satisfaction with learning experiences (for example, Owen, 2010). While participants' ICT skills and experience could be augmented, some negative factors were technical (bandwidth and hardware / software) and could not be resolved by the mentor or VPLD community. There were also issues around the blocking of essential sites in a school setting. For the bigger picture of scaling the VPLD model to a nationwide initiative these factors have several implications. The regular virtual meetings and sessions rely on video, audio, and screensharing. Once ultra-fast broadband has been rolled out in New Zealand, bandwidth should not be an issue. However, suitable, functioning hardware also needs to be available. Therefore, there is an associated cost implication to institutions (Shea, Pickett, & Li, 2005), that is accompanied by a need to assess the more rigorous blocking of sites in education workplaces.

18. Students

VPLD participants are encouraged to evaluate the effects of their shifts in practice on the learning experience as perceived by students, as well as gathering feedback to use for further changes, and (although problematic because the the variety of influences within each learner's environment) impact on student learning outcomes. The evaluations (formal and informal) conducted to date by VPLD teachers have identified positive effects as well aspects that have, when reflected on by the teacher, informed shifts in design and / or teaching practice; one teacher commented: "Personally, I only need to see the achievement, attitude and engagement of my students to know that I am on the right track". Effects include:

17. Increased level of engagement, as well as cultural and global awareness;
18. Development of 'soft skills' (e.g. time management and sense of self as 'learners');
19. Development of metacognitive, communication, digital literacy and research / enquiry skills;
20. Self-selected use of a range of multimedia to scaffold learning;
21. Creation of a range of own multimedia objects to demonstrate learning and / or practice skills; and
22. Positive impact on affective domain outcomes such as motivation, confidence, voice, and sense of belonging.

19. Wider education community

In the VPLD programme the professional learning is subsumed within the participant's role within their own institution's community, rather than being the central focus as can happen with other approaches to PLD. However, there are still concerns around the level of involvement of each participant's school community, and a number of strategies have been formulated. For example, in 2010 members of the wider education community were invited to join the VPLD online social space and encouraged to actively contribute, and in 2011 principals who have teachers participating in the VPLD programme were invited to meetings to acknowledge possible concerns and answer queries.

20. Conclusion

The extended duration of the VPLD appears to have a noticeable effect on teaching practice, as well as offering opportunities to forge lasting professional relationships. A clear example of how well the VPLD trial was received is: "Thanks for the opportunity. I've learned much and been inspired over time, without pressure of instant results. That's what PD should be about". The significant level of engagement and development demonstrated by nine of the ten teachers participating in the 2010 trial suggests that the approach is flexible enough to suit the myriad needs of educators as learners. The appropriacy of the VPLD model going forward will be explored in ongoing research (2011 to 2013).

While the findings of the 2010 trial may be consistent with any well-designed PLD intervention, one positive point of difference was that the VPLD – by its very nature (mainly online) – immersed practitioners in a virtual environment. Practitioners are part of a learning environment that models the principles and facilitation, design, and evaluation approaches that can potentially be applied to enhance their own students' learning experience and outcomes. This immersion means that there are opportunities for 'learning through doing', while also encouraging reflection on issues that can be an integral aspect of online learning. The CoP that underpins much of what happens in the VPLD in turn offers a forum for developing strategies that teachers then adapt to suit their own context and students. As such, participants are encouraged to adopt new pedagogies, technologies, tools, and vocabulary partly from the 'viral' effect of sharing effective practices within a CoP.

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An institutional study of the influence of 'onlineness' on student evaluation of teaching in a dual mode Australian university

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Student evaluation of teaching (SET) is now commonplace in many universities internationally. The most common criticism of SET practices is that they are influenced by a number of non-teaching-related factors. More recently, there has been dramatic growth in online education internationally, but only limited research on the use of SET to evaluate online teaching. This paper presents a large-scale and detailed investigation, using the institutional SET data from an Australian university with a significant offering of wholly online units, and whose institutional SET instrument contains items relating to student perceptions of online technologies in teaching and learning. The relationship between educational technology and SET is not neutral. The mean ratings for the 'online' aspects of SET are influenced by factors in the wider teaching and learning environment, and the overall perception of teaching quality is influenced by whether a unit is offered in wholly online mode or not.

Keywords: student evaluation of teaching, wholly online mode, class size, year level, discipline difference

Introduction

Student evaluation of teaching (SET) has a long history, has grown in prevalence and importance over a period of decades, and is now commonplace in many universities internationally (Davies, Hirschberg, Lye, Johnston & McDonald, 2007; Denson, Loveday & Dalton, 2010; C. Smith, 2008). SET data are collected for a range of purposes, including: as diagnostic feedback to improve the quality of teaching and learning; as an input to staff performance management processes and personnel decisions; to provide information to prospective students in their selection of units and programs; and as a source of data for research on teaching (Marsh & Roche, 1993). While the use of SET data may have originally been collected for primarily formative purposes to improve teaching and learning (Rovai, Ponton, Derrick & Davis, 2006), it is also increasingly used for summative judgements of teaching quality and teaching staff performance that may have implications for personnel decision making (Neumann, Gosper & Adams, 1997). The increasing use of SET for high-stakes decision making puts pressure on institutions to ensure that their SET practices are sound and defensible (Neumann, 2001).

The most common criticism of SET practices is that they are biased, and influenced by a number of non-teaching-related factors (Al-Issa & Sulieman, 2007). Rovai et al. (2006) report that while much SET research provides mixed results, there is some evidence that smaller classes are rated more favourably than large classes, that upper year-level classes are rated more favourably than lower-year classes, and that there is rating differences between discipline areas. While additional course-related factors are also noted, other reviews of the literature on SET also identify these three factors as commonly reported systematic influences on SET ratings (Davies et al., 2007; Neumann et al., 1997). One common approach to dealing with the perception that certain factors systematically influence SET ratings is the provision of what are known generically as rating interpretation guides (RIGs). Although the specifics of various RIGs-style systems vary, the essential element is the provision of a norm-based set of benchmarks for the 'fair' ranking or comparison of SET results. These benchmarks are based on a set of units of study that are similar in certain relevant respects – typically class size, class year level and discipline grouping – to the target unit (Lemos, Queirós, Teixeira & Menezes, In print; Neumann, 2001; C. Smith, 2008).

In more recent times there has been dramatic growth in online education internationally that continues to this day (Allen & Seaman, 2010; Loveland, 2007; Mayadas, Bourne & Bacsich, 2009). Rovai et al. (2006) note that much of the published research on SET relates to traditional classroom settings, and in an analysis of qualitative SET data (student written comments) they found a significant difference between the responses of students completing a wholly online version of a course compared to students completing an on-campus version of the same course – online students gave a more negative rating. They also note the limitation of a qualitative-only investigation of SET ratings, and call for additional research using other investigative methodologies. Likewise, Loveland (2007) notes the lack of research on the use of SET to evaluate online teaching, provides a study indicating significantly lower SET ratings for online classes compared to on-campus classes, and calls for additional research in this area. For many universities, programs and individual teachers, online learning is a crucial element of their activities. This paper presents a large-scale and detailed investigation, using the institutional SET data from an Australian university with a significant offering of wholly online units, and whose institutional SET instrument contains items relating to student perceptions of online technologies in teaching and learning. This paper seeks to identify those factors, if any, that influence student perceptions of online technologies in teaching and learning, and to identify the influence, if any, that wholly online mode of offer has on SET ratings generally.

The Deakin University context

Deakin University is an Australian university that is a major provider of distance and online education. In addition, it teaches on-campus at four campuses located in three cities in the State of Victoria, with campuses spanning metropolitan, regional and rural locations. Deakin University currently teaches on a trimester system, with three teaching periods per year of equal duration and status. In total, approximately 39,600 students are enrolled in studies (Deakin University, 2011). As part of an institutional commitment to expand online teaching and learning, Deakin University introduced a policy that required that, '[f]rom 2004, all students commencing a Deakin Bachelor degree course shall undertake and pass at least one wholly online unit, unless exempted by the Chair of Academic Board' (Deakin University, 2003). Wholly online is defined as: all content online; all communication and interaction online; assignment submission and feedback online; and employing online interactive communications. As a result of this policy, Deakin University offers a significant number of wholly online units across different year levels of programs in different discipline areas. Deakin University also has an 'Evaluation of Teaching and Units' procedure (Deakin University, 2009) that requires that, unless a case is made for exemption, Deakin University's student evaluation of teaching and units (SETU) questionnaire is administered to students enrolled in a unit of study every time it is offered. This means that a large volume of SET data is collected annually at Deakin University.

The SETU instrument, as a standardised, centrally administered questionnaire, was first introduced in 2003, and its current form was introduced in 2006, with item 10 added in 2010. It consists of ten core items:
This unit was well taught.
The course materials in this unit were of high quality.
The workload in this unit was manageable.
Requirements for completing the assessment tasks in this unit were clear.
The teaching staff gave me helpful feedback.
The library resources met my needs for this unit.
I would recommend this unit to other students.
The technologies used to deliver the online content in this unit performed satisfactorily.
The on-line teaching and resources in this unit enhanced my learning experience.
This unit challenged me to learn.
SETU respondents rate each core item on a five point scale (1=strongly disagree; 2=disagree; 3=neutral; 4=agree; 5=strongly agree) with a 'not applicable' option included.

Following the completion of the SETU survey period and collation of results, SETU data are reported via a public website; anyone with an interest can query the results for the ten core SETU items, based on a selection of evaluation period, faculty, school, unit and student enrolment location. The data reported for a unit include total enrolment, total number of responses and computed response rate for the enrolment location(s) selected, and, for each of the ten core SETU items, number of responses, mean rating, standard deviation of the mean rating, percentage agreement, percentage disagreement and percentage difference. SETU results are publicly reported for a unit unless the number of responses is less than ten; the presumption being that anything less than ten responses is an unrepresentative sample size.

Methodology

Mean ratings for the ten core SETU items for all units reporting data via the Deakin University SETU web site were collected for the whole year period, including trimester 2 2009, trimester 3 2009/2010 and trimester 1 2010. Based on the systematic coding convention used for identifying units of study at Deakin University, it was possible to identify the nominal year level and the ‘owning’ Faculty (used as a proxy for broad discipline area) for each unit and add these data to the data record for that unit. Using the Deakin University online unit handbook (Deakin University, 2010), it was possible to identify all units of study offered in wholly online mode and add this data to the data record for each unit.

For each of the three commonly identified factors that influence SET ratings (class size, year level and discipline area), an analysis of variance (ANOVA) was undertaken to identify and quantify any significant systematic variation in the mean ratings for the two SETU items related to ‘onlineness’ (items 8 and 9). Additionally, using online mode of offer, an ANOVA was undertaken to identify any systematic variation in the mean ratings for all ten SETU items. Pearson’s correlation coefficient was used as a measure of the effect size for any observed systematic influences. In all statistical analyses, the significance level used was $p < 0.01$. A discussion of the observed results is also presented.

Results and Discussion

General

The data extracted from the SETU reporting web site and used in the analysis here included mean rating sets for 1432 units of study, and represented 74498 sets of SETU ratings, 188391 individual student enrolments and 58.5 percent of all units listed in the Deakin University handbook for the period under consideration.

SETU items relating to ‘onlineness’

Deakin University’s SETU instrument contains two items directly related to students’ experiences of online technologies in their studies, namely:
Item 8 – The technologies used to deliver the online content in this unit performed satisfactorily; and
Item 9 – The on-line teaching and resources in this unit enhanced my learning experience.
Drawing on research that applies information systems models of user acceptance of technology in educational contexts (Lin, 2007; Roca, Chiu & Martínez, 2006), there is strong evidence that learner satisfaction with (and hence acceptance of) an online learning system is directly related to the perceived quality of the service and the system, and that system reliability is an important determinant of such user perceptions. Support was found here for this proposition in a strong, significant and positive correlation between mean ratings for SETU items 8 and 9. The observed Pearson linear correlation coefficient was $r = 0.855$ ($r^2 = 0.730$; $p = 0.0000$). This was the third highest of all SETU inter-item correlations observed. This observed correlation is visualised in Figure 1 showing mean SETU rating for item 8 versus mean SETU rating for item 9. One implication of this finding is that a high level of reliability for an online learning system is a prerequisite for student satisfaction with the system and perception of its value in enhancing learning.

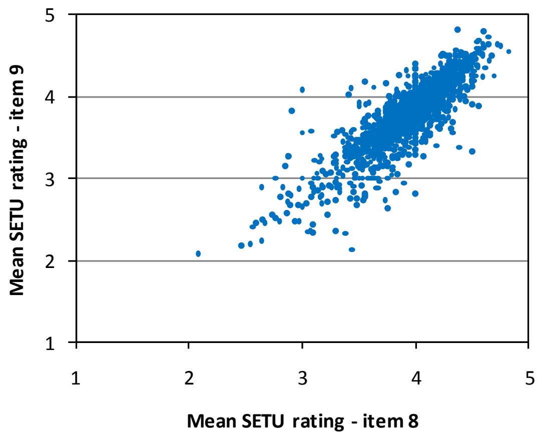

Figure 1: Scatter plot of mean SETU ratings for item 8 and item 9

Class size

For classroom-based teaching, it has been suggested that class size may influence the teaching approach used by a teacher and/or impact on the amount of personal communication or attention that a teacher can give to any particular student (Adams, Neumann & Rytmeister, 1996; Centra & Gaubatz, 2000), both having a consequent negative impact on student perceptions of teaching (and SET ratings) as class size increases. The officially recorded unit enrolment was used here as a proxy measure for class size; acknowledging that this is the nominal class size, which may vary depending on actual class attendances (either physically on-campus or virtually). For the reported Deakin University data under analysis, the unit enrolment varied from 12 to 1648, with the majority of units falling under 100 enrolments, and very small numbers of units with enrolments above 500. If the units are rank ordered by enrolment and divided into three groups, the break points occur at enrolments of 50 and 105. For convenience, the nominal class size groupings of <51, 51-100 and >100 were selected. For SETU items 8 and 9, a one-way ANOVA was attempted for the mean rating as the dependent variable against class size grouping. For both SETU items Levene's test of homogeneity of variance failed, so a robust ANOVA test using the Welch test statistic was performed instead. No significant difference in mean SETU rating between class size groupings was observed for SETU items 8 and 9. Table 1 presents a summary of the statistical test results. Figure 2 shows the mean SETU ratings of the three class size groupings for SETU items 8 and 9. Note that compressed vertical scales are used and 95 percent confidence intervals are estimated.

Table 1: Relationship between SETU items 8 and 9 and class size grouping

SETU item	Test statistic	Significance	Effect size
Item 8	$F = 0.885$	$p > 0.41$	n/a
Item 9	$F = 3.199$	$p > 0.041$	n/a

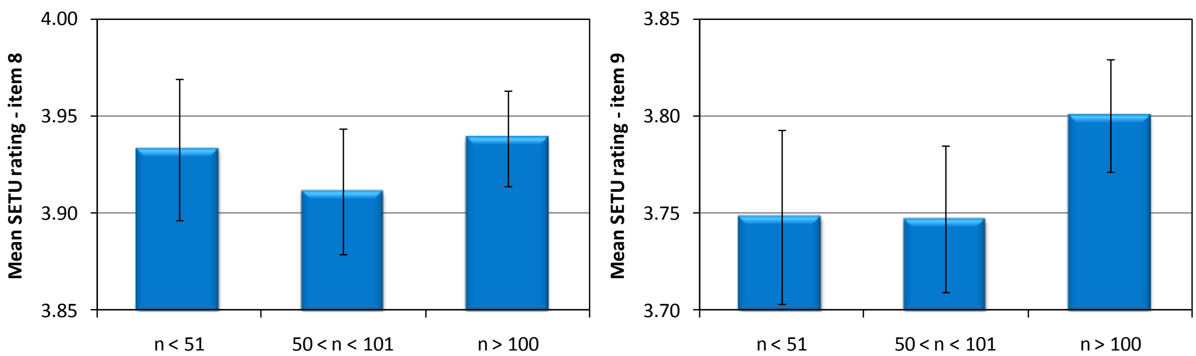

Figure 2: Mean ratings for SETU items 8 and 9 by class size grouping

Given that how an individual student experiences the performance of online technologies is essentially independent of the size of classes they are enrolled in, it is not surprising that the mean rating for SETU item 8 was observed to be independent of class size. It was also observed that the mean rating for SETU item 9 was not significantly related to class size. Drago & Peltier (2004) note that while the influence of class size on perceived course effectiveness for traditional courses is well researched, there is little research on this association for online courses. In a survey of 1126 MBA students from both conventional and online courses, they found a significant negative association between perceived overall course effectiveness and class size for traditional courses, but no such association for online courses (Drago & Peltier, 2004). They propose that the reason for this is that, either intrinsically or due to the development of educational technologies, many of the factors that contribute to perceived course effectiveness (including: course content; instructor support; course structure; instructor-student interaction; and student-student interaction) are essentially independent of class size for online courses. While the investigation here related to student SETU ratings of the online aspects of units (regardless of whether they are actually offered in face-to-face, blended or wholly online mode), it is believed that the same essential reasons might lead to class size grouping having no significant impact on the mean SETU ratings for items 8 and 9. While it beyond the scope of the investigation presented here, it is noted that the mean SETU ratings for some non-online-related SETU items (3, 5, 7 and 10) all exhibited a significant and negative association with class size grouping.

Year level

In the general SET literature, year level is often identified as a systematic and positive influence on SET ratings (C. Smith, 2008). The duration of undergraduate programs varies between the disciplines, with three years common in the general arts and sciences, but four or five years common for many professional programs. In addition to undergraduate programs, there are also many postgraduate programs. To accommodate for the variation in program duration, year level groupings of ‘early years’ (first and second years), ‘later years’ (third and later years) and ‘postgraduate’ (programs beyond undergraduate level) were employed. For SETU items 8 and 9, a one-way ANOVA was attempted for the mean rating as the dependent variable against year level grouping. For both SETU items Levene’s test of homogeneity of variance failed, so a robust ANOVA test using the Welch test statistic was performed instead. A significant difference in mean SETU rating between year level groupings was observed for SETU items 8 and 9. Table 2 presents a summary of the statistical test results and a measure of effect size based on Pearson’s correlation coefficient (*r*). Figure 3 shows the mean SETU ratings of the three year level groupings for SETU items 8 and 9. Note that compressed vertical scales are used and 95 percent confidence intervals are estimated.

Table 2: Relationship between SETU items 8 and 9 and year level grouping

SETU item	Test statistic	Significance	Effect size
Item 8	$F = 8.972$	$p < 0.0002$	$r = 0.096$
Item 9	$F = 16.515$	$p < 1\text{x}10^{-7}$	$r = 0.132$

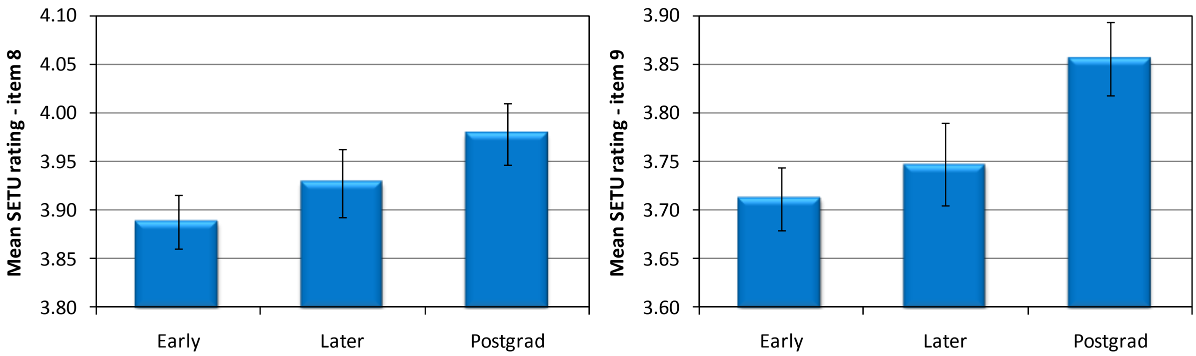

Figure 3: Mean ratings for SETU items 8 and 9 by year level grouping

It has been suggested that the commonly observed positive association between year level and SET ratings is related to student maturity, and that after several years at university, older students have more realistic expectations of their university experience (Denson et al., 2010) or, at least in some discipline areas, students become more independent in their learning in the later years of their study (Adams et al., 1996). More realistic/pragmatic expectations about the performance of online technologies in the support of teaching and learning could account for the differential mean ratings observed for SETU item 8. In an online learning environment (OLE) survey of 822 health science students, respondent age was found to be positive predictor for student attitudes to computers, both generally and in relation to education (Brown et al., 2010). With an increase in mature age and other 'non-traditional' students in undergraduate programs over time, the relationship between age and year level of study is perhaps less clear than it once was. However, Brown et al. (2010) posit that by the third and fourth years of their education, students will have had more exposure to e-learning, and that this may contribute to positive attitudes toward e-learning in older students. The findings here suggest that early years students will benefit from training and other support in how to use online learning technologies that are relevant to their studies.

Discipline area

There is evidence of systematic differences in general SET ratings between different discipline areas (Neumann, 2001; C. Smith, 2008), as well as evidence that different discipline areas use and value specific aspects of OLEs differently (Novell, Jaén & Bohigas, 2004; G. G. Smith, Torres-Ayala & Heindel, 2008; Woods, Baker & Hopper, 2004). Deakin University is currently structured around four academic faculties, each composed of a number of schools, and housing a range of relatively cognate discipline areas:

- Faculty of Health – Medicine, Nursing and Midwifery, Psychology, Exercise and Nutrition Sciences, and, Health and Social Development;
- Faculty of Arts and Education – Communication and Creative Arts, Education, History Heritage and Society, and, International and Political Studies;
- Faculty of Business and Law – Business, Accounting Economics and Finance, Management and Marketing, Information Systems, and, Law; and
- Faculty of Science and Technology – Architecture and Building, Engineering, Information Technology, and, Life and Environmental Sciences.

These existing faculty-based groupings offer a rational and reasonable natural categorisation for the grouping of disciplines offered at Deakin University. For SETU items 8 and 9, a one-way ANOVA was attempted for the mean rating as the dependent variable against discipline grouping. For both SETU items Levene's test of homogeneity of variance failed, so a robust ANOVA test using the Welch test statistic was performed instead. A significant difference in mean SETU rating between discipline groupings was observed for SETU items 8 and 9. Table 3 presents a summary of the statistical test results and a measure of effect size based on Pearson's correlation coefficient (r). Figure 4 shows the mean SETU ratings of the four discipline groupings for SETU items 8 and 9. Note that compressed vertical scales are used and 95 percent confidence intervals are estimated.

Table 3: Relationship between SETU items 8 and 9 and class discipline grouping (Faculty)

SETU item	Test statistic	Significance	Effect size
Item 8	$F = 11.998$	$p < 2\text{x}10^{-7}$	$r = 0.137$
Item 9	$F = 21.177$	$p < 4\text{x}10^{-13}$	$r = 0.187$

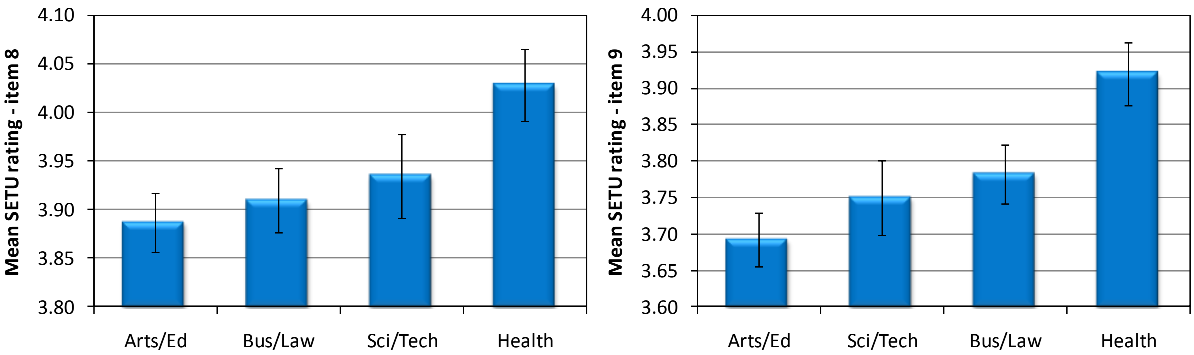

Figure 4: Mean ratings for SETU items 8 and 9 by discipline grouping (Faculty)

Research into the ways of knowing and ways of teaching suggest fundamental differences between discipline areas (Hammond & Bennett, 2002; White & Liccardi, 2006), yet much of the research into online learning seems to assume no influence from discipline context (G. G. Smith et al., 2008). The discipline group differences in SET ratings relating to 'onlineness' observed here are in broad agreement with the findings of a UK JISC research project which surveyed students from four different discipline areas and found that students from medical (health) disciplines gave the highest importance rating to e-learning as part of their studies, while language (arts) students gave the lowest rating of importance to e-learning (Conole, de Laat, Dillon & Darby, 2006). Previously at Deakin University it has been observed that students from different Faculties rated significantly differently the importance of, and their satisfaction with, a range of elements of the institutional OLE (Palmer & Holt, 2010). Such a finding supports the observations made here, and challenges the value of standard, one-size-fits-all institutional policies and templates relating to the use of the OLE. The identification of the need for more detailed exploration of the impact of discipline area differences on the user experience of online learning can be found in the literature (Jones & Jones, 2005; Novell et al., 2004; G. G. Smith et al., 2008; Wingard, 2004; Woods et al., 2004).

Interaction between year level and discipline area

The preceding ANOVA analyses suggest that both year level and discipline area have an influence on mean SETU ratings for items 8 and 9. It is worthwhile to test if these effects are independent or, in fact, are due to some underlying relationship between year level and discipline area in the data set under examination. A multi-factor ANOVA test can identify interactions between the grouping variables. For SETU items 8 and 9, a two-way ANOVA was attempted for the mean rating as the dependent variable against both year level and discipline area grouping combined. Table 4 presents a summary of the statistical test results for SETU item 8 and a measure of effect sizes for each item based on partial eta squared (η^2). Table 5 presents a summary of the statistical test results for SETU item 9 and a measure of effect sizes for each item based on partial eta squared (η^2). For both two-way ANOVAs Levene's test of homogeneity of variance failed, but the multi-way ANOVA test is relatively robust to inhomogeneity of variance, as long as there is no correlation between the mean and spread of the dependent variable. For both two-way ANOVAs, plots of mean versus spread showed no correlation, providing confidence in the statistical tests and the results presented in Table 4 and 5.

Table 4: Interaction between year level and discipline area groupings for SETU item 8

Item	Test statistic	Significance	Effect size
Overall model	$F = 5.346$	$p < 3\text{x}10^{-8}$	$\eta^2 = 0.040$
Year level	$F = 9.569$	$p < 8\text{x}10^{-5}$	$\eta^2 = 0.013$
Discipline	$F = 11.136$	$p < 4\text{x}10^{-7}$	$\eta^2 = 0.023$
Year Level x Discipline	$F = 1.673$	$p > 0.123$	n/a

Table 5: Interaction between year level and discipline area groupings for SETU item 9

Item	Test statistic	Significance	Effect size
Overall model	$F = 8.686$	$p < 5\text{x}10^{-15}$	$\eta^2 = 0.063$
Year level	$F = 15.300$	$p < 3\text{x}10^{-7}$	$\eta^2 = 0.021$
Discipline	$F = 17.638$	$p < 4\text{x}10^{-11}$	$\eta^2 = 0.036$
Year Level x Discipline	$F = 1.930$	$p > 0.071$	n/a

For both SETU items 8 and 9 there was no significant interaction observed between the grouping variables year level and discipline area. This provides evidence that these factors influence the mean ratings for SETU items 8 and 9 independently.

Online mode offer

Deakin University offers units of study in on- and off-campus mode (generally with some level of on-line support) and in wholly online mode (with the characteristics described above). While wholly online unit offerings are a minority, there was still a significant number (92) units offered in wholly online mode during the period under consideration. This time, instead of focusing only on SETU items 8 and 9, for each of the 10 SETU items, a one-way ANOVA was attempted for the mean rating as the dependent variable against wholly online status. For one of the ten SETU items (item 5) Levene's test of homogeneity of variance failed; in that case a robust ANOVA test using the Welch test statistic was performed instead. A significant difference in mean SETU rating between wholly online status was observed for only two of the SETU items (item 1 – 'This unit was well taught' and item 7 – 'I would recommend this unit to other students'), and in both cases the rating was significantly lower for wholly online units. Table 6 presents a summary of the statistical test results and a measure of effect size based on Pearson's correlation coefficient (r). Figure 5 shows the mean SETU ratings for conventional and wholly online modes of offer for SETU items 1 and 7. Note that compressed vertical scales are used and 95 percent confidence intervals are estimated, with a small population correction applied to the confidence intervals for wholly online mode of offer.

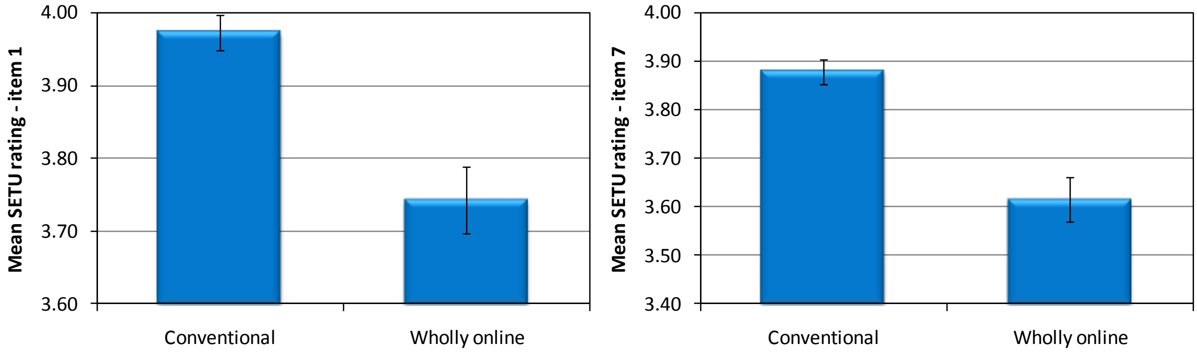

Figure 5: Mean ratings for SETU items 1 and 7 by online mode of offer

Table 6: Relationship between SETU items 1 and 7 and online mode of offer

SETU item	Test statistic	Significance	Effect size
Item 1	$F = 18.266$	$p < 0.0003$	$r = -0.112$
Item 7	$F = 22.350$	$p < 3 \times 10^{-6}$	$r = -0.124$

Here, it is interesting that SETU ratings relating to learning materials, workload, assessment requirements, quality of feedback, academic challenge, etc. were not significantly different for units offered wholly online, but the perception whether the unit was well taught or not was significantly different. This finding seems to indicate that students studying in wholly online mode notice the absence of the 'teacherly' aspects of their study – be it face-to-face contact in the classroom, or the hardcopy study guides provided for off-campus students. Rovai et al. (2006) note some evidence in the literature that some students find online study less satisfying than traditional methods.

In a Deakin University context, it has previously been observed that when an existing unit of study (coded as SEB221) offered in both on- and off-campus mode was converted exclusively for wholly online delivery, the SETU ratings generally decreased significantly (Palmer & Holt, 2007). In that case, while the SETU survey instrument had been modified in the intervening period between the different modes of offer, three of the items did not change. The items that appeared in both versions of the SETU instrument during the period in question were items 1, 7 and 9 (based on the numbering employed in the current version of SETU). Figure 6 shows the mean ratings for these three SETU items in the two years prior to conversion to wholly online mode (2003-2004), the year of the first offer in wholly online mode (2005) and the following year (2006). Figure 6 gives the number of SETU respondents and the effective response rate for each year in parenthesis. Note that a compressed vertical scale is used and 95 percent confidence intervals are estimated for the 2006 mean SETU ratings (as complete 2006 SETU data for SEB221 were available to the authors).

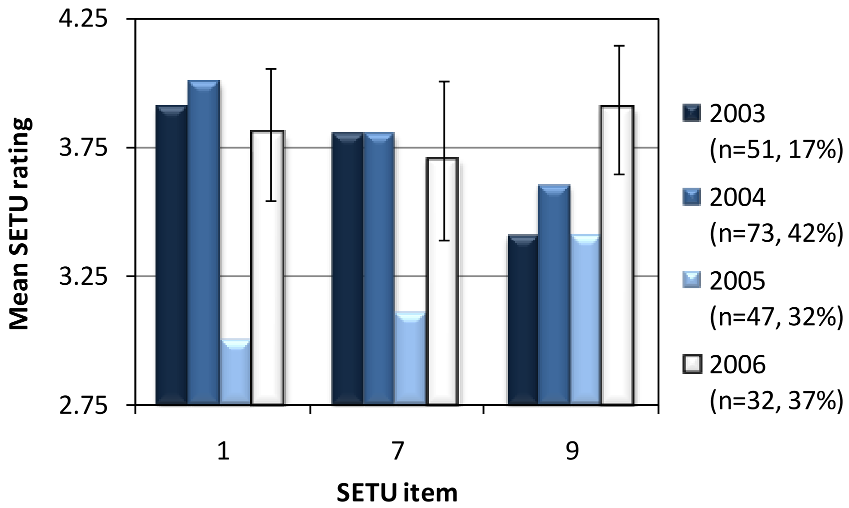

Figure 6: Mean ratings for SETU items 1, 7 and 9 for unit SEB221, 2003-2006

Even though the substantive unit content and the assessment details were not modified in any way, consistent with the influence of wholly online mode of offer noted in Figure 5 above, when the unit was moved to wholly online mode (in 2005), mean ratings for SETU items 1 and 7 declined significantly, while the mean rating for item 9 did not. Following the SETU results obtained in 2005, a small but deliberate change was made to the format of the unit for the 2006 offer to specifically take advantage of the wholly online format to both facilitate interaction between the previously essentially separate on- and off-campus student groups, and to re-introduce a strong teacherly presence in the online space. This intervention appeared to raise the SETU ratings for items 1 and 7 to their pre-wholly online levels, and perhaps even increase the rating for item 6 (see 2006 data in Figure 6) (Palmer & Holt, 2007).

Conclusion

Using the institutional SET data for an entire year from an Australian university with a significant offering of wholly online units, and whose institutional SET instrument contains items relating to student perceptions of online technologies in teaching and learning, it was identified that:

- mean ratings for the two ‘online’ SETU items (item 8 – ‘The technologies used to deliver the online content in this unit performed satisfactorily’ and item 9 – ‘The on-line teaching and resources in this unit enhanced my learning experience’) are strongly, significantly and positively correlated;
- class size had no significant influence on either SETU item 8 or item 9;
- mean ratings for SETU items 8 and 9 are significantly and positively related to the enrolled year level of the respondent, based on the groupings of ‘early years’ (first and second years), ‘later years’ (third and later years) and ‘postgraduate’ (programs beyond undergraduate level);
- mean ratings for SETU items 8 and 9 are significantly different between Faculties – with the Faculty of Health having the highest mean rating for both items, and the Faculty of Arts and Education having the lowest mean ratings for both items; and
- comparing units offered in wholly online mode to units offered in all other modes, mean ratings for SETU items 1 ‘this unit was well taught’ and 7 ‘I would recommend this unit to other students’ were both significantly lower for wholly online units.

It is not possible to conclude whether the relationship observed between SETU item 8 and 9 is causal and/or attributable to a halo effect where respondents do not clearly distinguish between the performance of online infrastructure and the value of online technologies in their learning. What is clear is that there is a strong correlation between the two items, and a poorly performing online learning system is likely to be associated with having a lower value for student learning. More generally, it is clear that the relationship between educational technology and SET at Deakin University is not neutral. The mean ratings for the ‘online’ aspects of SETU are influenced by factors in the wider teaching and learning environment, and the overall perception of teaching quality is influenced by whether a unit is offered in wholly online mode or not. While the observed effect sizes of the influences are comparatively small ($0.096 \leq r \leq 0.187$), two-way ANOVA analysis shows that those factors that significantly influence SETU items 8 and 9 are independent, and could potentially be additive in some circumstances. All are important in an environment where the first decimal in a mean SETU rating can be the difference between a satisfactory or unsatisfactory evaluation in an academic performance review. In particular, the observed influence of online mode of delivery on mean ratings for SETU items 1 and 7 is significant, as those items are two of the three SETU items (the other being item 9) reported to the University Council as overall teaching quality indicators for a unit of study. Given that the use of online technologies in higher education is likely to increase, as is the interest in the rational use of SET data, our findings here support the proposition that ‘onlineness’, like other recognised systematic influences on SET data, shouldn’t be ignored.

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Tutor Accessibility Support Kit (TASK): A Suite of Staff Development Resources for Inclusive Online Learning Design

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Higher Education institutions around the world have seen a significant increase in the number of students with disabilities and it is evident that the needs of these students should be addressed. The use of accessible e-learning can be an enabling experience for disabled students, however, the development of inclusive e- resources in Higher Education is convoluted and poses significant challenges to educators, as developers of their own online materials, and to staff developers, who are responsible for the provision of on-going and valuable support to academics. This paper describes the results of an evaluation that explored the potential of TASK (Tutor Accessibility Support Kit) as a training and support tool for academics with little or no previous knowledge in developing accessible online learning materials, either as part of a Continuing Professional Development course or as an online standalone tool.

Keywords: Accessibility, Inclusivity, Continuing Professional Development, Staff Support

Introduction

Disability discrimination legislation in the UK and across the world places a responsibility on Higher Education institutions to provide an accessible and inclusive learning environment for all students (for example DDA, 1995; SENDA 2001; European Union the EU Charter of Fundamental Right Article 21 and 26; European Disability Strategy 2010-2020; Americans with Disabilities Act (ADA), sections 504 and 508 of the Rehabilitation Act of 1973; Australian Disability Discrimination Act 1992). For the purposes of the Disability Discrimination Act a person is defined as disabled if “he has a physical or mental impairment which has a substantial and long-term adverse effect on his ability to carry out normal day-to-day activities.” (DDA, 1995). The Acts cover all aspects of an institution’s student services, including teaching and learning. This legislation requires providers to make “reasonable adjustments” for disabled people unless they can demonstrate that to do so would be unreasonable. Although “reasonable adjustments” is not clearly defined, effective use of information technology and online learning can result in “reasonable adjustments” (Ball et al., 2003).

HE institutions have seen a significant increase in the number of students with disabilities in the past ten years. According to the Higher Education Statistics Agency, during the 2008/2009 academic year, 67885 students reported a disability of a total of 939035 (7.23%) who enrolled for a first year course, both higher degree and postgraduate. Figures show that between 1995 and 2009 the number of students who declared themselves as having a disability grew by 58.4% (HESA, 2009). According to the same report, the vast majority of the students reported a specific learning difficulty, including dyslexia. Students are not obliged to report a disability during enrollment, therefore, the figures reported are derived from a subset, which may not be representative of the total student population, and the percentages could be significantly higher. Similarly, participation rates of disabled students in higher education in Australia have also been increasing. According to the Department of Education, Employment and Workplace Relations 2009 statistics report (DEEWR, 2009), between 2001 and 2009 there was an increase of 57.86% of disabled domestic students. Overall, the number of domestic disabled students in HE, in Australia, was 33636 or 4.2% of the entire domestic student population. While these proportions are small, the number of disabled students in HE is still significant and growing, and addressing the needs of these students to ensure full and equal participation is a challenge for all those involved in teaching and learning.

At the same time, as disabled students' participation increased, Universities worldwide have adopted e-learning systems as part of their learning and teaching strategy, largely through Learning Management Systems such as Blackboard and Moodle. This increased use of e-learning can be an enabling and liberating experience for students, giving opportunities for learning and participation that they might not otherwise have had (Pearson and Koppi, 2006). However, this can only happen if the learning activities and resources are designed to be accessible. According to Pearson and Koppi (2001), the same materials that provide opportunities can pose further barriers to those with disabilities. For example, although a number of students may have difficulty reading or comprehending text or distinguishing colours, many web based learning materials tend to be heavily text based. Others, with difficulty with organisation, structure or memory may find poorly structured and complex material difficult to navigate. Students with mobility problems, limited motor control or vision impairment may not be able to use a keyboard or mouse. Heavy use of multimedia can be a barrier to those who cannot see or hear.

Although specific material may be created or provided by specialist units or learning technologists, academics are largely responsible for producing and maintaining their own standard e-learning materials such as text documents, presentation slides, audio-visual material or spreadsheets. However, teaching staff are not always aware that there are disabled students in the classroom may not be aware of the requirements of disabled students, may not see it as their role to design accessibly, and cannot always appreciate the difficulties that disabled students face in accessing standard e-learning materials (Unterfrauner & Weiermair-Märki, 2008; Fisseler & Schaten, 2010). Although some academics accept the need to adjust their learning materials, others may regard the requirement to produce accessible online resources as a burden and a problem they have neither the skills nor the time to tackle (Bennett et al., 2003; Seale, 2006). Staff training is an important issue to consider when thinking about changing practice and implementing new accessibility and inclusivity initiatives in education. Seale (2002) suggests that it is imperative that institutions and those responsible for staff development consider support issues for academics. Ensuring accessibility and inclusivity will require commitment from academic staff, and this will mean that they will require on-going support. Evans (2002) also argues that there are enormous support requirements, relating to technical issues and material development, and therefore, those responsible for teaching disabled students should have sound support in all teaching circumstances.

Before academics learn how to produce accessible documents, they need to understand and appreciate the problem of access and empathise with the disabled student experience. Accessibility simulations can give an understanding of the effect a disability may have on the way students access online materials, certain training tools can offer support in inclusive design and they are both increasingly being used in education to support learning. This paper presents a study, which aims to address both the need to raise awareness of the problems disabled students face with access to and use of online learning materials, and the provision of appropriate and timely training materials to support the production of the most commonly used resources.

Accessibility Simulations

Accessibility simulations can give an understanding of the effect a disability may have on the way people access web sites. They can be seen as a disability awareness tool, which promotes better understanding of barriers to access, and enables academics to empathise with the disabled student experience. Simulations have already been used successfully in staff development workshops to help teachers understand the problem of access and prepare them for the adoption of inclusive teaching practices (Pearson and Koppi, 2006). A number of very good accessibility simulations are available online and could be used in accessibility awareness training events, such as those produced by WebAim (http://webaim.org/simulations/) and SimDis (http://www.techdis.ac.uk/resources/sites/2/simdis/), which simulate various aspects of disabilities in areas such as autism, dyslexia, hearing and visual impairments; the Visual Impairment Simulator (http://vis.cita.uiuc.edu/) produced by the University of Illinois at Urbana/Champaign; Vischeck (http://www.vischeck.com/) colour blindness simulators. However, data from previous evaluations indicate that simulations designed specifically to reflect the educational context are required (Papadopoulos et al., 2008). To address the need for an explicit educational context, a set of accessibility simulations have been developed, based on interaction with a learning management system (Blackboard). The disabilities chosen to reflect in the simulations were based on the most common disabilities in UK HE according to the Higher Education Statistics Agency (HESA) (2009).

Figure 1: Colour Blindness Simulation (left) and Cataract Simulation (right)

A set of evaluations was created, to examine the effective use of accessibility simulations in raising awareness of the access problems for disabled students to online learning materials. The results of the evaluation demonstrated that the simulations are effective for raising accessibility awareness and promoting inclusive practices, but that on their own they could not support the development of accessible practice (Papadopoulos et al., 2011). The next stage of the research was to design an interactive training resource to supplement the simulations and provide practical support.

TASK (Tutor Accessibility Support Kit)

The Tutor Accessibility Support Kit (TASK) prototype training and support tool, is designed to address the need for just in time practical support for academics to produce accessible e-learning resources. It takes the form of a repository of specially designed tutorials and is designed to be used in conjunction with the accessibility simulations. The tool can be used by staff developers, as part of a continuing professional development programme (CPD), or independently by teachers available on the desktop or online "anytime, anywhere". The accessibility tutorials on TASK are aimed at those with limited accessibility expertise and skills, the focus is on good design for all students and terminology specifically relating to accessibility has been kept to a minimum. One the of tool's core features is the ability for accessibility experts to contribute their own resources.

TASK currently incorporates two types of resources. The first is a series of videos that demonstrate examples of learning materials that are not designed to be accessible with the equivalent resource re-designed with accessibility in mind. The second set of resources is a collection of tutorials to provide step by step instructions for the creation of inclusive online materials, focused on the most common digital content.

‘Good versus Bad Design’ Videos

Examples of online learning materials that have not been designed with accessibility in mind (“Bad Design”) demonstrate and pinpoint specific problems. These examples are juxtaposed with examples of the same learning materials designed with accessibility in mind (“Good Design”), to pinpoint common problem and address easy fixes. There are currently five video examples of "Good vs. Bad Design" to cover the most commonly used resource types:

- Graph/Chart - this example demonstrates the issues involved in reading and interpreting graphs for students with colour blindness
- Learning object 1 – an example of a learning object, which introduces the Tool Box in Adobe Photoshop CS3 and the problems it poses to students with hearing impairments, along with the solution.
- Learning object 2 – an example of a learning object, which introduces a simple Flash CS4 animation and the problems it poses to students with visual disabilities, along with the solution.
- Presentation slides - an example of a PowerPoint presentation, which pinpoints a number of common accessibility mistakes and the way these issues can be solved.
- Word Document - an example of a poorly formed text document and the simple fixes that would make such a document accessible to students with a range of disabilities.

Repository

The TASK repository is a collection of tutorials, designed to support the creation of accessible online learning materials or improve existing resources. At this stage there are four different categories based on the most common file types used in the LMS and created directly by academics:

- Accessible PDF documents
- Accessible Flash presentations
- Accessible Word documents
- Accessible PowerPoint presentations

The repository incorporates a number of different types of resource:

- Walkthrough presentations with voiceover: Each video is supplemented by captions and narration
- Text based instructions with graphics: simple step-by-step bullet point instructions with screenshots of each step to highlight the process
- Text based instructions only: simple step-by-step bullet point instructions.
- Graphics based instructions: simple tutorials based solely on screenshots to demonstrate each step.
- Step-by-step videos controlled by buttons: a walkthrough step-by-step video presentation, where the user is able to control the pace. Text instructions are included.

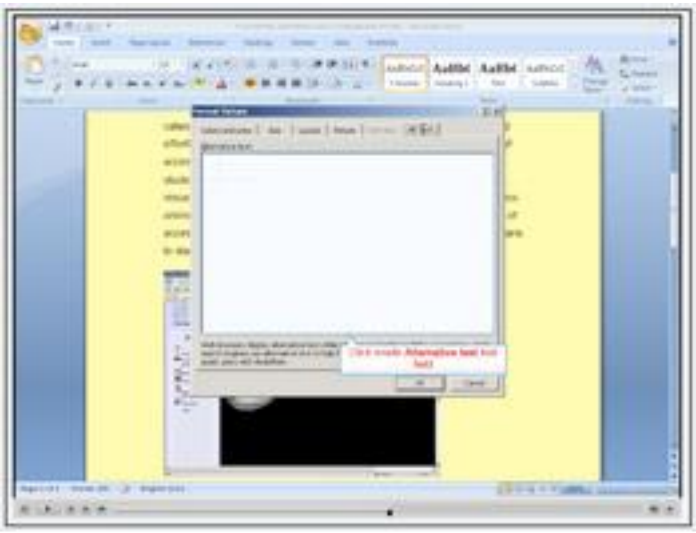

Figure 2: A typical example of a training resource on TASK (Walkthrough Presentation with Voiceover)

Evaluation Procedure

The primary aim of the evaluation of TASK was to elicit the views of staff developers on the appropriateness of the resources and its potential as a training and support tool for academics (either as part of a CPD course or as a standalone tool) with little or no previous knowledge in developing accessible online learning resources. The evaluation of TASK was conducted as a workshop, at the 15th Annual SEDA Conference 2010, a conference for staff developers.

The format of the workshop was as follows:

- Context of the research
- Introduction to and demonstration of TASK
- Post demonstration questionnaire
- Recorded semi-structured discussion

A brief slide show presentation was given to provide an overview of the research. This was followed by a detailed demonstration of the tool. All the current types of accessibility tutorials were demonstrated as well as the process for the creation of new tutorials by staff developers. The participants were then asked to complete a questionnaire to provide feedback on their impressions of the tool as a staff development resource. A semi-structured discussion, which focused on issues around the use of TASK in Continuing Professional Development workshops, as a standalone, online, "anytime-anywhere" support tool and on the format of the current tutorials, concluded the session.

Data Gathering

A questionnaire was the main data gathering method, which was utilised for the evaluation of TASK. The questionnaire was presented in four parts for an easier interpretation of the results. The first part aimed to determine the training methods used by the educational developers who participated in the study. The second part aimed to elicit the participants' views on the appropriateness of the types of resources that are available on TASK. Part three was designed to gather their views on TASK as a training and support tool. Part four of the questionnaire, deals with issues around the categorisation of the training resources.

The questionnaire includes 18 questions: four open-ended questions, 13 Likert-scale questions and one closed-ended (Yes or No). Two types of Likert-scale questions have been adopted. The format of a typical five level Likert item (strongly agree, agree, neither agree nor disagree, disagree, strongly disagree) is used for questions in part one and three of the questionnaire. All questions in part two follow a 1-5 rating scale format with variables ranging from “very inappropriate” (1) to “very appropriate” (5).

Questionnaire Results

A total of 19 responses were obtained. Two questionnaires were invalid, as they were not fully completed, therefore, their results were discarded and not taken into consideration.

Questionnaire Part 1

Part one of the questionnaire was designed to determine the methods and tools that staff developers use as part of their professional development strategy. The purpose of these questions was to determine the extent to which

TASK aligns with existing training methods. The results revealed that the majority of participants use a combination of online, face to face and print resources. Most of the respondents agreed that online tools are an important resource for training. This suggests that TASK would fit in with current staff development practice.

Question 1: What training methods do you use to teach academics?

94% of the participants revealed that they use a combination of online (computer based resources, online training materials) and offline (paper based resources, presentations, etc.) training methods to teach academics. Only one out of the seventeen participants replied that they rely solely on the use of online methods.

Question 3: Online training tools and resources are important and should be used in academics training for accessible design.

The majority of staff developers agreed that online tools and resource are important in teaching academics. 82% of the participants agreed or strongly agreed with the statement, while none disagreed (18% neither agree nor disagree).

Table 1: Questionnaire Summary of Results – Part 1

Question 1		Question 2	
Online methods	6%	**Strongly Agree**	47%
Offline methods	0%	**Agree**	35%
Combination of both	94%	**Neither**	18%
		Disagree	0%
		Strongly Disagree	0%

Questionnaire Part 2

This part of the questionnaire was designed to seek the views of the respondents on what they consider to be the most effective form of resource for supporting staff in learning how to create inclusive materials. The analysis of the results revealed that the most appropriate type of resources are step-by-step videos controlled by buttons and the walkthrough simulation videos with voiceover (M = 4.0588 for both, SD = 0.74755 and 1.02899 respectively). The least appropriate resource type is plain text based instructions without graphics (M = 2.2941, SD = 1.31171). The "Good vs. Bad" design videos were also very well received (M = 3.8824, SD = 1.16632).

Question 4: TASK offers a number of different types/forms of resources. Could you please rate the types of resources below from a scale of 1 – 5, in terms of its appropriateness and effectiveness as an educational resource? (1 very inappropriate – 5 very appropriate).

a) Videos – walkthrough simulations with voiceover

One of the most appropriate forms of resources for training academics, according to staff developers. Nine participants assented that this type of resource is appropriate (47% rated it 5 and 29% 4). Only 18% (three participants) found this type inappropriate.

b) Text based instructions with graphics

Thirteen participants (76%) agreed that this type of resource is appropriate and effective. None of the participants rated it with 1 on the scale, however, four participants rated it with 2 and 3.

c) Text based instructions (no graphics)

The majority of staff developers revealed their disagreement with this form. Almost 65% of the participants found the resource type to be very inappropriate or inappropriate, while only one person found it very appropriate.

d) Instructions based on graphics (just screenshots – no text)

Similarly, with the previous form, participants showed their disagreement with instructions based on graphics, without text. Almost 60% of the group members found the resource inappropriate. None of the participants found the resource to be very appropriate.

e) Step-by-step videos controlled by buttons

Arguably, the most appropriate and effective form of a resource, for training academics. Almost 80% of the participants agreed that step-by-step videos controlled by buttons is a very appropriate (5) or appropriate (4) type. None of the participants rated this type as very inappropriate (1) or inappropriate (2).

f)"Good vs. Bad" design videos

This was another appropriate example of a resource, according to staff developers. Twelve of them (70%) believe that this type is appropriate for academics' training and support.

g) Auditory instructions (no graphics, no video)

Participants' views on this form of resource varied.

Table 2: Questionnaire Summary of Results – Part 2

Question 4a		Question 4b		Question 4c		Question 4d		Question 4e		Question 4f		Question 4g	
1	12%	**1**	0%	**1**	35%	**1**	18%	**1**	0%	**1**	6%	**1**	18%
2	6%	**2**	12%	**2**	29%	**2**	29%	**2**	0%	**2**	6%	**2**	18%
3	6%	**3**	12%	**3**	12%	**3**	35%	**3**	24%	**3**	18%	**3**	23%
4	29%	**4**	35%	**4**	18%	**4**	18%	**4**	47%	**4**	35%	**4**	23%
5	47%	**5**	41%	**5**	6%	**5**	0%	**5**	29%	**5**	35%	**5**	18%

Figure 3 below summarises the perceived appropriateness and effectiveness by the participants.

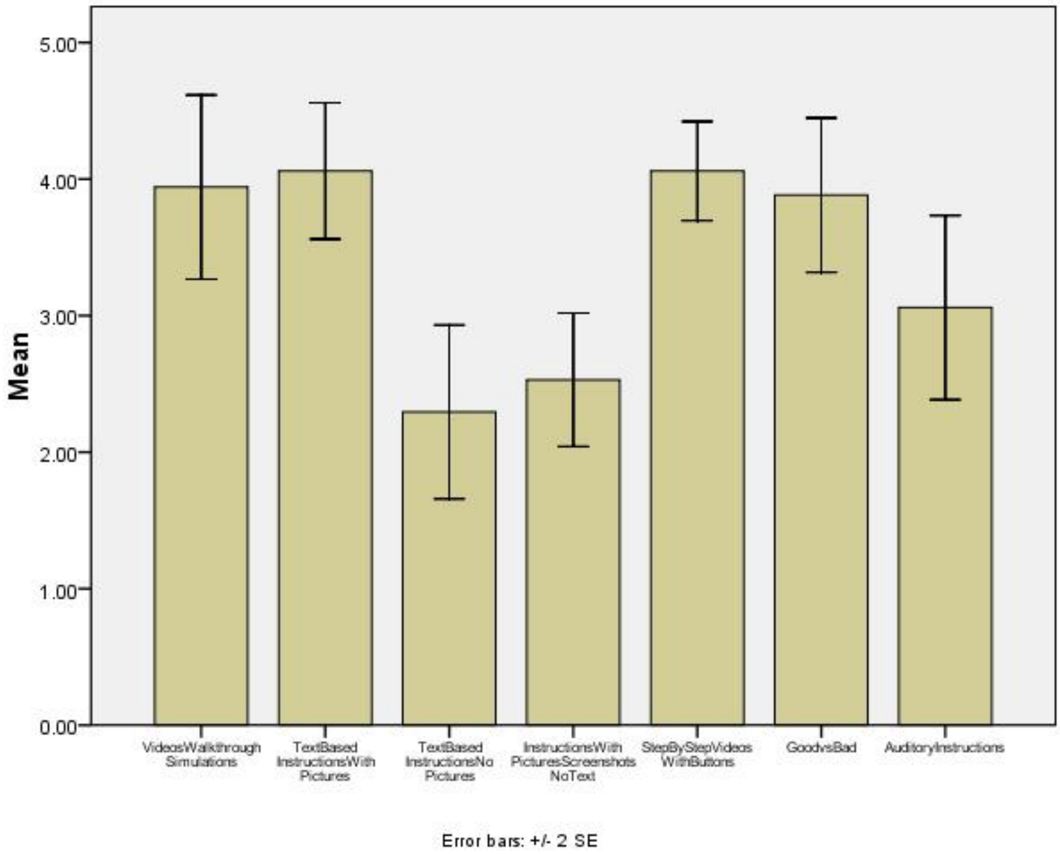

Figure 3: Perceived Form Appropriateness

Questionnaire Part 3

This part of this questionnaire aimed to determine staff developers view on the effectiveness of TASK as a training and support tool for academics, either as part of a CPD course or as a standalone tool. The results revealed that the majority of participants consider TASK as an excellent tool, which they would use in CPD courses and stated that it would prove very useful and beneficial for academics, who decide to use it independently.

Question 6: As a staff developer, I will definitely contribute to TASK and add new resources

Eight participants (47%) agreed that they would contribute to TASK and add new accessibility resources. Another 47% neither agreed nor disagreed and only 6% disagreed with the statement.

Question 7: TASK is an excellent tool to use, in order to teach academics how to develop accessible online learning material.

More than half of the participants assented that TASK is an excellent tool to teach and support in developing accessible online learning resources, for students with disabilities. 35% were indecisive and a small 12% found the tool inadequate for this purpose.

Question 8: I will use TASK in my teaching sessions.

Similarly with the previous question, more than half of staff developers would use TASK in their training sessions (41% agreed and 12% strongly agreed). Nevertheless, two participants strongly disagreed.

Question 9: TASK can benefit academics, as they could use it independently to improve their skills in developing accessible online learning resources.

Overwhelmingly, the participants agreed (76%) that academics could benefit, by using TASK independently in order to improve their skills in accessible and inclusive design (29% strongly agreed and 47% agreed). Only one participant disagreed.

Table 3: Questionnaire Summary of Results – Part 3

Question 6		Question 7		Question 8		Question 9	
Strongly Agree	12%	**Strongly Agree**	18%	**Strongly Agree**	12%	**Strongly Agree**	29%
Agree	35%	**Agree**	35%	**Agree**	41%	**Agree**	47%
Neither	47%	**Neither**	35%	**Neither**	29%	**Neither**	18%
Disagree	6%	**Disagree**	12%	**Disagree**	6%	**Disagree**	6%
Strongly Disagree	0%	**Strongly Disagree**	0%	**Strongly Disagree**	12%	**Strongly Disagree**	0%

Questionnaire Part 4

This part of the questionnaire aimed to determine participants' view on the existing categories of tutorials on TASK.

Question 10: The training tutorials on TASK are categorised depending on the nature of the tutorials (i.e. Microsoft Office Word 2007 tutorials, Microsoft Office PowerPoint tutorials, Adobe Flash CS4 tutorials, etc.). Do you agree with this structure?

Data reveals that participants' views on the chosen categorisation are balanced. Nine participants (53%) agree with this structure, while eight (47%) do not agree.

. **Table 4: Questionnaire Summary of Results – Part 4**

Question 10	
Yes	53%
No	47%

Results Discussion

Data analysis from the first part of the questionnaire as well as the discussion, revealed the importance of online tools in continuing professional development for academics. Although the participants still use traditional training methods, such as presentations and paper based materials, they also utilise online tools and computer based resources to support academics. The participants frequently use videos, audio files, video tutorials, other types of learning objects, specially designed modules on virtual learning environments such as Blackboard or Moodle, and wikis. One surprising finding was that none of the staff developers appeared to be using the specialist staff development materials for accessible online resources produced by JISC Techdis, such as the Accessibility Essentials (http://www.jisctechdis.ac.uk/AccessibilityEssentials/). JISC Techdis is a leading UK advisory service on technology and inclusion and provides advice to support the innovative use of technology within the education, business and community sectors. JISC TechDis Accessibility Essentials are a set of accessibility resources, providing practical information on making electronic documents more accessible. These are materials, which cover key accessibility and inclusion themes. Nevertheless, the vast majority of the participants (82%) agreed that online training tools and resources are important and should be used in continuing professional development. Two of the participants commented:

"There are so many high quality computer based, online training resources out there. It would be foolish not to take advantage of them."

"…there should be a fair balance between online and offline resources. They are both equally important…"

TASK was generally conceived as a repository that would facilitate the contribution of resources by staff developers and accessibility specialists – both to capitalise on existing excellent resources and to provide a comprehensive resource for academics – a kind of one stop shop. However, only 40% of the participants expressed a willingness to add new training resources. Further discussion revealed that they would prefer tool with a "complete set of resources", instead of being engaged in discovering or developing the material themselves.

The discussion also revealed that a significant number of staff developers believe the tool could be used successfully in conjunction with other existing tools for academics training and support. One of the participants suggested that TASK could potentially be very beneficial when used with some of JISC TechDis Staff Development Materials or if existing resources are incorporated into it. It was pointed out that although there are high quality resources available, staff would benefit from a tool that could reside on their desktop and be introduced in staff development workshops and draw together these materials to provide a 'just in time' package.

A participant stated:

"…take comments on board and build on existing resource"

"…I can see this tool evolving to a huge resource, both for academics and staff developers, though a community of practice. In that case maintaining the site and keeping everything up to date will be the biggest challenge"

Staff developers suggested alternative types of tutorials, which could be incorporated on TASK. Podcasts and vodcasts are becoming increasingly popular, and a participant proposed a page with a list of podcasts and vodcast tutorials, which academics could download to mobile devices. Respondents suggested that a combination of walkthrough simulations, with user controls and enriched with auditory instructions would be the most appropriate and effective form of resource. One of the participants also proposed a category or a page on the tool, which will include links to literature around issues of accessibility and inclusivity, such as journal and conference papers.

More than half of the staff developers would be interested in using TASK in their own teaching sessions, and furthermore, consider it an appropriate tool for this purpose. Data from both the questionnaire and the discussion shows that TASK could equally benefit academics in CPD sessions, as well as independently, in order to improve their skills in accessible design.

“Yet to be proven, but I believe it has potential. Depending on how it develops, this could be a great tool, in the hands of staff developers”

A number of participants raised concerns over the categorisation of the existing resources on TASK. They are currently categorised depending on the nature of the tutorials (i.e. Microsoft Office Word tutorials, Microsoft Office PowerPoint tutorials, Adobe Flash tutorials, etc.). Almost half of the participants suggested alternative tutorial categories, depending on the nature of the disability (i.e. tutorials for dyslexia, tutorials for motor impairments, tutorials for blindness, etc.).

Conclusion and Future Work

This paper presented a study, which aims to address both the need to raise awareness of the problems disabled students face with access to and use of online learning materials, and the provision of appropriate and timely training materials to support the production of the most commonly used resources.

The requirement to address the needs of students with disabilities presents significant challenges to academics, as developers of their own e-learning materials, and staff developers, who are responsible for the provision of on-going support and training. This evaluation was designed to present a prototype accessible design resource to staff developers and seek their feedback to inform further development and ensure its appropriateness in supporting the development of accessible online resources.

A number of issues has been identified and need to be addressed, as a result of this evaluation:

- More examples of ‘Good versus Bad Design’ are required to demonstrate a wide range of common accessibility mistakes and ways of addressing them.
- Step-by-step user controlled videos, with auditory instructions proved to be the most appropriate type of resource. This is the format that should be adopted for new resources, which will be developed and incorporated into TASK in the future.
- A multiple search facility needs to be developed that will enable training resources to be selected by disability type, resource type or by task.

Ultimately the simulations and the tutorials will together form a framework for support, which combines the motivational aspect of simulations and a training tool, to support academic staff in designing accessible teaching material.

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Engaging students in learning through online discussion: A phenomenographic study

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This article draws on the findings of phenomenographic research into university teachers' conceptions of learning through online discussion. It was revealed that university teachers consider online discussion in their pedagogy to – a. provide time and access; b. engage learners; c. foster a community of learners; and d. enable higher-order cognition and learning. Widening participation in higher education reinforces the challenge for teachers to encourage learner engagement. This article explores the adoption of online discussion as a strategy to engage learners. It contributes to our understanding of how teachers' think about learning technologies, in particular, asynchronous online discussion and its affordances for learning. There are implications for university teachers, educational designers, academic developers, e-learning professionals and all those involved with the enhancement of student engagement, learning experiences and outcomes.

Keywords: engagement, online discussion, phenomenography, teachers' conceptions

Introduction

Engagement is recognised as a fundamental attribute of deep learning. Teachers of school education, workplace professional development and higher education are particularly focused on strategies to engage learners in activity for learning. Fostering engagement involves well-designed curricula, courses, lessons and student exercises. Increasingly, our learning environments involve technology to mediate student-teacher, student-student and student-expert communication, particularly in online programs and increasingly in blended programs. In light of a call to widen participation in higher education (Bradley, Noonan, Nugent, & Scales, 2008), the synergy between good strategies for engagement and the affordances of computers, the Internet and mobile technologies is an important line of research. There is general agreement that engagement is important in learning and teaching however, as revealed by Harris (2008), there is less agreement on what counts as engagement. Harris (2008) found six qualitatively different conceptions held by compulsory school-teachers (p. 68).

This article draws on the findings of a recent study that revealed university teachers' conceptions of learning through online discussion in various positive ways, including as a way to engage learners. The study extends specialised research into university teachers' conceptions of and approaches to e-learning (Ellis, Hughes, Weyers, & Riding, 2009; González, 2010) and blended learning (Ellis, Steed, & Applebee, 2006) by investigating a single but central component of e-learning courses – online discussion (Palloff & Pratt, 2007, p. 148). Ellis et al. (2009) found university teachers think about learning technologies as – tools to enable access, tools for information delivery, tools to provide active learning and tools to build knowledge. The research described in this article is situated broadly in literature on students' and teachers' conceptions of phenomena in education (Prosser & Trigwell, 1999). Conceptions are important because they inform teachers, educational designers and researchers of how to approach pedagogy, design and research in light of current practice with and thinking about phenomena in education. This study investigates one of the teacher competencies that Goodyear, Salmon, Spector, Steeples and Tickner (2001) refer to as *facilitation of online learning*. Additionally, the study described in this article incorporates preliminary research findings (Parisio, 2010).

The importance of discussion and online discussion

Discussion can enliven classrooms by creating a balance of students' and teachers' voices (Brookfield & Preskill, 2005). It is a valuable way to reveal diverse and complex views about a topic as learners are guided to explore questions, challenge beliefs and learn about other perspectives on subject matter. Indeed, good teaching has been described as 'a sort of conversation' where learners and teachers are equally listening and talking (Ramsden, 2003, p. 160). Interestingly, it is often a large component of our courses but rarely articulated in curriculum documents. Moreover, it is central to instructional strategies such as cooperative and collaborative learning but it's taken-for-granted that our students will know how to effectively practice democratic discussion for learning.

In online courses, discussion for learning moves from the traditional face-to-face context to an online environment – usually, but not limited to, a learning management system. Indeed, some campus-based courses incorporate online discussion components in a blended mode of teaching and learning (See Ellis & Calvo, 2004; Ellis & Calvo, 2006; Ellis, Goodyear, O'Hara, & Prosser, 2007; Ellis, Goodyear, Prosser, & O'Hara, 2006). Brookfield and Preskill (2005) suggest that often online discussion is experienced as sterile, unfriendly and alienating. Many of the contextual cues we have come to rely on in traditional face-to-face discussion, such as the speaker's tone, tenor, intonation, and facial expression, are removed. Like many faculty teaching staff, Brookfield and Preskill were sceptical of a trend to commodify and strip courses of the presence of a face-to-face teacher (2005, p. 215). However, the present study reveals that teachers think about many benefits for learning through online discussion. In the next section, an outline of how the study was conducted is presented.

Methodology

The study adopted a broad phenomenographic approach to research. Phenomenography emerged out of seminal studies investigating students' approaches to and conceptions of learning (See Marton, 1981; Marton & Säljö, 1976). The aim is to systematically reveal and describe the various ways that people experience phenomena in education (Marton & Booth, 1997, p. 111). It is qualitative and based on a second-order perspective on phenomena, thus phenomena are understood by learning how other people experience them (Marton & Booth, 1997). This is in contrast to the researcher directly studying the phenomena (first-order). Phenomenography has been adopted in various ways to research students' and teachers' conceptions in higher education research, compulsory education, health and business research (Harris, 2011).

The sample size (N=15) for this study was based on recommendations from experienced phenomenographers who indicate that fifteen to twenty participants adequately allows for saturation of categories (Bowden & Walsh, 2000). Saturation means there will most likely be repeated conceptions in the sample but most importantly all the various conceptions are captured. In order to capture the greatest variety of conceptions, the sample varied on discipline; class size; degree type; teaching mode (online/blended); and years of experience teaching with technology. They were professors, associate professors, senior lecturers and lecturers who all used online discussion in their teaching. Data was collected systematically via in-depth semi-structured interviews with a focus on the question – What does learning through online discussion mean to you? The interviews were a joint interviewer-interviewee exploration, or in other words, a constitution of the phenomenon as seen by the interviewee. An articulation of the interviewee's reflections on their experience was made as complete as possible by following up with probing questions (Marton & Booth, 1997).

Systematic analysis was performed in three iterations, as is recommended in phenomenographic methodology. The first involved reading the text-based transcripts line-by-line to identify utterances that related to the area of investigation. Analysis of interview transcripts was conducted in a way similar to open coding in Grounded Theory (Corbin & Strauss, 1990). The analysis went beyond the words and content to explore the meanings that people were conveying. The second iteration involved bringing together the utterances into groups of conceptions by identifying similarities and differences in meanings. A conception was compared with the pool of meanings gathered during the first analysis and also within the context of its transcript. In this process, some conceptions were merged as they were essentially describing similar experiences. The third iteration of the analysis shifted focus to the relationships between the categories. The groups of utterances were arranged, re-arranged and narrowed into categories by testing them against the original data – adjusting, retesting and readjusting again until eventually the whole system of meanings was stabilized (Marton, 1994). These conceptions were arranged in hierarchical-order to reveal the outcome space. Importantly, logical relations between the categories were described to highlight the hierarchical arrangement: the higher-order categories encapsulate and extend the lower-order ones (Bowden & Walsh, 2000).

Results and discussion

The majority of research participants described experiences with asynchronous text-based discussion that took place on a 'discussion board' in a learning management system. Only two participants described experiences with synchronous online discussion (the real-time rapid exchange of text and/or audio). Nonetheless, all experiences were treated as research data. It was revealed that the university teachers sampled think about learning through online discussion as a way to –

a. provide time and access,
b. engage learners,
c. foster a community of learners, and
d. enable higher-order cognition and learning.

The richness and variability of the knowledge that teachers have about learning through online discussion resonates with some conceptions of learning technologies. For example, learning through online discussion as a way to provide access for remote, isolated and online students (category 'a') was consistent with thinking about learning technologies as tools for access and information delivery (Ellis, et al., 2009, p. 112). For the purpose of this article, category 'b', to engage learners, will be explored and discussed in detail in the next section.

Category b. Learning through online discussion as a way to engage learners

This category of conceptions relates to the way teachers consider online discussion as a way to engage learners. It reflects a shift of focus from technology to learning and students. It encapsulates using online discussion as a way to build confidence, self-efficacy and self-esteem and to encourage '*experimenting and risk taking with ideas*' (Teacher 2). It also encapsulates the first category where teachers described experiences of using online discussion to give the learner time to think about and construct a contribution to the discussion. The representative quotation for category b is reproduced below, along with other quotations in the category. A commentary on analytical thinking is offered to increase transparency.

> […] where people feel safe and prepared to take a risk and where they support one another and comment and respond to what other people are saying in their own time. […] I think there is anonymity in an online discussion forum, although students know each other's name. It is a safe environment where students are prepared to speak out (Teacher 12).

In the representative quote above, the teacher describes online discussion as a way of engaging students because they are more likely to take risks. This quotation aligns with a conception of engagement that focuses on motivation and confidence in participation (Harris, 2008, p. 65). In this way, students are more likely to engage in the learning exercises. In another way, the quote below refers to an attempt to use technologies that students are familiar with in their social life. This teacher is drawing on a popular social networking culture (e.g. Facebook) to foster engagement in the learning.

> What is it that students today engage in that they can bring from their social life into their educational life? So, I thought, this is where a lot of students are spending their time with their social networking type things. If I can build on those skills and use discussion forums in that way, then hopefully I am going to promote engagement. You know tapping into what students, like to do (Teacher 13).

In the teacher quotation below, asynchronous online discussion is considered part of assessment. This teacher describes a focus on contribution quality to determine if a student has demonstrated 'deep engagement' in the discussion. In this quotation, the teacher described a focus on those contributions that *further the discussion* as evidence of engagement.

> So a post that demonstrates deep engagement is one where they have read others' postings and really reflected on it and then provided some further discussion to build on that community's knowledge. But it is not enough for them to provide say, an opinion, or an emotional response, it has be to more scholarly than that (Teacher 4).

In the following quotation, the teacher has described a technique used in facilitation to help give students a sense of ownership. Here the teacher describes how providing space for students to discuss by themselves can lead to greater learner engagement.

> To let them take ownership of their discussion, the content that they are producing, even their assessment tasks, you know, it is all one and the same thing. Um, if people feel ownership, then they are far more likely to engage, they and more likely to remember it, and are far more likely to learn the meta-cognitive skills or generic skills or whatever, that your course is teaching. If you allow them that freedom they feel that they are actually contributing and respected (Teacher 2).

This quotation resonates with teachers' approaches to teaching – blended teaching as a way to encourage student autonomy in learning (Ellis, et al., 2009, p. 115). Additionally, this quotation reflects teachers' conceptions of engagement – engagement as owning and valuing learning (Harris, 2008, p. 65).

Conclusion and future directions

This study revealed four qualitatively different ways teachers think about learning through online discussion. The article has contributed particularly to our understanding how teachers think about engagement in online learning contexts by focusing on a specific but central component of online and blended environments – online discussion. University teachers have described online discussion as way to enable risk taking, to link to popular culture, to assess learning, to show respect and to provide learners with a sense of ownership. This adds to our understanding of what constitutes learner engagement in online environments. In light of a call to widen participation in higher education, it reveals implications for educational designers and developers in higher education who are involved with design, training and support in online teaching and learning contexts. A logical addition to research in this area would be to investigate the relationship with students' conceptions, which would result in a more holistic understanding of this integral part of the online learning experience.

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Towards a University Educational Framework

Rob Phillips
Murdoch University

This poster exposes a draft university-wide educational and educational technology framework for discussion. Its purpose is to guide educational policy making, particularly for educational technologies. The framework is based on a general conceptual framework of learning and a set of design principles for a contemporary learning environment. The framework is expanded by considering which learning activities and technologies are best suited to actualizing these design principles.

Keywords: Conceptual framework, learning, teaching, educational framework

Introduction

Under the guidance of the Educational Technology Committee at Murdoch University, I started the development of an educational framework which could guide a range of policy, including educational technology, initiatives. This educational framework was crafted in the context of Murdoch's current strategic directions, implementing a 'contemporary learning environment'. Such an environment needs to provide an equivalent learning experience for all students, across all campuses, on- or offshore, and on- or off-campus. It should also support an international perspective, and facilitate work-integrated learning, as well as the development of Murdoch's graduate attributes. In the context of the government's expanded tertiary education agenda, a contemporary learning environment also needs to support:

- a student population from diverse academic, socio-economic, linguistic and cultural backgrounds;
- a student population for whom study is not the only priority, who choose to study at different places, at varying times, and choose to attend or not attend formal classes;
- formal and informal learning;
- a sense among students that they are part of the Murdoch community.

Conceptual underpinning

This framework is predicated on the concept of a learning community – a community of scholars; and it is driven by one underlying principle: **a focus on learning**. Ultimately, learning is a cognitive activity done by individual learners, but it can be facilitated by teachers. In other words, learning has more intrinsic value than teaching.

To take this vision further, it is helpful to consider learning as having three inter-related components, the Learning Environment, Learning Processes and Learning Outcomes (called the LEPO framework) (Phillips, McNaught, & Kennedy, 2011). Three actors engage with these components to form a learning community, as shown in Figure 1, that is, teachers, students and support staff. The LEPO framework draws on other work, namely:

- Biggs' Presage, Process, Product (3-P) model (1989);
- Laurillard's conversational framework (2002);
- The Learning-centred Evaluation Framework initially conceived by Bain (1999);
- Reeves and Reeves' model for interactive learning on the Web (1997); and
- Goodyear's problem space of educational design (2010).

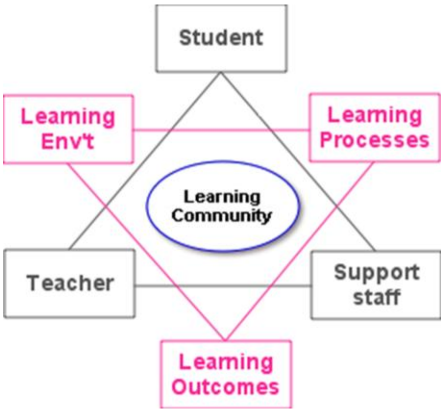

Figure 1. Figure 1. Interaction between learning environment, processes and outcomes and teachers,

The Educational Framework

The preceding discussion, and the literature on learning and teaching in higher education, leads to the following design criteria for learning environments which support flexibility and diversity (Derived in part from Mitchell, Matthews, Pospisil and White (2009) and the broader Learning and Teaching literature.). We have identified three elements: *learning elements*, *teaching elements* and *community elements*, shown in Table 1. These design principles are aligned against the LEPO framework in the inner sections of Figure 2, which graphically describes the entire educational framework.

Table 1. Design Principles for a contemporary learning environment.

Learning Element	**Design criterion/principle**
Individual learning	Learning is undertaken by individuals
Interaction with others	Learning is facilitated by interaction with others
Construct new knowledge	Learning is an active search for meaning by the learner, using current knowledge to make and maintain cognitive connections
Authentic tasks	Learning comes from performing meaningful and authentic tasks
Informal learning	Much learning takes place informally and incidentally, and is driven by curiosity
Learning how to learn	Students can learn how to learn

Teaching Element	**Design criterion/principle**
Constructive alignment	There is alignment between intended learning outcomes, assessment and learning tasks
Scaffolding	Teachers *scaffold* learning tasks so students can build on their existing knowledge
Facilitating learning	Teachers can assist students to learn by designing learning tasks and classroom activities which engage students with complex ideas in meaningful ways.
Graduate attributes	Graduates can demonstrate a range of lifelong learning skills and graduate attributes

Community Element	**Design criterion/principle**
Student wellbeing	Students feel that they are part of the Murdoch community, thus facilitating their continuing success at university.

The next layer of the framework in Fig. 2 portrays the generic types of activities which support learning in the broad sense which has been defined here and which can underpin the learning principles in Table 1. Rather than considering learning and teaching activities in terms of traditional terms (e.g. lecturing, tutorials), I choose to work generically, to avoid falling into traditional ways of thinking. Fig. 2 characterises 17 generic learning activities and teaching activities. The outer circle of Fig. 2 lists specific technologies which can provide the technology-supported functionality required.

Observation of Fig. 2 will reveal that multiple technologies can support particular learning and teaching activities (e.g. Group learning activities). Similarly, multiple learning and teaching activities can be supported by a particular technology (e.g. LMS forums). Where technologies are used in multiple locations, the extra instances are shaded differently. Note that educational technology is not always appropriate for a given learning or teaching activity (see Learning Activity 6. Becoming an expert). Further, the desired learning outcomes and particular context determine the appropriateness of using educational technology.

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Learning analytics and study behaviour: A pilot study

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The analysis of student access to learning management systems and web-based lecture capture systems is a growing area of interest for teachers in higher education wishing to improve the student learning experience. The data trails left by students as they engage in these environments can be accessed and analysed for meaning. This paper describes a study conducted as part of a wider multi-university study into student study behaviour. It offers a detailed snapshot of four students whose access to Lectopia recordings were tracked and analysed, and who were subsequently interviewed to confirm or disconfirm assumptions made about their study methods from the analysis. The data revealed that a surface analysis using learning analytics was largely insufficient to determine student study characteristics, but qualitative data provided rich information to supplement the analysis. Suggestions are made for further research into how this emerging methodology can be further developed and strengthened.

Keywords: learning analytics, academic analytics, student engagement, technology-enhanced learning, lecture-capture systems, study patterns, e-learning

Background/ Intro

Learning technologies are now pervasive in universities in the developed world, but we have little evidence of their effectiveness in improving learning outcomes. In many Australian universities, a blended approach is taken, providing a mix of online and face-to-face study opportunities (Littlejohn & Pegler, 2007). In some Australian universities, students study externally, by distance education, and learning technologies enable remote learners to communicate with each other and their teachers. The most common learning technologies in use in Australia are Learning Management Systems (LMSs such as Blackboard or Moodle) and web-based lecture-capture technologies (such as Lectopia).

Much e-learning research over the years has been based on quantitative data largely derived from the perceptions of students, which may not provide accurate indicators of learning. Such studies rarely indicate the causality of effects. On the other hand, qualitative approaches rely on descriptive data and focus on individual contexts. Emerging research, such as the study described in this paper, seeks to combine data from technology usage logs with descriptive methods, to develop a richer understanding of how students engage with e-learning environments.

E-learning environments automatically capture system-based records of users' activities, recording who accessed what, and when. Use of this data is termed usage logs, audit trails, learning analytics or academic analytics (Goldstein & Katz, 2005; Kennedy & Judd, 2004; Oblinger & Campbell, 2007). Teachers can use this data to reconstruct an individual student's online presence in great detail. However, the meaning of the masses of data that can now be collected is not always clear. Usage log data can be used to track how students use lecture recording systems (this work) and web-based learning management systems (LMS) (See, for example, Dawson, McWilliam, & Tan, 2008; Phillips, 2006; Phillips, Baudains, & van Keulen, 2002). Usage data can also be used to analyse how social networks form during online discussion forums, e.g. Dawson's SNAPP tool (Dawson, Bakharia, & Heathcote, 2010).

However, usage logs simply record users' behaviour in an e-learning environment, but they do not explain why that behaviour occurs. Kennedy and Judd (2004, p. 19) explain that, "at their most basic level audit trails measure the behavioural responses and activities of users", without explaining why they do what they do. So, while usage logs of learners' activities in e-learning environments are increasingly used, and data is often relatively simple to generate, care should be taken in analysing and interpreting this data. This paper contributes to knowledge in this area.

Previous work

The impact of web-based lecture-capture technology on the teaching and learning enterprise has been a popular subject of research in recent years. A large study across four universities (Gosper, et al., 2008) is just one of many recent studies about technologies such as Lectopia (See Taplin, Low, & Brown, 2011 for a recent review). The overwhelming finding of this research into lecture-capture technology is that students find these tools beneficial in terms of both flexibility and assisting their study schedules. However, teaching staff have viewed this technology negatively in some cases, because of falling attendance at face-to-face classes.

A recognised shortcoming of much of this research is that it has focussed on the technology *per se*, rather than the learning environment as a whole (Gosper, et al., 2008). This was the impetus for our current work, which holistically examines a unit of study, and uses learning analytics to gain a richer understanding of what students actually *do* in a technology-enhanced learning environment.

In this research we are primarily interested in learning processes, rather than learning outcomes. That is, the way that students interact with the learning environment and the learning tasks which are embedded in that environment. We are interested in the learning activities that students undertake as they engage with learning tasks: what the learner actually does, whether intended or not. This includes interaction with the learning environment; engagement with designed learning tasks; how this engagement occurs (e.g., individually, in groups, as directed by the teacher); and self-directed review and reflection activities. We contrast these *studying* learning processes with cognitive (or internal) learning processes: "psychological processes which lead to greater competence or understanding" (Goodyear & Retalis, 2010). Goodyear and Retalis proposed that learning processes are "tightly bound up with" (p. 12) – but are not the same as – studying activity, which is our focus in this work.

Lectopia usage patterns

We have previously reported (Phillips, et al., 2010) on the development of a learning analytic tool which 'mines' data recorded by the Lectopia lecture recording technology and aggregates this data in a week-by-week manner. Patterns of use are then displayed graphically for a whole class or individual students. Our initial work (Phillips, et al., 2010) identified eight main conceptual usage behaviours that distinguish between student activities in Lectopia. *Conscientious* students access Lectopia regularly. *Good-intentioned* and *Repentant* students have some weeks of regular use, at either the beginning or end of the teaching period. Other students access recordings only in dedicated blocks – they are *Bingers*. *Crammers* leave their engagement with recordings until just before the examination period. Other students may access recordings once (*One-hit wonders*) or not at all (*Disengaged*), or their pattern of use may not fit any of the other categories (*Random users*).

These categories provide indicators of behaviour, but they do not explain that behaviour. For example, bingeing students could be very effective in practice, balancing their study, work and family commitments, and studying when they find time. On the other hand, a bingeing student could be falling behind in their work because of poor time management and prioritisation skills, and their efforts could be ineffective. A simple of review of the numbers does not provide this depth of understanding.

Our continuing work has applied this analytic tool to pilot studies of student behaviour in three units across two universities. This paper reports on one of those pilots, drawing on usage data to identify and interview students with diverse patterns of behaviour, in order to validate the use of this tool.

Method

Our work aims to investigate how students engage with, and study in, e-learning environments. We address this in part in this paper, but we are more interested in validating the Lectopia learning analytic tool we have developed, and its use in a suite of methods. We have two specific research questions: 'How useful is the Lectopia analysis tool in identifying student behaviour patterns?' and 'What can this pilot study tell us about student study behaviour in the context of this investigation?'

The design of the study was informed by a pragmatic, mixed-methods paradigm of inquiry, using a modified design-based research approach, which has emerged in recent years as a suitable approach to educational research, in particular e-learning research (Herrington, Reeves, & Oliver, 2010; Phillips, McNaught, & Kennedy, 2011). While a design-based research approach often starts with the initial design of an innovation, in this case we take a *reconstructive* approach (van den Akker, 1999), using existing information to derive the baseline for the study. Design-based research also has an explicit interest in theory development, albeit as relatively humble 'design principles'.

We accessed a range of sources of data to address our research questions: the Lectopia analysis tool described above; the Social Network Analysis tools developed by Dawson et al. (2010) to analyse student behaviour in discussion forums; standard usage reports from the LMS; assessment results; interviews with unit coordinators; and semi-structured interviews with a sample of students.

An essential element of the research design hinges on the ability to identify students so that various sources of data can be cross-referenced (e.g., learning analytics and grades) to their interview responses. Ethics approval was received for this approach, and students were informed about the research, and the possibility of being interviewed, at the start of semester. Interviews were scheduled after all unit activities and assessment had ceased, that is, after the end of semester.

The baseline criterion for categorising students (Phillips, et al., 2010) was to distinguish between behaviour on two dimensions:

- attendance and non-attendance at lectures
- use and non-use of Lectopia

Data for the former were taken from attendance record sheets filled in at each lecture. However, as will be seen from the interview data, not all students did this. Data on Lectopia usage was obtained from the Lectopia analysis tool.

Towards the end of the semester, we began to collate class attendance data and Lectopia usage patterns. We used this to create a shortlist of students with different behaviour categories whom we would approach as possible interviewees. It proved problematic to get students to agree to be interviewed, because the timing of the interviews in the break between semesters meant that many students were unavailable. Other students with high Lectopia use were enrolled externally, and their geographic distance meant travel to the interview location was difficult. While we approached 'backup' students in each category, we were unable to interview as wide a cross-section of behaviours as initially planned. Our stratified sample became, instead, a convenience sample of those who were available for interview within the available timeframe, which impinged on the variety of behaviour categories available.

The semi-structured interviews sought some background information and questioned students about general study habits, before discussing the learning analytic data relating to lecture attendance, Lectopia hits and LMS sessions. We trialed the interview approach with three students. This trial included video-recording the interview so that gesturing around the usage charts could be captured. The visual aspects of the video recording did not yield a great deal of useful information, so subsequent interviews were simply voice-recorded. The interview concluded with questions related to students' perceptions of performance overall in the unit in terms of final result, and whether this meant their chosen strategy was one that they considered worked for them in that unit of study.

The interviews were transcribed and analysed using a constant comparative method (Glaser & Strauss, 1967; Merriam, 1998). Each interview was initially coded, by two researchers according to temporary themes emerging from the data. Successive interviews were constantly compared to these themes, and within and across categories to find meaningful patterns in the data. Refined themes were then finalised to provide meaning, and to describe and explain phenomena within the data. Data were also broadly considered within the three-stage framework suggested by Miles and Huberman (1994): data reduction, data display and conclusion drawing and verification. The qualitative interview analysis was then combined with the quantitative usage data and assessment results to develop a richer understanding of each case. Finally, one of the unit coordinators was interviewed to comment on any contextual issues that might have influenced the analysis.

The pilot study

The semester unit of study (the focus of this paper) was a third year unit on the sociology of education, offered at a metropolitan Western Australian university. The unit had three cohorts: ~150 internal students at the main campus; ~50 internal students at a regional campus; and ~100 external (distance education) students. This particular unit was chosen because it appeared to be well-designed, had a clear and comprehensive study guide and made use of both LMS and Lectopia technologies. Further, the unit coordinators at both campuses were interested in the research, in order to better understand the impact of their teaching.

The teaching activities each week comprised a one hour lecture (recorded through Lectopia) and a two hour workshop for internal students. External students accessed the Lectopia recordings, and carried out interactive activities through discussion forums in the LMS (Blackboard Campus Edition 8). Online participation was assessed for external students but not for internal students. The weekly topics related to issues that impact on education contexts within Australia, supported by numerous readings, which students were expected to read in preparation for workshop or online discussions.

The unit assessment was outcomes-based and relatively innovative in that it aimed to position pre-service teachers as 'practical theorists' (See Bell & Patterson, 1998), so they can act as informed and responsible teaching professionals. Assignments were scaffolded, research-focused and promoted critical reflection on practice during two in-school practicums (pracs) during the semester. The assessment consisted of a short research proposal (in Week 3); a critical autobiography of pre-service teachers' prior educational experiences; and a 2000 word research paper. This final report encouraged students to reflect on the values that they hold and how these may conflict with the views of other stakeholders in the educational system. A final exam completed the assessment requirements.

Results

Lectopia behaviour patterns

The PHP-based Lectopia Usage tool described in Phillips et al. (2010) was used to generate data for the unit studied, by performing database queries on the log data recorded by Lectopia. This data was downloaded and imported into Excel for further manipulation through various formulae and pivot tables. A series of macros were developed to automate the generation of this data and subsequent graphs. The pivot tables allow graphs to be generated for the entire class of students, and for individuals. The Excel macros also provide alternative ways of drilling down into the data, so that the researchers could see at a glance the nature of each 'hit' (or access to a Lectopia event):

- the format of each hit (download/stream/MP3/MP4, etc.)
- the timing of each hit (hits in the first day/within seven days/after seven days)

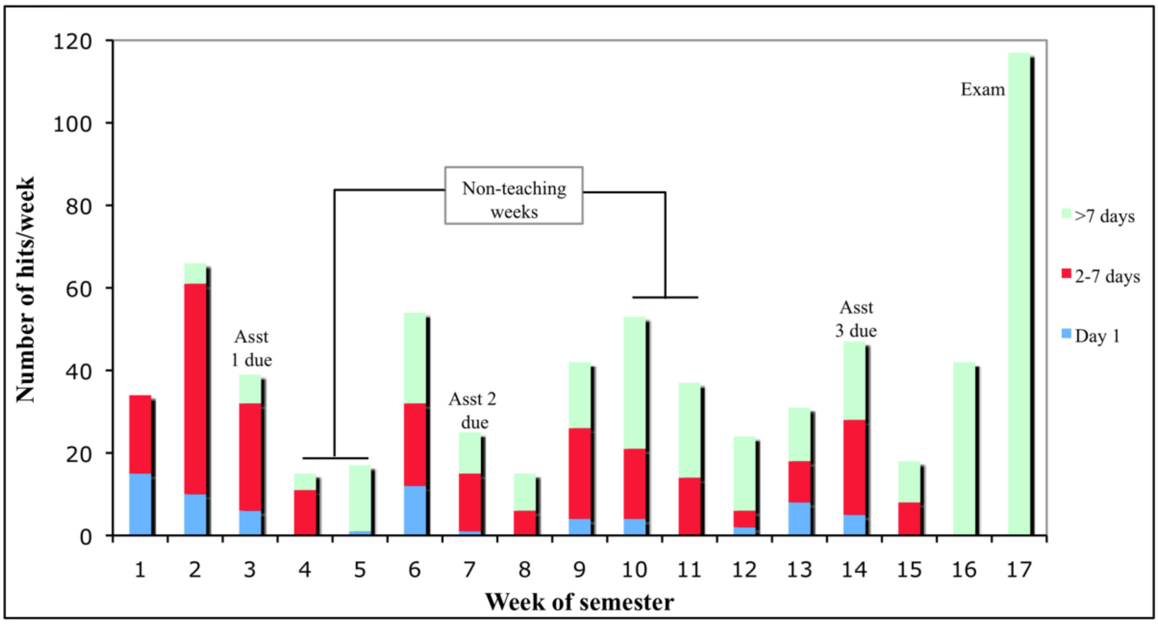

Figure 1. Representation of the delay in listening to recordings against the week of the semester

- the type of each hit (whether it is an initial hit or a repeat hit on a recording)
- the number of the lecture that is accessed in which week

Figure 1 shows one representation of the overall data for all 109 students in the pilot unit who accessed Lectopia. This shows the total number of hits on the Lectopia system (y-axis) against the week of the semester (x-axis). The semester is structured as 10 weeks of formal teaching (Weeks 1-3, 6-9 & 12-14), with four non-teaching weeks (shown on Fig. 1) used for teaching pracs. The study and exam period extended from weeks 15-17. Figure 1 also indicates assessment dates. In addition, the time between the lecture recording and the time recordings were accesssed is shown as an extra dimension in Figure 1, with three intervals: on the day of the lecture, during the first week, and after the first week.

Figure 1 shows varying patterns of use across the semester. Lectopia use was relatively high in Weeks 2 and 6, prior to submission of Assignments 1 and 2, respectively. Overall, Lectopia use was quite low during the first non-teaching period. On the other hand, Lectopia use was relatively high during the second non-teaching period, and also in Week 14 – the week for submitting the final assignment. By far the highest use was during the week of the examination. The delay before listening to a lecture recording is also shown in Figure 1. In the first three weeks of semester, the majority of access was in the first week of ‘publication’. As the semester progressed, approximately 50% of recordings were accessed more than one week after the lecture was recorded.

While we could speculate about some of these patterns, it would not necessarily be productive, because at this stage we do not have enough evidence to support our speculations. Instead, as described above, we selected a sample of students for interview, to probe their behaviour more deeply.

Table 1 summarises the characteristics of students who consented to be interviewed, in terms of their enrolment type, their self-reported attendance at lectures, their observed hits on the Lectopia system, the behaviour category we assigned to them based on their pattern of Lectopia hits, and their final mark in the unit. Only one student (D) self-reported regular attendance at lectures according to the attendance sheets. Lectopia use ranged from none (E) to substantial, with three students (A, B, F) recording more hits on Lectopia than the ten available lecture recordings.

Manual observation of LMS usage reports indicated that all six interviewees accessed the LMS to some extent, largely to download unit materials. The six students also largely ‘lurked’ in the discussion forums, and tended not to post messages (Dennen, 2008). The SNAPP tool therefore provided little useful information. This was arguably predictable, because the unit design did not require internal students to contribute to forums, and all of our sample students were enrolled internally.

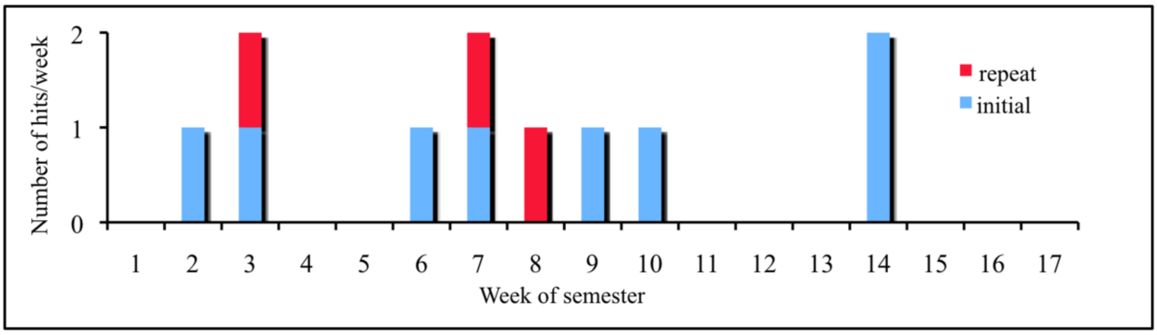

Fig. 2. Repeat or initial hits by week for Student A

Student A was classified as *Conscientious*. As shown in Figure 2, she accessed lecture recordings on 8 occasions, during most of the teaching weeks. Figure 2 also indicates that Student A reviewed lecture recordings a second time three times. Students B and F were categorised as *Crammers*, because they accessed all the recordings only in Week 17, with no access prior to that. Students C and D were categorised as *Random*, because they only accessed Lectopia on a few, dispersed occasions. These two students were the only ones who indicated they had attended on-campus lectures. Student E was classified as *Disengaged*, because she did not access Lectopia, and no lecture attendance was recorded.

Table 1. Summary of the six students selected for interview

Student	Background	Attendance	Lectopia Hits	Lectopia Category	Mark
A	Grad Dip. Mature-aged	-	11	Conscientious	88
B	B.Ed. regional campus	-	17	Crammer	61
C	B. Ed. main campus	1	3	Random	70
D	B. Ed. main campus	8	5	Random	64
E	B. Ed. main campus	-	-	Disengaged	51
F	B. Ed. main campus	-	15	Crammer	66

Interview data

The six students were interviewed for 45-60 minutes. During the interview, each student was presented with data on their own personal usage patterns, and advised of their predicted pattern descriptor (see Table 1). Each student was able to comment on whether this was an apt description of their study pattern, and could refute the label. Here, we present the data for four students with four distinct Lectopia usage patterns (Students A, B, C and E). Students D and F are not considered here for space reasons, and because their behaviours were similar to students C and B, respectively.

Student A

Student A was a mature-aged student with school-aged children. She attended the first lecture, but subsequently used Lectopia while working from home. She did this because this was the only class she had that day, and she could save an hour's travel time, but also because she was highly motivated, and felt able to learn independently: "I'm more of an independent learner than a group learner".

Student A agreed with her characterisation as *Conscientious*. She adopted a routine of studying every day from 9am-1pm, while her children were at school.

> This is my study time, what I do each week, listen to lectures, do the notes, do the readings – try to keep up to date if not a week ahead with the readings. It's called being a mature-aged student who likes to study, helps me to keep up with my study.

Her study patterns included regular LMS access to download required and optional readings. Over time, she stopped accessing the optional readings because she didn't think these were relevant. As an individual learner, Student A logged on to the discussion board "just to see if anything important" was there, but did not contribute to, or actively participate in, the discussion.

Student A is an experienced learner who was highly engaged with the unit and its materials, despite not attending lectures and not contributing to discussion forums. This student appreciated the flexibility offered by Lectopia, and used her self-efficacy skills to achieve a final grade of High Distinction.

Student B
Student B was also a full-time, mature-aged student with family responsibilities, enrolled at the regional campus and working part time as an Education Assistant in a school. She was categorised as a *Crammer*, but disputed this, claiming that she had attended all lectures and tutorials (her attendance was not recorded). Her reported behaviour was systematic and conscientious. She followed the study guide and allocated 1.5 hours early in the morning to do the readings.

Student B used the LMS to download unit materials, but did not find the discussion forum helpful. She admitted struggling with understanding the unit material because of family and time pressures, and she only just passed the two major assignments. Because she was worried about failing, she put in a special effort to revise for the exam, and achieved a distinction in this, for an overall Credit grade.

This student strategically used Lectopia as a revision tool. She downloaded all the lectures in Week 17, for revision purposes:

> I had the lecture notes and grabbed a red pen and took it differently, but by listening to one after the other, I think it helped a lot.

An advantage that Student B found, as a regional student, was that the lecture recordings were of the main campus lecturer. This assisted her revision because the lectures were presented in quite different ways.

> …it was good though because I had one lecturer – she's very good but then when I listened to it, it was another lecturer so it was similar content but in a different way.

Student B found that not only did her revision with Lectopia help her examination result, it also assisted her to consolidate the learning outcomes intended in the assignments. She reflected:

> It was hard for me to believe schools weren't doing their best. I ... couldn't believe there was more to it. It took a while for me to understand that and be critical of things. ... I guess I thought schools were doing everything right [but] this was all about investigation and what schools could do better. I think they are doing their best but this unit says that they are not.

Student C
Student C was a full-time internal student at the main campus. She was categorised as a *Random* student because she had infrequent access to Lectopia and incomplete attendance data. However, she claimed that she was a *Conscientious* student because she attended the majority of the lectures. She used Lectopia to listen to and take notes from recordings of lectures that she had missed. Student C systematically used the Unit Guide, the textbook and the LMS to guide her learning. She would read the weekly preamble to check what to cover, and do the readings prior to the lecture. She appreciated the amount of detail on the LMS compared to other units of study.

> The structure [of this unit] with the readings online, the external links, the questions – just everything was in the one spot and that was awesome.

Student C accessed optional materials as needed, within workload constraints.

> If they were hard concepts or I felt like there were lots of gaps ... I'd be more likely to go to the online readings but then as the semester goes on and stuff piles up, I just didn't.

She also regularly read the discussion forum, but only posted twice, because she thought, in general, that the students who posted the questions could have answered them themselves by reading unit materials. Unlike Students A and B, Student C enjoyed interactions with her peers to enable her to "bounce ideas", but also was able to work independently. Student C demonstrated a high level of commitment and motivation "I take the reader with me and study anytime." Her learning habits include devoting a block of time to learning, but more often she "fitted 5-10 minutes every now and then." This commitment led to a High Distinction grade in the research paper and a Distinction result overall.

Student E
Student E was an internal full-time 2nd year student on the main campus. She was categorised as *Disengaged* because there was no evidence of class attendance, and she did not access Lectopia, but she claimed to attend most of the lectures. Student E engaged with unit materials through the LMS and was a prolific internet user: "I

pretty much use the internet for everything apart from the books we have to have". She downloaded lecture notes and annotated them in lectures. She also read over 130 forum posts and contributed to forums three times.

This student purposely chose not to use Lectopia, partly because "I went to most of [the lectures]", and partly because of an awareness of her own learning challenges in previous units:

> I have it downloaded and don't listen to it, or listen to it for 5 minutes and then phase out. That's why I go [to lectures] because I've tried listening to them and I tend not to, so I try to get there as much as I can. (E)

Student E appeared to be relatively disengaged with the unit. As a second year student in a unit mostly 'populated' by third year students, she felt isolated and used the LMS to compensate:

> Most of my friends are not doing [the unit]. That's why I went to LMS on this because it's my only class I've got with these people.

She noted that discussion forums gave her a sense of how others were tackling their study, and found that often others online had the information she needed so she did not need to ask the teacher:

> [Discussion forums] were one of the best bits when I first started. Especially when you are on your own you are not sure you are doing the exact right thing, and to have someone to bounce off or to check your opinion and they come back saying either no or yes. So it's online so you can do it anytime. Like if you are working on your assignment at 3am or something, you can write it up there and someone will answer eventually.

While she might have been classified as *Disengaged* with Lectopia, but did attend lectures, her reported behaviour was less engaged than other students interviewed, and this showed in her final grade – a bare Pass. She self-reported problems with self-efficacy, and was still grappling with the discipline needed for successful study:

> When it comes to assignment time ... I start to get lazy, leave it for a week or two and have to sit down for longer. ... No, I got worse [grades] than I thought. Towards the end of the semester I got really lazy and in the last assignment I did not use LMS as much as I should have. Usually when I've finished an assignment I go on to LMS and check the marking guide and the criteria for it ... [It's] frustrating but it's because I got lazy and didn't go through and check it again.

Discussion

The previous section makes it clear that the four students exhibited very different study behaviours, with varying degrees of success. Student A made a conscious decision that she could study effectively without face-to-face contact, and she used Lectopia and other unit resources to facilitate this, with great success. Student B attended face-to-face classes, but was struggling with the unit content because she was over-stretched in terms of her own time. She used Lectopia to recover from poor assessment results during the semester, and, in the process, came to some core understandings that the unit set out to facilitate. Student C attended most face-to-face classes and used Lectopia only to catch up on classes she missed. Her approach to blended learning made extensive use of LMS-based learning resources, diligent self-study and peer interactions to become a successful independent learner. Student E attended most face-to-face classes but did not use Lectopia because she found it challenging to concentrate on recorded audio. Instead, she made extensive use of the LMS and relatively high use of the discussion forum to try to engage with a unit that few of her friends were enrolled in. She found it difficult to engage in the unit and reported problems in self-regulation, which led to a low pass mark.

The results provide solid evidence towards the second research question. The four students displayed different approaches to the use of technology to assist their study in this unit. All four students reported here (and another two in this case study, and nine more in two further case studies) were endeavouring in different ways to engage with their studies, using technology and unit resources in various ways. Some students were more successful than others at this, but we do not try to attribute a particular technology use to this success or lack thereof. Instead, the four cases reported here start to illustrate some of the complexity of the modern, technology-enhanced learning environment.

This complexity points to the need for an ongoing program of study into this area. At the same time, however, this pilot study has validated both our learning analytic tool (first research question) and our mixed methods approach, combining direct observations of technology-usage behaviour with student perceptions (through interviews) to gain a deeper understanding of student study behaviour.

Shortcomings

Despite the promise of this approach, this pilot study has also identified a number of shortcomings in the research design, which we intend to address in subsequent studies. Table 2 lists a number of limitations in the research design, together with suggested improvements.

Table 2. Suggested improvements to the research design

Shortcoming	Improvement
Not all students recorded their attendance at on-campus lectures.	Lecturer to emphasise importance of recording attendance. Research assistant remains in class until attendance recorded.
Ethics issues preclude interviewing students during semester. Hard to get students to agree to interview.	Choose a larger potential sample and spend more time contacting students.
Sample of students interviewed was too narrow. Hard to identify disengaged students.	Interview more students. Use other measures to identify different behaviour patterns. See below.
Difficult to get external students to agree to interview.	Use phone or webconference interviews.
Range of units of study too narrow and role of unit designer underplayed.	Repeat the study across a range of units with different characteristics.
Interviews need to probe reasons for study behaviour in more depth.	Interview students about the unit-specific context (e.g., Why did you not listen to Lectopia in Week 8?) and about 'whole of unit' issues (What did you do in workshops? Did you do your readings before class?)

Apart from some easily rectifiable process issues, two major implications arose from this analysis: a need for the broadening of the mechanisms for identifying student behaviour patterns; and the application of the methodology to other contexts.

There is little need for students to visit a Lectopia recording multiple times, and it, therefore, produces relatively sparse learning analytic data. This contrasts with LMS use, where students may have multiple reasons for accessing content and learning tools in a given week as they engage with the growing online community in the unit. LMS usage data is thus richer than Lectopia data and more useful as a predictive tool. A key requirement of subsequent work is to apply the same approaches used here, and elsewhere (Phillips, et al., 2002), to the analysis of LMS data.

A second mechanism for identifying student study patterns is through an initial survey of students mid-semester. The survey could probe perceptions about how students generally use educational technologies in their study. It would investigate a range of dimensions of study behaviour: interactions with the learning environment; attendance patterns; study patterns; computer usage; work hours and expectations of success. When the results of this survey are combined with LMS and Lectopia usage data, we should have a rich mechanism to identify students with diverse study behaviours at all levels of engagement, and another level of data to use in selection of students for interview.

The final methodological modification would be to study a wider range of units to investigate the impact of disciplinary characteristics and teacher beliefs on the teaching approach and the learning design. Potential units could be selected from relatively large undergraduate units across a mixture of disciplines. Selection of units could best be achieved through document analysis of study guides together with expert review by the project team in terms of how well they appear to facilitate student learning in their particular context through alignment of pedagogy, tasks and resources.

Conclusion

Educators in higher education and other sectors are, more and more, using learning management systems and lecture-capture technologies to offer students a truly flexible and rich learning experience. While teachers in these environments already have access to quite detailed information on individual student access, particularly the *what* and the *when* of student access, they currently do not have a great deal of information on the *how* and the *why*.

This study endeavoured to further understanding of student engagement within a blended learning environment. It aimed to offer some insights into learning analytics, describe how they can be used to build student activity profiles, and demonstrate that initial analysis can be fleshed out in much greater depth and accuracy in tandem with qualitative research methods. Interviews with selected students provided accurate and insightful information on their studying habits and learning strategies.

We believe that further research into learning analytics (both our own as suggested here, and the work of many other scholars working in this field throughout the world) will refine its ability to accurately diagnose problematic student access and identify potential at-risk behaviour. Learning analytics will further expand to easily provide teachers with information about how and why students are using unit tasks and resources, and it will be a useful evaluative tool to enable continuous improvement of learning environments for on-campus and distant students.

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Reform, Quality Agendas and Professional Development: Reflections on Engaging Academics in Technology and Change

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Major policy reforms within Australian Higher Education coupled with important advances in e-learning technologies have created a highly stressful environment for teaching academics. Faculty learning and teaching leaders responsible for the delivery of professional development face demanding new challenges. The authors outline the relative success of strategies they have trialed, including those using new technologies, to assist staff with their learning and teaching practice. Although the use of new technologies to assist staff has resulted in some success, problems associated with the initiatives are identified. The assumption that the uncritical use of new technologies will necessarily provide the solution to the current dilemmas faced by teaching academics is questioned. The paper concludes with a discussion of new ways of thinking about professional development where a strong focus is placed on the prudent use of new technologies and where staff are given greater responsibility for their learning and teaching development.

Keywords: quality enhancement, quality assurance, reform, innovation, technology, change

Introduction

Reform in Australian higher education has been protracted, intense and unprecedented (Ball, Dworkin, & Vryonides, 2011; Blackmore & Sachs, 2007; Marginson & van der Wende, 2007, Putnam & Gill, 2011). Reforms have resulted in a range of contradictory pressures including pressures to meet industry and student demand, strong government pressure for greater accountability coupled with a decrease in public funding, accreditation pressures to meet professional standards, academic pressures to maintain international status in research and teaching and technological pressures to move online and provide more flexible delivery. Recently the Government has announced that by 2025, 40% of Australians between the ages of 25-34 will have a qualification at bachelor level or above and from 2012 universities will be funded on the basis of student demand. A national regulatory and quality agency for higher education is to be established. This body will be responsible for the audit of standards and performance, quality assurance of international education, and for maintaining national consistency through regulatory arrangements (DEEWR, 2009). In response to these reforms universities are beginning to look once again to technology, particularly online delivery, as a tool for dealing with the expected rapid growth in undergraduate student numbers.

Pressure has increased on faculty based, learning and teaching leaders and developers to engage academics in the technological and educational professional development (PD) required to meet these changes. The requirements to ensure both ‘Quality Assurance’ and ‘Quality Enhancement’ in learning and teaching in face to face and online delivery environments have caused considerable tensions. Of particular concern is the engagement of academics in the professional development required to fully participate in the change process; academics are becoming change weary. This paper looks at how three faculty based learning and teaching leaders are working to identify strategies that engage academics in the key professional development themes of ‘quality’, ‘innovation’ and ‘technology’ while still meeting university accountability measures.

The Balance between Quality Assurance and Quality Enhancement

As the higher education sector in Australia has become more ‘commodified, technologised and internationalised, these pressures have converged to focus on quality issues in teaching and research as a marker of distinction’ (Blackmore, 2009 p.857). A further distinction can be made between Quality Assurance (QA) and Quality Enhancement (QE) (Lomas, 2005). QA relates to the system and structure that manages the educational system. It can include standardizing curricula, setting benchmarks and evaluating the fitness of purpose of programs. The accountability of institutions to government can lead to QA being seen as more important than the practice of teaching and learning, and often having a negative connotation in the view of academics (Wright, 2003). At the authors’ university and probably at most others, the main academic QA issues are related to providing routine information about unit outlines, reaccreditation, assessment and results. QE, on the other hand, refers to the student learning experience and focuses on improving existing teaching and learning practices (Lomas, 2005). Enhancement activities related to good curriculum design and learning and teaching practice are usually long term and require academics to commit considerable time to reflection on complex issues. Enhancement projects are often research or scholarship driven. Increasingly they involve the use of innovative teaching and learning technologies requiring sophisticated PD support mechanisms.

While quality in teaching and learning and research is admirable, the increased focus on quality has heightened the tensions in the debate between QA and QE. There is an underlying assumption in national and institutional policy that greater QA will enhance learning and teaching. Anecdotal evidence, at the authors’ university, indicates that this is not necessarily the case. While QA and enhancement are not mutually exclusive, academics are often navigating a rocky path between the enhancement (often more personally rewarding), and the managerial requirements of the assurance aspects (often administrative, compulsory and time consuming). In reality the strong institutional focus on QA frequently means that academics have less time to focus on teaching and learning improvement, particularly innovations using new learning technologies. Pressures on academic workloads in response to recent reforms has meant time, effort, and workload responsibilities have skewed learning and teaching practice towards the performance side of the quality debate rather than to innovation and enhancement. In this environment many staff appear most concerned about meeting immediate teaching delivery demands and improving their research output. Experimenting with innovative learning and teaching technologies is a not a high priority in such an environment.

Professional Development, resistance and change

Effective PD has become even more crucial in this rapidly changing environment (Dykman & Davis, 2008). Emphasis on curriculum renewal and the development of technology and flexible delivery resources is typified by a move away from behaviourist approaches towards constructivist learning models. This has triggered a need for formalized teaching qualifications and more integrated and advanced PD (Berge & Muilenburg, 2002). Over the last 10 years there has been an expediential increase in the use of technology such as Learning Management Systems (e.g. Blackboard upgrade features), administration tools, video conferencing, audio recordings, blogs, wikis, YouTube, SMS and various other Web 2 technologies particularly in response to facilitated learning in fully online degree programs. Significant PD is required to provide academics with the skills to use these technology tools, and once technically mastered further PD in appropriate pedagogical usage is often required (Anderson, 2008; Dykman & Davis, 2008). PD of this nature can not be addressed simply by running a few workshops; more sophisticated and integrated models are required.

There are major hurdles to be overcome if more appropriate PD models are to be adopted. Academics appear to be overwhelmed by the PD demands associated with university QA processes and university wide ‘innovation’ projects. Increasingly PD is being associated with the performative measures imposed by QA compliance (Buczynski & Hansen, 2010; Lomas, 2005; Vidovich, 2002, 2009) and ‘technological innovation’ with strategies for dealing with large cohorts of students. Curriculum design is often more closely associated with documentation and accreditation than classroom practice. Given academics are time-poor and change-weary, many are adopting a range of resistance practices ranging from outright refusal, to avoidance, or at best qualified compliance (Anderson, 2008; Palloff & Pratt, 2011). Disengagement is becoming a critical issue in the successful implementation of strategic educational change. A key challenge is not just engaging academics in PD but re-engaging them with meaningful and sustainable change where they feel they have a significant role to play.

The authors of this paper hold learning and teaching leadership positions and are responsible for the planning and implementation of strategic educational change, both from a QA and QE perspective. Hence we too tread a fine line between encouraging academics to improve their teaching practice through innovative use of new learning and teaching technologies while also assisting them to meet their compliance reporting responsibilities. Learning and teaching support staff face major pressures as they attempt to identify and acquire the complex range of skills required to manage both the performance requirements of policy dictates and the enhancement of learning and teaching practice in a period of rapid technological change. New models of PD need to be identified which take in to account a variety of complex learning environments (university, workplace and online), integrated technologies (beyond the LMS), and the multiple delivery methodologies academics are likely to require in the next few years (Blin & Munro, 2008). Change will be rapid and ongoing, and PD will need to be built into everyday practice if sustainability is to be achieved.

First attempts

In response to these challenges the learning and teaching leadership team within the Faculty has begun to modify its PD activities to align them closely with a 'curriculum design approach' to academic development. QA with QE are addressed more holistically and technological innovation is seen as a key element of the curriculum renewal process. Rather than conducting a series of 'one off' PD workshops staff are being encouraged to engage with a wider range of professional development opportunities focused around the use of good practice examples, technological innovation, curriculum design and applied research through funded, self directed work based projects.

Further efforts have been made to ensure technological innovation is rewarded and showcased within the Faculty. A series of lunch time 'teaching tasters' have been held where staff can discuss innovative approaches to learning and teaching and how they can incorporate technology effectively into their teaching practice. Topics discussed include the use of wikis and blogs, the 'pros' and 'cons' of using 'clickers' to promote student engagement, the use of audio recordings to assist science students verbal communication skills and the use of virtual galleries. The faculty has also established a number of learning and teaching awards (including one for sessionals) that are specifically designed to encourage staff to participate in the ALTC awards program and showcase innovation. More traditional PD activities have continued and where possible external speakers, selected for their relevance to key, strategic faculty themes and initiatives have presented to staff via interactive workshops. Speakers have been asked to relate their work to national agendas or imperatives and focus on strategies for working within these agenda issues. Where possible these presentations have been recorded and repackaged as online resources available via the Faculty Learning and Teaching web site. Sessional staff have been asked to identify key themes for PD and have also been funded to attend a university wide 'Foundations in Learning and Teaching' program which focuses on good teaching practice for both face to face and online delivery. An annual learning and teaching innovations week has been initiated within the Faculty and workshops are targeted towards relevant topics and the specific interests of academics; all sessionals are funded to attend. A faculty based learning and teaching web site has been established as a key element of the rewarding and showcasing of innovative practice within the Faculty.

Progress

To date the strategy has had partial success. The keynote speakers and the establishment of a learning and teaching innovation week have slowly been gaining academic support. A new L&T initiative where sessional staff have the option of attending informal learning and teaching support sessions on a fortnightly basis has also proved to be successful. However, accessing ongoing staff continues to be difficult with most PD sessions still being attended by the same small group of academics. The reasons for non-attendance generally include insufficient time due to teaching, administration and research commitments. Disengagement is still a major issue. The most successful activities have been those that target specific individuals or small groups of staff engaged in curriculum design associated with the reaccreditation of specific programs. More recently a series of faculty funded ($5,000) targeted learning and teaching projects have been well subscribed. It is hoped that these projects will provide a platform for sustained and supported strategic educational change providing academics with the opportunity to direct their own PD. Innovative technology has been a key theme in these academic led projects with funding being allocated to projects which include an investigation into how students make use of Lectopia and the possible relationships between usage and student learning outcomes; the production of DVDs to support the development of students' counselling skills; and the investigation into the extent to which student use of iPads improves their engagement in active learning. Selection criteria and reporting requirements for these projects have emphasised the need for quality design, technological innovation, scholarship, dissemination and flexible delivery. All projects are practice led and specialised educational support is provided to successful applicants. Challenges continue to surround issues such as access to specialist technological support which will also impact on the major revamp of the Faculty web site.

Future directions

The ongoing challenge for the team is to identify ways of further helping staff to balance the demands of QA and QE and to engage them more fully in all forms of PD. As part of our review of PD within the Faculty we are administering a survey to all teaching staff to identify what they see as the challenges they face in their day to day teaching and what kinds of supports or assistance they believe they require. A series of follow up focus groups will be conducted with a representative sample of faculty staff. We hope to gain insight into the barriers for participation in past programs and to learn more about academics' perceptions of the supports they require to improve their learning and teaching practice, with particular regard to their use of e-learning technologies. Preliminary findings from our research suggest that we need to continue to develop a more flexible PD model and provide multiple opportunities for academic participation. We need to continue to draw on the good practices of staff and focus on a 'bottom up' approach where staff take greater ownership of their personal PD. We need to showcase and share the work being done by staff, particularly in the successful use of technologies such as ePortfolios, Lectopia, iPads and pod casts. We plan to place less emphasis on a 'one size fits all' approach and to place greater emphasis on embedding PD within specific programs and/or disciplines areas. Paid support for sessional participation in PD will continue and new ways of recognising PD activities in the Faculty workload model will be addressed.

A key technological initiative is to overhaul the Faculty Learning and Teaching web site. The team plans to develop a site which clearly explains, pictorially and in plain English, how quality learning and teaching is viewed within the Faculty. It will address the key components of: curriculum design, learning and teaching theory, assessment and feedback, reporting and standards, scholarship and classroom practice, resource development, technology enhancement as they relate to the programs offered within the faculty. Of key importance is the notion that all these components are inter-dependent. Embedded within the site will be downloadable resources supporting core academic activities such as writing learning objectives, moving content online, curriculum renewal, and how staff can access support and PD (both formal and informal). Learning and teaching projects, award winners and success stories will be showcased. Future learning and teaching projects planned for the Faculty will be benchmarked against this site to demonstrate their educational relevance. It is hoped the site will raise the profile of learning and teaching as a scholarly activity. Ways of making this site interactive, by using Twitter and Chat websites, are also being investigated.

Conclusion

Managing change in educational organizations is one of the most complex tasks demanded of educational leaders. Change is not just about the creation of new policies and procedures to implement external mandates. It is also about developing strategies by which individuals can respond to the impact of cultural as well as structural change, about personal change as well as organizational change, about the place of beliefs and values in framing organizational form and culture. The limitations we face in our attempts to change the PD approach within our institution suggest that a new paradigm of PD is required; one that is forged in response to the constantly changing higher education environment. We should be identifying ways of using the ever increasing technological tools at our disposal as well as acknowledging that staff must be directly engaged in formulating their development. If we are to engage staff meaningfully in the ongoing process of QA and QE of learning and teaching we need to actively embrace new ways of conceptualising the development of professional potential, rather than continuing to tinker with traditional outmoded models of academic PD.

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The Personal Learning Space – Technology enabling engaging pedagogy

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The Personal Learning Space, conceptually positioned between the Institutional and Personal Learning Environments, can be thought of as an 'eportfolio PLUS'. It is institutionally provided but personally controlled, providing a unique balance between direction and independence that encourages student engagement. Action research demonstrates that the scaffolding and templates, sharing and collaboration, formative and summative feedback, reflective structure, and privacy and security all enable engaging pedagogy in a manner previously not available to tertiary educators. This paper includes two examples from practice at La Trobe University that illustrate the opportunities the PLS is providing for both teachers and students.

Keywords: personal learning space, engaging pedagogy, reflective practice, eportfolios

Introduction

Ramsden (2011) argues that 'independence, control, and engagement' are key to effective teaching in higher education. In particular, the right balance of student control and teacher direction is essential.

> Get students engaged with content in a way that enables them to reach understanding. Give them enough space to learn at their own pace and in their own sequence. They need to feel in control over what they're doing, as well as feeling that you're directing them – the right balance is important, both for learning well and for enjoying it. (Ramsden, 2011)

This paper argues that the Personal Learning Space can provide a mechanism for achieving this balance in a way that has not previously been available to tertiary educators and students.

What is the Personal Learning Space?

Most tertiary institutions provide a range of technologies to support learning, principal amongst these is the Learning Management System (LMS). These tools, which might collectively be called the 'Institutional Learning Environment (ILE)', are controlled by the institution and populated with institutional content, and are typically withdrawn from the student at the end of each semester or the course. They have the primary aim of facilitating institutional teaching and learning and administration processes including provision of course material, management of course delivery and assessment, collection and presentation of data, and enabling communication in the online environment. Teacher direction is high and student control minimal, conditions unlikely to maximise student engagement in learning.

Many students and staff are now also coming to the tertiary environment with their own, idiosynchratically selected suite of tools which have become defined as Personal Learning Environments (PLE). This eclectic range of tools is personally chosen and provided, populated with personal content, and managed and controlled by the individual. This environment is highly engaging and user independence is absolute, but there is little capacity for teachers to provide direction to learners or to enter into a dialogue with the students. The tools of a PLE are not designed to support or scaffold learning and provide limited and time-consuming mechanisms to support institutional processes. The whole notion of individual choice as the core principle of the PLE is compromised as soon as students are required to complete institutional tasks in this environment (Sutherland, Brotchie & Chesney, 2011).

A third space for facilitating teaching and learning appears to be emerging. Though not designed as a new genre of software an analysis of 30 case studies (Poot, 2010) and 38 learning designs (Sutherland et al, 2011) suggests certain consistent characteristics of this 'space'. The Personal Learning Space (PLS) can conceptually be described as 'the space in the middle':

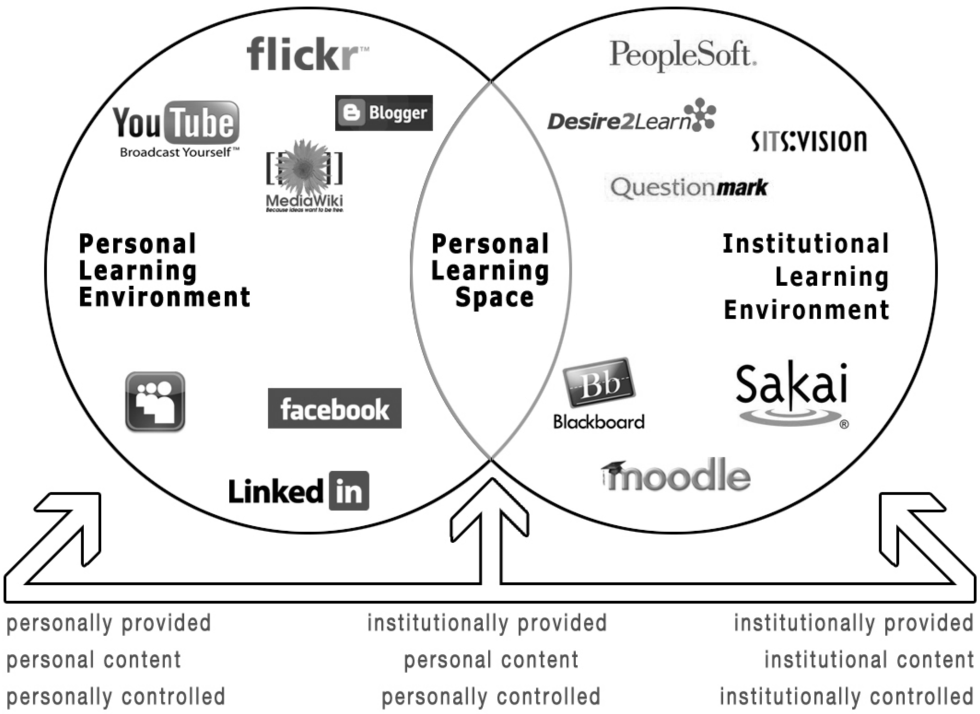

Figure 1: The Personal Learning Space situated between the Personal Learning Environment and the Institutional Learning Environment (Sutherland, et al, 2011)

This space is institutionally provided but is under the control of the learner and is populated with personal content. In this space individuals can learn at their own pace using a range of powerful inbuilt scaffolding tools and templates. The PLS is underpinned by a reflective structure and users create enduring and iterative records of learning and experience. One common example of activity in the PLS is the creation of eportfolios. Users can invite others, including peers, mentors and tutors, to engage with their work and retain absolute control over the nature and timing of this engagement. Teachers can direct student learning through the provision of templates and broad instruction, but students have the freedom to adapt and interpret these in ways that are representative of their own personality and individuality. While the PLS includes tools to manage institutional processes such as feedback and assessment, all records of learning belong to the student and remain within their control before, during and after these formal processes (Sutherland, et al, 2011).

The overall aim of the action research described in this paper was to improve practice in teacher education programs at La Trobe University through a reflective and recursive process. The university was undergoing wide sweeping curriculum reform and the Faculty of Education teaching and learning team identified significant synergy between the concepts and functions of the PLS and the evolving demands of the redesigned curriculum (Masters, Austin & Doolan, 2010). The team was aiming to develop a model whereby students could take responsibility for their learning and develop personal meaning whilst drawing connections between the sometimes disparate aspects of their courses and experiences. It was hypothesised that the combination of teacher direction and student independence and control afforded by the PLS would maximise engagement in the learning process.

Method

The Personal Learning Space, PebblePad, was introduced across the Faculty of Education at La Trobe University in a staged implementation process beginning in 2008. The initial phase involved the replacement of an existing digital eportfolio task in a single subject with a portfolio in the PLS. In the second semester 2008 two additional tasks in two subjects were replaced with PLS activities. From this beginning, use of the PLS in subjects and courses across the faculty continued to grow to the point where, in 2011, digital PLS tasks are mapped across all courses.

Throughout this implementation process an approach based on participatory action research was taken (O'Brien, 1998). Following each phase of the implementation student outputs and outcomes and teacher experiences were reviewed and findings used to inform the planning for the next phase. This process involved content analysis, informal interviews, and use of data from institutionally administered student evaluations of teaching and learning.

Results

The following two examples illustrate the type of learning activities now occurring across the Faculty of Education at La Trobe University.

Example 1
In Outdoor Education the PLS is used to engage students in planning and preparation for a final year activity called 'The Long Walk'. Students complete three pieces of work in the PLS – an action plan, a planning and preparation webfolio, and a research webfolio. Each uses an inbuilt template, together with some direction from the teacher about the key areas to be addressed. In the action plan the student is required to identify all the tasks they need to complete prior to the long walk, complete a SWOT analysis, and identify supporting resources. This is shared via live links with both the teacher and fellow students from the outset, enabling students to learn from each other, and the teacher to provide formative feedback throughout the development of the action plan. The planning and preparation webfolio, similar to a personal website with multiple pages, is used by the student to present evidence of their preparation. This is shared with the teacher so that progress can be monitored and formative feedback provided. While this is part of the assessment requirement it also has a very important safety element as the teacher needs to ensure that each student is adequately prepared and physically and emotionally ready to undertake the arduous 18 day walk in the Australian High Country. The research webfolio requires students to create an interactive research portal to engage others with their chosen topic that relates to an aspect of the walk. Students need to be creative in their use of in-text links, digital media, and presentation options to create a piece of work that has value well beyond the assessment process. The teacher provides multimodal formative and summative feedback on all work via the PLS, including screen capture, highlighting, and audio. This learning design illustrates the highly active and interactive nature of the PLS. As Biggs (2003)

states, ‘learner activity and interacting with others’ are key characteristics of engaging learning and teaching environments (p.79). Students reported significant benefits from the iterative nature of the planning and implementation with 64 out of 65 students accessing their feedback, 27 accessing feedback multiple times, and 87% reporting that the feedback was ‘very useful’ for improving their work (Munge, Doolan and Sutherland, 2011).

Example 2

A second example of engaging pedagogy with the PLS comes from a teacher education course. Academics and educational designers planned and designed a range of learning experiences in the PLS across the various subjects that students undertake. Each activity uses different inbuilt system templates and includes video presentations, audio, reflection, text and video blogging, and multi-media webfolio presentations. The activities aim to engage students and relate their learning experiences to one or more aspects of their growth as an emerging teacher. As the PLS is the students’ personal space, all records of learning, experience and reflection from across all subjects are stored together, enabling students to start making links between the different activities, to re-use these artefacts for different purposes, and to show growth over time. The privacy of the space encourages students to reflect honestly upon their development, secure in the knowledge that others cannot see these reflections and growing understandings unless shared. The space becomes a place for self appraisal, reflection, contemplation, and development of a sense of self as a teacher, both in terms of skills and identity.

> *Through completing this web folio I have achieved something that I did not anticipate. By analyzing my own thoughts and experiences it has helped me to draw connections and relate subject matter to my own life. When sitting in a lecture or tutorial I am so busy writing notes and taking in information that I forget to stop and think about my thoughts to evaluate what I have learnt. .... In some cases, its not always possible to see the bigger picture until you step away from the immediate environment.* (Education student)

This clearly demonstrates a level of learning beyond simple note-taking and describing. What the student describes above are higher order forms of learning including analysing, relating, evaluating and applying. These are known to be associated with higher levels of engagement in learning (AUSSE, 2008; Biggs, 2003).

Analysis

Analysis of the range of student outputs, together with interviews with academic teaching staff and feedback from students allow some tentative conclusions to be drawn about the value of using a PLS in teacher education programs:

- For the teacher and educational designer the PLS provides a range of new possibilities for curriculum design and delivery which takes the emphahsis away from teacher directed content and allows for the construction of knowledge by the student.
- The PLS not only supports but encourages reflective practice in both students and staff.
- The PLS provides multiple opportunities for ongoing formative feedback by the teacher.
- The PLS provides the continuity of a learning space between subjects and across years allowing students to draw connections between all aspects of their course.
- The PLS provides rich and varied opportunities for sharing and collaboration.
- Both students and teachers value the control and ownership over the PLS.
- The nature of the PLS has challenged both teachers and students to do things differently. Some have found this difficult and have required additional support to make the transition.

Conclusion

The PLS provides opportunity for engaging pedagogy that is not readily possible in other elearning spaces. Key enabling characteristics of the PLS include inbuilt and teacher designed scaffolding and templates; easy inclusion of digital media; sharing, collaboration and submission via live links; ongoing ownership and control over records of learning beyond the time in the institutional setting; and the total privacy and security of the students' learning environment.

This new space undoubtedly presents challenges for students, teachers, and educational designers alike. If these challenges can be seen as opportunities and if time is taken to rework curriculum and teaching pedagogy in order to maximise engagement with this space, the learning outcomes can be tremendous. As stated by Julie Hughes (2011), one of the foremost PLS practitioners, the PLS "...allowed me/liberated me to journey, to create, to connect, to model, to inspire in ways I had never imagined with earlier technologies." It can be argued that the PLS enables engaging pedagogy that can be enjoyed by students and teachers alike. This can only be positive for education!!

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Pedagogy and Learning Spaces in IT

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In order to plan for the future, we need to understand the past and present better. There is a dearth of data on Information Technology (IT) teaching practice**.** This is an explorative study that documents and appraises current IT teaching practices, with a particular emphasis on the extent to which the layout of computer laboratories impact on teacher pedagogy. Recent discussion on learning spaces has focussed more on collaborative spaces or student hubs, without really addressing the needs of regular IT users – teachers and students. This paper will discuss the various challenges for IT teachers, and make suggestions for future improvements. This investigation is part of a larger study into the pedagogy of IT teachers, and how it is articulated through classroom practice. It is a qualitative enquiry that adopts a case study methodology triangulated by classroom observation, videotapes, teacher interviews and student questionnaires.

Keywords: pedagogy, IT, learning spaces, kikan-shido, teacher talk, computer laboratories

Introduction

A number of universities, in Australia and overseas, have recently invested large sums into collaborative learning spaces, 'learning commons' or 'student hubs', and outfitting them with the latest in design, furniture and technology. Sleek and modern looking, they have been purposely built with flexible areas to cater for large classes, individual and group study, as well as recreational use. This is in sharp contrast to the very traditional computer room designs used in most educational institutions, where the teacher stands at the front and the students sit in horizontal or vertical rows. Attention seems to have shifted from formal, timetabled teaching spaces to informal, personal spaces before addressing these pedagogical issues and 'getting them right' for the regular users of IT computer labs. This raises a couple of important pedagogical issues Why is it then, that in many of the universities and TAFEs, the typical design of computer labs has not really changed since the introduction of computers in the 1980s? Why do the layouts facilitate a 'stand and deliver' teaching style, rather than one that is more collaborative and social constructivist? Furthermore, much of the literature emphasizes the intrinsic relationship between pedagogy and room layout, but there seems to be little evidence- based research conducted on actual classes, and in particular, of IT classes in the tertiary sector. This paper examines a range of computer labs in several metropolitan educational institutions, and discusses them in relation to the interplay between pedagogy, learning space and technology

Methodology

This investigation uses a qualitative approach with a case study methodology (Bogdan & Biklen, 2003; Denzin & Lincoln, 2005; Merriam, 1998; Stake, 2005; Yin, 2003) as the main means of collecting information. It is a multi-case study (Merriam, 1998; Stake, 2006; Yin, 2003) of current IT teaching practice across six universities and Technical and Further Education (TAFE) institutes in metropolitan Melbourne, some of which were nested (Merriam, 1998) within three institutions, with a total of eleven IT teacher participants. This allowed a cross-cross or multi-case analysis to be performed in line with the ideas of Stake (2006, p. 27) "to show how the program or phenomenon appears in different contexts".

A range of IT teachers were video-taped during their normal timetabled lab sessions and observation notes taken. Bromley (cited in Merriam, 1988, p. 28) writes of the importance of direct observation in natural settings, Green et al of "in-depth and first hand understanding" (2006, p. 112) and Schofield of the ability of a case study to "produce a coherent and illuminating description" (2007, p. 183). Those findings were triangulated with interviews with each of the IT teachers and questionnaires distributed to students. Two cameras were used, one on the teacher while the other was focussed on the students, to enable a full a record as possible of the lesson from the perspective of the teacher delivering the class and student reaction to it. As Miles and Huberman (1994, p. 29) state: "By looking at a range of similar and contrasting cases we can understand a single-case finding, grounding it by specifying *how* and *where*, and if possible, *why* it carries on as it does. With the interviews, there was "an opportunity for teachers to tell their stories of practice, and then to build from that telling various opportunities for reflection and learning" (Lyons & LaBoskey, 2002, p. 61). Both students and teachers were asked what they liked and disliked about the lesson, and whether they considered the lesson a 'good' one. In short, these research tools put a human face to the classroom experiences.

Literature Review

Computer labs, like classrooms, are now commonly referred to as 'learning spaces', alluding to the fact that these areas are predominantly places in which students learn and are taught by qualified teachers. There is a growing body of literature on learning spaces and it has been recognised that formal spaces such as lecture theatres, classroom and labs should have flexible layouts that support a diversity of teaching and learning approaches (P. Jamieson, 2007; P. Jamieson & Dane, 2005; Kolb & Kolb, 2005). Some refer to these as the next generation of learning spaces (K. Fisher, 2007; P Jamieson, Miglis, Holm, & Peacock, 2007; Long, 2007; Long & Ehrmann, 2005).

There have been an increasing number of reports, forums and conference presentation by some universities, here and overseas, who have re-designed, and invested heavily, in some of their formal as well as their informal physical spaces to support collaborative and project-based learning (Bulmer, Miller, Byers, Milne, & O'Brien, 2005; Hunley & Schaller, 2007; Mirijamdotter, Somerville, & Holst, 2006; Tregloan, 2007; Wolff, 2002). As Jamieson (2007, p. 19) asserts: "We need to push beyond the notion of a classroom as a uni-directional, single level, uniformly lit, rectangular box.". Universities such as Stanford, MIT, Swinburne and Queensland University of Technology have invested heavily in changing the design of physical spaces, but one wonders how likely those scenarios would be replicated and implemented for the regular IT classes that are heavy users of timetabled computer labs across the board. Furthermore, there is little on how existing lab layouts could be used in more pedagogically interesting ways, or how these traditional spaces could be used in a more student centred, and less than a teacher-directed approach, in IT classes.

There have been authors who have written about the impact of wireless computers and tablets on the design and use of learning spaces (Brown & Lippincott, 2003; Punie, 2007) and Wainer (2008) promotes the idea of 'studio pedagogy' where case-studies and projects are combined with web 2.0 tools, but frankly admits that while it is done in architectural design subjects, it is "difficult to fit into more computer science curricula" (Wainer, 2008, p. 175). As Christen (2009, p. 28) points out: "But this networked world, and the powerful learning tools it offers has yet to penetrate the typical classroom."

Recent research into learning environments has highlighted the connection between pedagogical practice and design (Brown, 2005; Bulmer, et al., 2005; P. Jamieson, 2007; Johnson & Lomas, 2005; Oliver, Harper, Hedberg, Wills, & Agostinho, 2002), however, after close reading of the literature, it is clear that many of the writers have failed to include the data on which their conclusions are based; that is, the information drawn from actual class investigations, and from the perspective of evidence-based research (Thomas & Pring, 2004) on the connection between pedagogy and learning spaces. Rather, they have been drawn from theoretical, academic critiques based largely on casual observation (Kolb & Kolb, 2005; Wainer, 2008; Wolff, 2002) in art schools, chemistry classes (Tregloan, 2007), engineering (Howell, Steer, & Radcliffe, 2008) or science (Bulmer, et al., 2005), not IT classes.

In conclusion, there seems to have been very little research conducted on actual IT practice in computer labs in the tertiary sector. Most of the studies seem to have been carried out in primary or secondary schools, not in TAFEs or universities, and in subject areas other than IT. Extensive searches in journals and professional association have been unsuccessful in uncovering information on actual IT practice and the computer rooms in which it is conducted.

Definition of Pedagogy

Pedagogy is a term that is commonly used in teaching and learning matters, and there are a range of meanings. In this paper, it was decided to adopt the definition put forward by Alexander (2000, 2008a, 2008b), that pedagogy is both the act of teaching as well as the thinking behind it. As Alexander (2008a, p. 75) states: "Teaching is a practical and observable act. Pedagogy encompasses that act *together with* the purposes, values, ideas, assumptions, theories and beliefs that inform, shape and seek to justify it. "

Pedagogy in IT Teaching

Prior to a discussion about how learning spaces impact pedagogy, it is important to identify IT teaching practice. This will be explored through an analysis of the different types of IT lessons, teaching style and teacher talk, before the exploring the range of timetabled computer laboratories and classrooms.

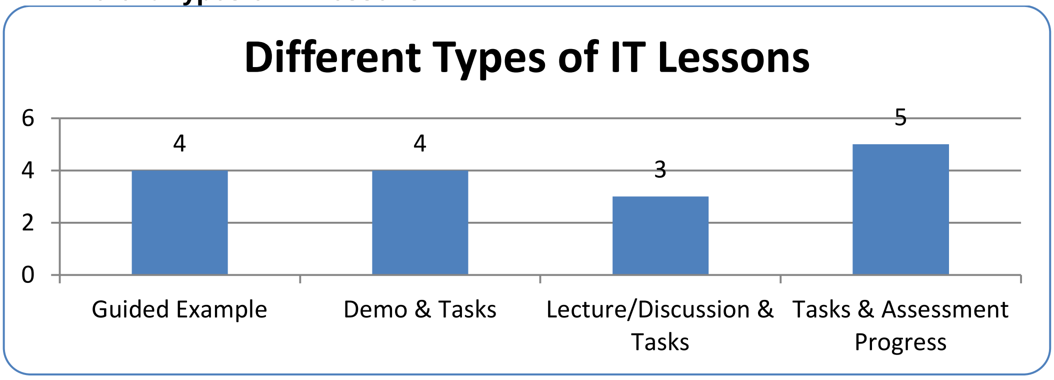
Different Types of IT Lessons

Basically, the IT teaching observed within this investigation was a largely, didactic across all the institutions. and this could be clearly seen in the way in which lessons were structure. One of the key findings of this investigation was the identification of about four main types of IT lessons They are listed as follows:

- a guided example that IT teachers worked through with the class
- teacher demonstration of a problem followed by a series of activities or set tasks completed by students
- a lecture/class discussion on a topic with set tasks and activities completed by students
- a lesson where IT teachers monitor student progress on assessment or set tasks

From the seventeen classes observed, about 64% of them were teacher-led and directed to the whole class:

Graph 1 : Different Types of IT Lessons



Although the dominant practice was teacher-led, IT teachers were observed constantly checking on student progress on set tasks or assessment. IT Teachers would constantly stop during their lecture or demonstrations to walk around the room and supervise how well students were following instructions. Clarke (2003, 2004) refers to this close monitoring as 'Kikan-Shido' or 'moving between desks', and according to Hattie (2003, p. 4) this type of timely feedback is the most powerful influence on student achievement. Moreover, students too seemed to appreciate this and commented in the student surveys that it gave them the opportunity to have "direct consultation with the teacher to see whether I was on the right track, "got me moving and on track" and "helped me to improve my work" Therefore, while the significant majority of lessons were teacher-led, it needs to be balanced with the fact that IT teachers would often circulate around the computer lab assisting students and solving software problems.

Didactic Teaching Style

In many of the lessons, the teacher was often positioned at the front of the classroom or lab, and guiding, demonstrating or lecturing to students. Most of the lessons involved IT TAFE teachers giving instructions on how to use a particular piece of software in computer rooms. This approach is very teacher-centred, and conveys strongly the singular role of the teacher as instructor and as the transmitter of knowledge:

Photograph 1: IT Teachers in Stand and Deliver Mode

As most of the IT lessons involved the teacher addressing the class as a whole, the majority of IT teachers, within this investigation, were observed in this 'stand-and-deliver' style of teaching. This type of teaching imposes a certain learning style upon the students, because knowledge is seen as a quantity of information that needs to be absorbed. According to Ramsden (2003), this encourages surface learning, rather than deep understanding, because the approach to studying is narrow and minimalist.

There were various reasons put forward by the teacher-participants for adopting this as their preferred teaching method. All the IT teachers couched their practice in very simple language. One of the most apt descriptions of teaching style came from a programming teacher, who said that in the old days, it was called 'chalk and talk'. They explained that the first 15 or 20 minutes would be spent explaining the concept or task to the students, until they "got the drift", and then students would apply those techniques to a series of tasks. Their response was revealing, not only because they were able to articulate their practice better than the others, but because there was an acknowledgement that this was but one way of teaching, amongst other methods:

> Look, all I can say is that's what I have always done, and I'm very comfortable with it. Because we've got the projectors, they can see what's happening, I'll do it on the whiteboard then, we'll put on the projector, and type it into the actual interface. And then I run it and see what happens. So, basically, we're walking them through the whole process. [IT Teacher]

Another teacher agreed lecturing was used "in a big way" in IT classes, but also admitted that they didn't feel that it was very good way of teaching because of their English as a Second Language (ESL) training. His suggestion was "you have to involve students and lots of group work" and confessed they were also in the process of re-thinking their strategy: They stated:

> Traditionally, we in IT don't tend to be very good teachers. In IT, you tend to be much more focused on coming to terms with new technology, and really, perhaps explaining how technology works or ways of thinking, but not necessarily the teaching process. [IT Teacher]

As many of these veteran teachers rarely referenced educational theories during their interviews, an interesting conundrum is raised. Many, if not all, teacher training courses emphasise the importance of studying theoretical frameworks which are perceived to enhance teaching practice, and this case study demonstrates that one's practice can still be successful, as evidenced by the student surveys, despite it not being informed by theoretical frameworks.

Teacher Talk

Generally, most of the dialogue in the IT class was dominated by the teacher – 'teacher talk'. That is, teachers were observed delivering information, giving instructions or leading discussions. In one instance, an introduction to XML scripting by an IT teacher took about 25 minutes, with little opportunity for students to ask questions or interject as there were no pauses. One of the student noted in the questionnaire that although "xml was good and fun to learn, there was no room for questions".

IT 'teacher talk' was often characterised by the drilling of facts, and repetition of content, with many 'closed' questions that did not encourage more explorative or scaffolded dialogue. There were many questions that required the correct answer or those that just solicited a 'yes' or 'no' response. Questions were usually designed to test the ability of students to recall and repeat information. Often, IT teachers posed a series of questions in a row, and did not provide a pause, or enough time in which students could answer them. Fisher (2007) asserts that the quality of responses are enhanced, if students are given time in which to think, while Alexander (2006) maintains that these type of questions are representative of a subject-centred approach, contain answers already known by the teacher and are examples of lower, rather than higher cognitive engagement and interaction.

There were very few 'genuine' class discussions witnessed; where there were free and open exchanges of opinion on a range of issues such as one would find in humanities classrooms. When more open questions using ‘how’ were used, the answer range was very narrow. For example, students were usually asked questions such as, ”How are we going?”, “What else might we ask?”, or “How well have we understood variables?”. Open questions would normally invite a wide range of responses, however, these do not because the choices in answers are very limited. Alexander (2005) described these types of questions as “ pseudo-inquiry”. In addition, many of the student responses were short and very brief and when they did ask a questions, it was very direct and to the point. Although, student responses to class discussions were very positive,with some students commenting that “ we can interact with each other”, ” exchange ideas”, and “ we had an interesting discussion”, there was an overall reticence or reluctance to participate in class discussions. The interactions in the IT class support the research conducted by Smith et al (2004) that found that in many classrooms, student answers averaged five seconds, and usually contained three words or less about 70% of the time.

Therefore, when analysing ‘teacher talk’ in the IT Classroom, it can be seen that rote and recitation play an important role, and class discussions were used in a very limited way and were very much teacher directed.

Computer Room Layout

One reason why IT teachers may have adopted a very didactic or teacher-centred approach may have been due to the layout of the computer labs and classrooms, or ‘learning spaces’. This section examines the range of computer labs used in the metropolitan educational institutions, and discusses them in relation to the interplay between pedagogy and space.

All of the classes observed as part of this study were timetabled in dedicated computer laboratories. The majority of these were very traditional in design, with the teacher located behind a workstation at the front of the room, with a whiteboard and/or screen behind them. The following photos are a representative sample from the study of the typical computer room layout found in most educational institutions and schools:

Photograph 2: Examples of Computer Laboratory Layout

Lab A **Lab B** **Lab C**

The students were positioned in vertical rows (Lab A + Lab B) around the perimeter, and in centre aisle/s depending on the particular room dimensions encouraging a lecture style delivery. There was one computer lab (Lab C) in which students were seated in horizontal row. Interestingly enough, when one of the IT teachers asked students to conduct an audit as part of their assessment for the Occupational Health and Safety (OH&S) component of the Training Package, they concluded that the lab with the vertical rows had the preferred layout: “They all point to the fact that there's only one lab in this joint which is functional because all the computers face the board and students don't have to crane their necks.” (IT Teacher) It was quite common to find access to data show projectors, many of which were either installed in the lab or available for loan on trolleys and readily connected.

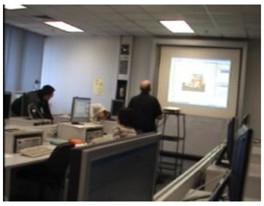
One might assume that these traditional lab layouts would work well for the Stand and Deliver style of teaching which they seem to promote. In fact, they perform this function very poorly as teachers’ faces were often obscured by the computer monitor, the rooms were dark and many students who are seated with their backs to the screen have to constantly swivel around. Often the lights in the computer labs were switched off (Lab D) to accommodate the data show projector and it was usually dark. The teacher’s faces are sometimes obscured by the computer monitor (Lab E + Lab F) when they are demonstrating or explaining instructions:

Photograph 3 : Problems with Computer Room Layout

Lab D **Lab E** **Lab F**

One teacher had their back to the class during their demonstration because the data show was not connected to a computer or a laptop:

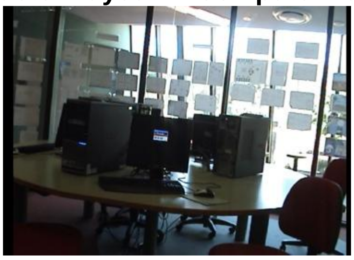
Photograph 4: Data show Projector Problem



Sometimes the voices of the IT teachers were not able to be heard from the back of the room, and students had to swivel around to see if they were seated with the backs to the front of the room. Therefore, the design and layouts of the computer labs used by teachers and students are not ideal, with one IT teacher commenting wryly that “probably non-practitioners designed them”. Indeed, there are certain authors (Brown, 2005; Wedge & Kearns, 2005) who agree with this assertion, and recommend that pedagogical considerations should be a priority because of the potential to improve teaching and learning practice. As Jamieson et al (2007, p. 25) state: “For this reason, the process must be driven by the educational vision and the requirements of the educators.”

During observation visits to a number of educational institutes, there was only one computer room that did not conform to the traditional layouts described previously. The PCs were organised in clusters of four on round tables spread around a very spacious room. Other institutions may have had layouts similar to this, but they were not seen or referenced in interviews during the course of this investigation:

Photograph 5 : Cluster Layout in Computer Lab



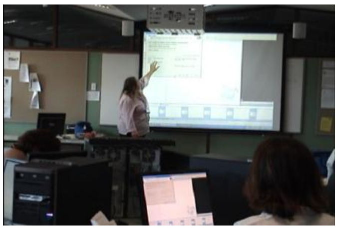
Cluster Layout A

Cluster Layout B

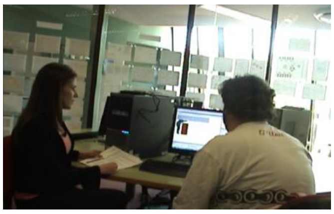
This photo (Cluster Layout A) shows where the computers are placed on a round table without students. There seems to be ample room to encourage discussion and group work, however, the height of the CPU and monitor would make discussions difficult. The other photo (Cluster Layout B) shows the computer room during a class. The spots most commonly chosen by students were, invariably, those which had a direct view of the teacher and the screen. Sitting positions such as the one in the foreground of the photo (above right) where the student faced the back of the room, were positions usually chosen last, because those students who had their backs to the teacher were required to swivel around to see the front of the room.

This type of learning space was designed so that students could work on projects collaboratively, that is, the placement of the computers in a circle around circular tables would encourage discussion and group work. However, the two classes observed within this space provided no evidence of this approach:

Photograph 6 : Use of Collaborative Learning Space by IT Teachers



Example A



Example B

One class was a ‘stand and deliver’ on how to use Ms Moviemaker with the teacher at the front demonstrating (Example A) and students were working on their own movie clip individually. Although pairs of students were observed offering assistance to each other when they had problems, it was a class, not a group activity. The other user of this learning space was an IT teacher (Example B) providing feedback on individual assessment. Students were not working on group assignments, and as the assignments were all different, little collaboration was seen to be encouraged. Therefore, it could be seen that the layout of the learning space was not used as it was originally intended. This learning space, where computers were arranged in groups on round tables, encouraged a collaborative, constructivist approach, at odds with the way in which the IT teachers used the room. This is an example of the change in mindset required of practitioners mentioned by Trowler et al. in their study (2003). In short, the pedagogy of the learning space was different to the pedagogy of the teacher using the computer room.

Changing Learning Spaces to Suit Teacher Pedagogy

There were only two teacher-participants who sought out learning spaces other than those in which their classes were timetabled. These actions drew attention to the relationship between learning space and pedagogy. In this section, there will be an examination and discussion of their reasons, and how this contributes to current debates on learning spaces and pedagogy.

One TAFE IT teacher moved a class from a computer room into a normal classroom for a limited period. Students had a bound copy of the notes, and read them as the teacher went through them using the electronic copy that was projected onto the wall. The classroom layout was very traditional. The desks were organised in a series of rows facing the front of the room (View A) and the teacher was situated at the front with a whiteboard behind them (View B) and with a portable data show projector connected to a lap top.

Photograph 7 : Example A of Teacher Changing Room to Suit Pedagogy

View A

View B

Again, the teaching practice was very didactic, very much the Stand and Deliver' type with closed questions that were designed to see if students understood the content. The main reason the IT teacher moved students into a classroom, was because he was concerned that if they were in a computer room, students would not be as attentive:

> I find that students tend to get distracted by computers. If you are up the front, trying to deliver, they are on the internet and playing games. They do get distracted with the computer. They will be doing work on the computer and, generally, they might have an assignment due and therefore tune-out of the current class and focus on work that is mark based. Sometimes a theory room is better, although there are timetabling limitations. (IT Teacher)

Furthermore, it is important to note some of the problems with the layout of this room. If students wanted to look at the power point presentation, they needed to look at right angles to the whiteboard. The photo (below left) shows how the angle made it visually difficult for the students, because they could look either at the teacher, or the screen, but not both. It was also very difficult for the teacher who had to flick between the class and the wall (below right)

Photograph 8 : Placement of Data Show Projector

There were several supporting columns within the room that were positioned in spots that made it awkward for students to see the teacher and the electronic display easily. Therefore, when teachers seek rooms better suited to the pedagogy of the lesson, the choice is usually limited to rooms that have problems, and that is probably the reason why they are available.

Another IT teacher organized for two of their lessons to be timetabled out of the lab. They wanted to have a class discussion, and felt that the computer room was not appropriate. They detail their concerns in the following interview extract:

> The layout of that room sucks air. Well you've got students with their back to the board and they have to turn around to watch the instructor. This is not good, because they should all be facing the front. (IT Teacher)

The choice was limited because the TAFE institution did not provide discussion rooms; they either provided standard classrooms or computer labs. Two rooms were found; one was a former staff lounge, while the other was the student lounge:

Photograph 9 : Example B of Changing Rooms to Suit Pedagogy



Former Staff Lounge **Student Lounge A** **Student Lounge B**

While the former staff lounge (above, right) was small, it contained a number of comfortable chairs as well as a whiteboard. The awkward shape was not ideal, but students were able to see each other. The IT teacher discussed the assessment for the course and the major part of the class was dedicated to students talking about their projects and exploring suitable options: This type of discussion would not have been able to take place as effectively in a lab because students would be physically separated by hardware components such as monitors and CPU cases. It is interesting to note that students seated themselves together with a clear space at the front (foreground of photo) for the teacher to sit and write on the whiteboard. On another occasion, the only room available for a class discussion was the student lounge. As evidenced in the photo (Student Lounge A) the area was very spacious, but lacked privacy because it also functioned as a walkway from which classrooms and computer labs were accessed. Again, students were seated in a semi-circle (Student Lounge B) with a whiteboard at the front. Therefore, there were not many alternative learning spaces if a teacher did not want to use a computer lab, and finding alternatives added an extra layer of complexity to their teaching preparation.

These two examples demonstrate there were limited choices for IT Teachers if they wished to include class discussion and group work within the standard layout of PC labs and classrooms, because they are inflexible learning spaces and not suitable for collaborative activities. Several regular classes were moved from their timetabled rooms to other learning spaces to better suit the pedagogy of the lesson, and this demonstrates the importance of layout and how it is directly linked to the successful delivery of certain types of activities. One may even go so far as to suggest that if an IT Teacher were timetabled into classrooms and labs previously described, it would be difficult to break out from a Stand and Deliver pedagogy, to include more inclusive strategies. Furthermore, it can be seen that even when students are in a learning space which can be configured in a variety of ways, furniture is arranged in a very traditional manner, with the teacher at the front. The layout of the space trains students as well as teachers.

Some Key Findings

Perhaps, at this stage, after examining the way in which IT teachers used a variety of different rooms and labs, some pertinent remarks could be made:

- One cannot underestimate the way in which the mindset or particular educational philosophy of the practitioner dictates how classrooms and computer labs are adapted for teaching.
- When IT teachers are timetabled into computer labs that are intended for collaborative work, professional development of staff needs to be conducted to teach them how to use them as they were intended to be used. It cannot be assumed that teachers would instinctively know how to use those spaces accommodate them within their existing pedagogy.
- IT teachers should be allowed to have a choice in the selection the computer rooms so that they are able to choose a layout that best suits their pedagogy, and is appropriate to the lesson or subject they are teaching.
- For the cluster layout to work more effectively, the computer hardware – monitors and cases – should be placed in such a way that their height does not obscure the faces or muffle the voices of the students who sit on the other side of the table, as this may make it difficult to hold group discussions. Also rather than having the teacher placed in the front of the room, they should be positioned in the middle to better reflect the collaborative nature of the room layout.

Conclusion

The 'learning spaces' in this investigation were in complete contrast to some of those showcased by universities here in Australia (QUT, Melbourne University and USQ) and abroad (Harvard, MIT and Stanford), with their flexible lecture theatres and computer labs designed for collaborative and constructivist teaching and learning approaches. Almost all of the labs were designed in a very traditional way. There was little flexibility to move computers or desks to allow for group work, class discussion or project collaboration. This in itself promotes a Stand and Deliver teaching practice and offers very little flexibility in the type/s of teaching and learning that takes place. It makes it difficult for IT teachers to engage with students in more pedagogically meaningful ways. This is in line with the findings from Jamieson et al (2007) that few give serious thought to the impact of the physical environment on the quality of the student learning experience, or how it influences teaching approaches.

It is my contention that the layout of the computer lab per se imposes a style of pedagogy on the teacher, because it encourages a certain type of teaching behaviour, a didactic style that may run contrary to constructivist or student-centred principles. That is, if one teaches IT the expectation is that the computer lab would be in a traditional manner which in turn promotes and supports a 'lecture style' approach. One key issue here was whether IT teachers are aware of this when they planned their lessons. From the evidence, it seems clear that most of the IT teachers who taught within these learning spaces have consciously accepted that this is the way it is and it never really occurred to the majority of them to question the status quo, apart from two IT teachers. It also raises the issue of whether this didactic teaching style may have become embedded in IT pedagogical practice, so that it is broadly accepted as the preferred teaching mode for IT. In an interview, one of the teachers intimated that this may indeed be the case:

> Students expect a step by step approach when IT teachers are teaching software Yes, that's fine in application processes when you learn PHP, Java or Visual Basic you need to have step by step. This is how you set up a database or this is how you create a shopping cart, and this is the code that you need. You know, that's step-by-step that needs to happen. [IT Teacher]

Attention seems to have shifted from formal, timetabled teaching spaces to informal, personal spaces before addressing these important pedagogical issues and 'getting them right'.

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That’s what friends are for: creating an online community of, and for, first year students to increase retention

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Research has demonstrated that involvement in learning communities is important for student engagement and retention (Bailey and Alfonso 2005). This paper describes the use of Facebook to create an online community for first year students in a Journalism course that had recently increased in size and in terms of student diversity. A Facebook group was set up one month before the beginning of semester. New students were invited to join the group, which was supported by the subject coordinator and student peer mentors. Students participated throughout the semester and showed very high levels of peer interaction and engagement. The paper describes the outcomes for students, including a substantial improvement in student retention.

Keywords: online community, Facebook, engagement, first year experience, student retention

Introduction

If Denise Bradley had a Facebook page, she would have thousands of followers. Not the academics and the students who already have access to Australia’s universities – but the others, those who are locked out of the kind of education which gives them access to power, money and longer relationships.

Why would Bradley suddenly be ‘friended’ by young Australians who don’t move in her academic circles? Because the new chair of TEQSA, who wrote the Review of Australian Higher Education for the Federal Government, recommended that students should have a choice of where to study; that funds should follow the students; and that institutions will be allocated funds on the basis of performance against specific targets for teaching and equity. ,

The Federal Government, on Bradley’s advice, has demanded a significant increase in university enrolment of students from low SES backgrounds, who currently are one-third as likely to participate in higher education (Universities Australia 2008). In other words, universities are being called upon to expand their horizons when it comes to recruitment, enrolment and retention.

Retention is already a challenge for universities. ACER (2009) reports that regular first year attrition is around 20 per cent although peer mentoring has been reported as successful in countering this (reference). Vincent Tinto (2006) points out that substantial gains in student retention have been few and argues that in early analyses of student retention, blame was often placed on the student who dropped out: “this is what we now refer to as blaming the victim”..

Recently, attention has moved from this narrow approach to a more wide-ranging one that examines the social and systemic factors that influence student retention. Bailey and Alfonso (2005; cited in Universities Australia, 2008) have researched literature on ‘persistence’ program effectiveness (programs aimed at raising the retention of underprivileged groups) such as advising, counselling, mentoring and orientation programs; learning communities; developmental education programs for academically under-prepared students; and college-wide reform projects. Their findings show that the most successful programs are those in the style of learning communities where students are in a single cohort.

Central to the model of keeping students at university is “the concept of integration and the patterns of interaction between the student and other members of the institution especially during the critical first year of college and the stages of transition that marked that year” (Tinto, 2006, p. 3). By other members of the university, Tinto singles out academic staff. Thus it is academic staff who need to develop explicit ways of increasing interaction with students – and between students – in learning communities.

Facebook as a site for building learning community

Facebook is a social networking site used by one in 13 people on the planet (http://www.digitalbuzzblog.com/facebook-statistics-stats-facts-2011/). Importantly, for the purposes of building communities, 48 per cent of users aged 18 to 34 check their Facebook profiles on waking; and more than half of those do that before they even get out of bed. What Facebook itself describes as the college [tertiary sector] age group – 18 to 24 – is the fastest growing sector of users. Digitalbuzz, which researches Facebook use, reports that 57 per cent of people say they talk more to people online than they do in real life.

As an academic trying to build a learning community, these statistics were very appealing to me. Further, I discovered that within Facebook there is an apparently very useful toolthat could facilitate discussions between students and academics: the Facebook group. According to Facebook, Facebook groups cater for specific interests:

> Create a private space. Have things you only want to share with a small group of people? Just create a group, add friends, and start sharing. Once you have your group, you can post updates, poll the group, chat with everyone at once, and more. . . .
>
> share different things with different people. Groups let you share things with the people who will care about them most. (Facebook, 2011)

As Sebastian Valenzuela et al (2009), write in their study which used data from a random web survey of college students across Texas around use, attitudes and behaviours on social network sites, by partaking in online social networks, individuals seek to maintain and increase their real life social networks. So an academic working to increase student retention may well consider that participation in an online community may improve student retention rates. Valenzuela argues that:

> By making users feel connected to a community and increasing their knowledge of other members, sites such as Facebook can foster norms of reciprocity and trust and, therefore, create opportunities for collective action. (2009 p. 882)

Valenzuela et al's study sought to show, using survey data collected at two different US campuses, there exists a positive relationships between intensity of Facebook use, intensity of Facebook groups use and students' life satisfaction, social trust, and civic and political participation. Their results show that indeed positive associations do exist (also see Tinto, 2006; Bailey & Alfonso, 2005).

As Sally Kift (2004) argues, when we engage in widening participation practices we need to recognise that students have varied entry level skills and knowledge but, most importantly, differing cultural capital. Facebook is useful here because, as Valenzuela points out in his 2009 study, students' socioeconomic backgrounds do not have a direct relationship with having a Facebook account.

Craig McInnis (2003) points out that students are increasingly using information and computer-based technologies but not necessarily in ways that enhance their engagement with the learning experience or with the learning community. The case study outlined here was one intervention aimed at readdressing this imbalance.

Building a virtual community with tangible effects

At the beginning of 2011, the faculty in which I am employed made extra offers to students. The first year cohort for the BA (Communication) went from approximately 550 to 900. The faculty, through its head of undergraduate programs, asked for academics to develop retention strategies.

In 2009 the BA (Communication) degree had an attrition rate of 18 per cent; most who withdrew did so before the HECS census date. While this attrition rate was consistent with ACER findings (2009) it was clear that more could be done. Thus in 2010, a peer mentoring strategy was put in place and attrition dropped to 12 per cent. However, this was still considered too great a number, and other innovations were called for.

Given that nearly 90 per cent of university students are known to use Facebook (Hepburn, 2011) the social software seemed a logical tool to consider deploying to further improve the attrition rate. The intention was to build an online learning community. While this in itself is nothing new, the intention with Facebook had an added element: to encourage not just scholarly collaboration but also emotional support.

The UTS Journalism 2011 group was set up on Facebook the night before university offers were made. Students were advised of its existence through the niche social networking site boredofstudies (www.boredofstudies.org), as well as through Twitter and through direct emails, where possible. In addition, more senior student mentors were recruited. These students had (minimum) distinction grades in their journalism subjects. They attended the first day of class and were assigned new student groups of six; from then mentoring took place either in small meetings or online. Three final year journalism students were appointed as 'metamentors', to answer queries if the lecturer was unavailable.

Outcomes

While no particular style of interaction was prescribed on the Facebook group it was clear that it was a space in which to discuss university-related issues. Interaction began immediately. Before teaching started the first year students had already spent a month in the Facebook group(of 262 students taking up their offers, 248 joined the group).

Throughout semester there were 1700 original posts and several thousand responses to those posts. The majority of the 1700 posts from January to June were generated by first year students. While the major coordinator (who is a regular Facebook user) answered questions where necessary there was growing evidence that students were using their own experiences to respond to each other as the semester progressed.

Towards the end of the semester, in the absence of a formal feedback mechanism for this project at this stage of the year, I posted a question on the UTS Journalism 2011 asking whether students had found the page useful. About a dozen students posted responses but on Facebook, it is not possible to be anonymous. That did not stop students from posting both negative and positive comments.

When asked about their experience of the Facebook group at the end of the semester, students were mainly very positive:

> Well in terms of you communicating with us, not to mention us communicating with each other/helping out/teamwork etc, Facebook has been a godsend. (Student 1)

> I agree. I probably wouldn't have done 1/2 of what I have without the facebook group. It's been my salvation a number of times. I think it's brought us together as a group as well. (Student 2)

> What I found extremely useful was if something was posted, for example something regarding an assignment or the blogs, we could converse about it with teacher's input. This was useful when teachers would email something but then also post it here and we all had a chance to ask a few

things, clarify and share other helpful insights. (Student 4)

This underscored the way in which students were able to operate as a group – and the unifying effects of such a group. However, some students posted their concerns about the Facebook page.

The facebook group was not without its complications. One student pointed out that:

“On the other hand I've found it can have the effect of creating mass panic - someone will say something possibly wrong and send all the students crazy. What is said on the page is given a bit too much authority when students should be referring to the subject outline/tutors. (Student 3)”

I learned from this that it was important to intervene or to prompt other students to intervene. I plan to post a link to the subject outline if UTS guidelines permit this.

One of the most enlightening student observations was “It’s all very one for all and all for one” (student five), a comment attesting to the strength of the community that formed and its strong interactive and supportive functions.

Students’ appreciation of the work of the Facebook group is important but equally important is that by the HECS census date, attrition from this cohort was dramatically reduced to three per cent. This outcome is even more significant given the much larger and more diverse cohort. Although only a small sample, other majors at the University also implemented this innovation, with similar attrition rates of 3.1 per cent or less.

There was one major which did not choose to use Facebook groups in this way.It experienced an attrition of nine per cent.

Conclusion

More research is called for into how Facebook and other social software tools might serve to encourage engagement and retention for first year students. While attrition is an issue that is impacted by multiple variables, this small case study points to a promising future for the integration of Facebook into other blended learning approaches.

As Craig McInnis (2003) wrote nearly ten years ago, students expect university to fit into their lives. Undergraduate students now have many more choices about when, where, and what they will study, and how much commitment they need to make to university life. Many students even shape their own timetables – so how can universities integrate themselves into what students perceive as multiple competing priorities? McInnis argues that to meet the challenges posed in educating this generation, universities have to understand that students often have conflicting motives, values and expectations. I suggest that when academics become administrators and moderators of Facebook groups, they gain unique perspectives on the motives, values and expectations of students.. These insights can then by deployed to serve more general learning and teaching goals, an outcome in line with McInnis’ arguments that universities need to reassert their responsibility in shaping the experience of students for the benefits of both students and society.

As Stephen Billett argues, students are increasingly “time jealous”. In order for them to engage with the process of higher education, they need to develop their own personal epistemologies construed and constructed from their own experience (Billett UTS Teaching and Learning forum, 2011). I suggest that this construal and construction will embed more thoroughly if academics make the process congruent with the experience of students in their non-student roles, which is why Facebook is so useful.

Facebook may work as a Trojan horse, embedding academic values while appearing to be fun. Don Tapscott, quoted in *The Facebook Effect* (2010), writes: “Social networking has become social production [but] this is not just about friendships.” In the case study presented here, it also proved to be useful in creating a learning community among first year university students, and that, in turn, improved student engagement and retention.

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Leading change: Applying change management approaches to engage students in blended learning

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The Australian National University (ANU) and the University of South Australia (UniSA) have embarked on Federally-funded project to collaborate in the design, development and delivery of a range of undergraduate and postgraduate courses in engineering. The collaboration investigates new ways to bring together the strengths and discipline expertise of each institution to the students of both universities, utilising blended teaching and learning approaches. The collaboration brings much change – at the organisational level in the blending of programs, at the staff level in their approaches to teaching and at the students' level in their approaches and engagement with cross-institutional blended learning. This paper focuses on how change management principles were used to guide a systematic approach to engaging students into the learning culture associated with the Engineering Hubs and Spokes Project's theme – ‘Advanced Collaboration for Excellence’.

Keywords: cross-institutional, engineering, blended, change, learning approaches, engagement

Introduction to *Hubs and Spokes* blended teaching and learning

The Australian Federal Government has funded a three-year ‘Hubs and Spokes’ project to explore processes and outcomes associated with advanced collaboration in teaching and learning in higher education. The vision is to allow students from ‘spoke’ universities, to study high quality courses offered collaboratively through specialist centres of excellence, called discipline ‘hubs’, while receiving credit towards their home degree (Trounson, 2011). A reciprocal ‘Hubs and Spokes’ collaboration model operates within the health and engineering disciplines of the Australian National University (ANU) and the University of South Australia (UniSA). The engineering component of the project involves collaboration in undergraduate course streams and co-development and delivery of new postgraduate and engineering internship programs. Courses are offered to students from both institutions in 'blended' mode.

Components of the blend

Blended teaching and learning is a cornerstone of our Engineering Hubs and Spokes collaboration, but, as 'blended' can be a uncertain term (Oliver & Trigwell, 2005), it is important to unpack what we mean when we say 'blended'. There are several distinct components to the Hubs and Spokes blend; namely, course design and development, face to face and online teaching, and face to face and online learning and support for learners. The undergraduate course sharing arrangement in Hubs and Spokes allows students from UniSA to access a co-developed stream of courses involving renewable energies offered by ANU; similarly students from ANU are able to access manufacturing management stream of courses offered by UniSA (Blackmore *et al*., 2010). A common learning management system platform, Moodle, simplified the process for cross-institutional course sharing (Kane & Lonie, 2011).

It is important to appreciate that Hubs and Spokes course sharing is not outsourcing. Both streams of Hubs and Spokes courses have been collaboratively developed. This is the first level of blending – *the blending of staff expertise, approaches and perceptions of teaching and learning in engineering*. The second level of blending is that of *delivery mode*. The courses have been developed for technology-enhanced learning opportunities coupled with significant face-to-face learning experiences that are replicated at each institution with facilitation by on-the-ground academic staff. A third blend is achieved in Hubs and Spokes courses as *students are required to collaborate across institutions*. This collaboration provides penultimate and final year engineering students with opportunities to use reflection to develop advanced collaboration skills in relation to technology-enabled communication. As engineers, we appreciate that this experience will better prepare our graduates for the realities of professional life in global engineering firms and accessing continuing professional development opportunities available through technology-mediated communication (Kamrani & Nasr, 2008; Sheppard *et al*., 2008).

The implementation of this project has brought much change to project staff, faculty and students. Our staff have learned how to collaborate with unfamiliar people, academic structures, policies and approaches and work together to enhance and deliver each other's approaches to teaching and learning. This has resulted in a productive and enriching collaboration that has had many positive spin-offs in our home institutions. What we hadn't fully appreciated until our first full evaluation round, was the extent that the students at both institutions would need to change their own familiar and largely successful ways of learning at university and embark on more flexible but often alien ways of learning, and how much support would be required by students to bring about this change.

Manufacturing management course development

In this section we focus on the systematic development, delivery and continuous improvement of the manufacturing management courses offered by UniSA to ANU – further information about ANU courses offered to UniSA students is explained elsewhere (Blackmore *et al*., 2010).

The original UniSA online course development

Prior to the Hubs and Spokes collaboration, the UniSA manufacturing management courses had been taught as fully online courses through the *School of Advanced Manufacturing and Mechanical Engineering* to distant learners. Two of these courses, *Intelligent Manufacturing Systems* and *Supply Chain Management G* had been previously developed for fully online delivery using a systems engineering approach which consisted of considering the customers (in this case, the students) the various stakeholders' (lecturers, IT staff, University etc.) and requirements at the design onset (Amer *et al*., 2007) using various analytical tools. Figure 1 depicts a 'fishbone' cause and effect analysis of the our initial 'distance approach' to online learning, which identified limitations in the study material, delivery style, people involved and the information and technology (IT) systems supporting course delivery, all of which had impacted on student engagement. These issues were addressed through incorporating Salmon's (2002) model of 5 stages to active online learning; access and motivation, online socialisation, information exchange, knowledge construction and development. Group work was developed through these stages and enabled students to become engaged and interactive. Course material was presented through a variety of means: taped lectures with notes and slides; related research and industry articles; and teaching material made available through eReaders with links to related industrial sites. The course coordinators' delivery style aimed to motivate students to remain engaged by having a consistent online presence, communicating regularly to the students through forums, giving regular feedback about students' online work and quickly addressing any IT issues that arose. Student self-assessment was encouraged through the posting of an online solution file towards the end of the courses. The results of these enhancements to the online learning experience were evident in consistent positive student course evaluations.

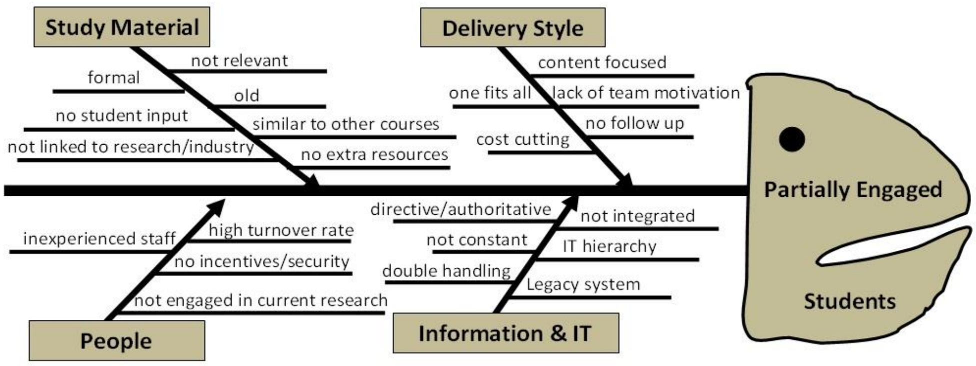

Figure 1: Fishbone analysis of traditional (distance) mode of online learning

The change to Hubs and Spokes blended courses

To commence the collaborative development of these successful online courses into the new blended mode for the Hubs and Spokes project, an online course portfolio was developed (Cerbin, 1994). Course portfolios included information about the current online delivery of the course such as:

- UniSA course information booklets -with the aims, objectives and assessments
- study guide and website
- text book and references
- staff homepages of the teaching team
- trend graphs of enrolment numbers
- trend graphs of student feedback collected over the previous three years using UniSA's standard student evaluation instrument
- current grade distribution data.

The course portfolios were shared with all collaborators using an institutionally-neutral Hubs and Spokes web site built on EdNA (Educational Network of Australia). EdNA provides free group web sites to Australian educators. Fortunately, EdNA was built on a Moodle platform, and thus also provided some early experience for our collaborators in using Moodle, which was the foundation of our newly-installed learning management systems at UniSA (learnonline) and ANU (Wattle) (Kane & Lonie, 2011).

Focus on staff and course re-development

Prior to meeting with our colleagues at ANU, a scholarly peer review of blended learning environments was performed to help the UniSA teaching team articulate their teaching and learning conceptions and perceptions associated with these courses (Trigwell *et al*., 1999; McKenzie *et al*., 2010). This reflection was also shared via the EdNA website. A workshop that was then organised between collaborators at UniSA and ANU to share perspectives and brainstorm enhancements to the course. Face-to-face activities (e.g. practicals or tutorials) that had successfully been used to support learning key concepts related to manufacturing engineering in courses at either institution were shared and the richest learning experiences selected and incorporated. *The Teaching Options in learnonline* planning and review document (LTU, 2010), which incorporated Chickering & Gamson's principles of undergraduate teaching (1987), Ramsden's quality teaching (2007) and Biggs & Tang's constructive alignment principles (2007), was used as a framework to consider student engagement using face-to-face and the new Moodle-based tools available to the teaching team. An action plan was agreed to, which was subsequently adapted into a project management document, called a *Blended Learning Agreement*. The artefacts from these workshops were shared via the course portfolio on the Hubs and Spokes EdNA web site.

Course web site development was conducted by project team members in conjunction with academic staff collaborators. Construction of the web site progressed well over the 3 month development phase, with weekly to fortnightly cross-institutional reviews of progress in relation to the *Blended Learning Agreement,* which were facilitated using technology. Scaffolded activities to introduce students to the range of new Moodle-based technologies used in the courses were designed and integrated. Formative evaluation of student experiences was integrated at weeks 3, 6 and 9 using simple surveys with minor adjustments made to the student experience on the fly. Summative evaluation, designed to evaluate student engagement, was conducted post-teaching by Hubs and Spokes team members not directly involved in the teaching and learning environment.

Initial evaluation of students through surveys, focus groups and interviews revealed that a proportion of the students studying manufacturing management courses just didn't get it - they did not perceive the value of Hubs and Spokes courses or learning in this new collaborative environment between two institutions. All they knew was that, despite enrolling in their home institution, they were being asked to do more and different things, which challenged their current approaches to learning. They felt the additional burden of needing to tackle this change in addition to mastering the new content. We were concerned that students were resisting change and adopting surface approaches to the online and face to face components of their blended learning (Ramsden, 1992). We realised that although we had transformed the teaching environment, and carefully considered the teachers perceptions and conceptions of teaching and learning through workshops and collaborative course development opportunities, we had not focused enough on the student's perceptions and conceptions of the teaching and learning environment (Ramsden, 1992; Trigwell & Prosser, 1991; Trigwell *et al*., 1999). As a result, we were asking the students to make significant changes to their approaches to learning, which they were resisting and this was negatively impacting on their engagement.

Student engagement and its relationship to change

In general, engagement can be expressed as

> ... a coming together, a merging, a fusing. Engagement points to mutual listening, to reciprocity, to dialogue, but conducted in a willingness to *change*. (Barnett, 2003, p.253; emphasis added)

The reference to *change* by Barnett is important. In Engineering Hubs and Spokes courses, students are required to change the way they learn, change their processes for learning, change their time and place of learning - as well as be prepared to learn new content with new people. Experiencing and becoming more confident online collaborators will better prepare our students for their new careers and will better shape their identities as engineers of the future (Kamrani & Nasr, 2008; Sheppard *et al*., 2008).

Student engagement, or the 'time and energy students devote to educationally sound activities inside *and outside* of the classroom' (NSSE, 2007, p.3; emphasis added) can be seen as five somewhat overlapping but distinct benchmarks (Coates, 2006);

50. **level of academic challenge** – the students' chosen behaviour, did students work harder than anticipated to meet the challenge of change?
51. **active and collaborative learning** – opportunities for the social and intellectual dimensions - these can be individual experiences or collaborative, in discussion with peers, inside and out of the classroom, in person or virtual
52. **student-faculty interaction** – opportunities for mentoring, to observe discipline role models, to have informal learning conversations with staff
53. **enriching educational experiences** – opportunities for meaningful or significant learning experiences (other than in-course experiences)
54. **supportive campus environment** - how the environment around the students can make engagement in learning more likely to be the outcome.

Through surveys such as *National Survey of Student Engagement* (NSSE), the engagement of students has been used to provide measures of quality of university education. The indices examined in this survey look at not only in-course learning, but the environment that surrounds the learners. This examination of the whole student experience as a measure of engagement is very relevant when considering our Hubs and Spokes model of blended learning. We are creating a new teaching and learning culture that supports the creation of excellent learning environments through advanced collaboration. To properly engage students and staff in this process we needed to better share our vision and hope for the future and provide adequate support and encouragement, using in- and out-of-course experiences, to bring about this change (Adams *et al*., 2011).

Using change management principles to re-engage learners for change

The recognition that our Hubs and Spokes collaboration was actually a change process for students and that this involved not only the course but the culture that surrounds the course, we were encouraged us to draw on scholarship related to change management to support our analysis and further development.

Simplistically, organisational change can be seen as 3 separate phases (Lewin, 1952);

1. unfreezing of the old culture and setting the stage for change,
2. making the change happen, and
3. re-freezing, to make the changes stick.

With regards to students transitioning to Hubs and Spokes blended learning, we needed to consider what preparation students had for undertaking our cross-institutional blended courses, what support they were given for making the change and what reinforcement the students needed to make the changes stick.

John Kotter analysed hundreds of change management attempts in large and small industries over 10 years and distilled his principles of change into 8 strategic steps (Kotter, 1995; 2007). He found that all eight steps needed to be present and in the right order for the change process to be successful. Kotter acknowledged that these steps also take time, and warns that moving onto the next step before enough time has been spent on the preceding step will only give the illusion of progress. Kotter's framework has been previously used to guide faculty developers as change agents within university settings (Diamond, 2005; Dawson *et al*., 2010), to analyse the effectiveness of strategic change and innovation on staff in higher education in general (Carneiro, 2010) and localised settings (Guzmán *et al*., 2011) and also for supporting students transition from university to career (Heathcote *et al*., 2007). We propose that Kotter's steps can be used as a means to evaluate learning support for students to better engage them in the new approaches to learning that are afforded by blended learning.

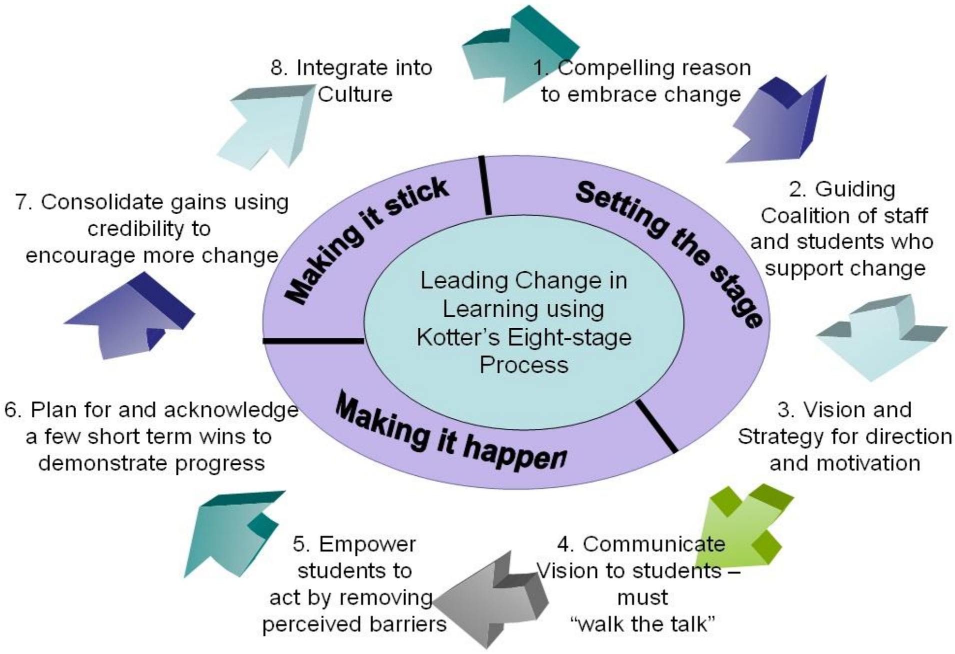

Figure 2: Leading change in learning using Kotter's Eight-stage Process

When we utilized John Kotter's 8-step framework for leading change (Figure 2) to analyse our project, we found gaps, particularly in our support for students in transition to change. In our first iteration of these courses we had concentrated on the *making it happen* steps, using constructively aligned assessment (Biggs & Tang, 2007) as our driver, but had seriously underdone the first 3 steps of *setting the stage* for change and had also done minimal work to *integrate the change* into the culture of learning. By brainstorming as a project team, we were inspired by Kotter's framework to see new opportunities for future development of Hubs and Spokes courses that could ensure the long term survival of this change, by more holistically engaging students (Table 1).

Discussion

Student engagement is an umbrella concept that looks at the level and quality of student involvement in their learning (Coates, 2006). Institutions are responsible for ensuring that those environments that *surround* teaching and learning, as well as what happens inside the course, such as aligned assessment (Biggs & Tang, 2007), do indeed encourage engagement and provide opportunities for learning. The final responsibility for learning, however will always be the students, and their choice to change will be influenced many shifting factors that are out of control of institutions. Regardless of this 'dynamic web of influence' on student engagement (Pascarella & Terenzini, 1991, p 458, *cited in* Coates, 2006), as learning becomes more distributed, as in our Hubs and Spokes project, a greater onus will exist on course development teams to more holistically support students to make the change to engage with new ways of learning and being (Adams *et al*., 2011).

Table 1. Leading change in learning –audit of student support for transition

Kotter's framework applied to students	**What we had previously done to support each stage**	**What we are or planning to do to further scaffold students transition towards change**
	Setting the stage	
1. Establish a compelling reason to embrace the change	New course learning objectives related to advance collaboration skills. Explain during introductory lecture to students about Hubs and Spokes courses and how this will impact on their learning.	Create a required induction experience that includes the voices of industry leaders outlining the reason for Hubs and Spokes type learning in relation to the development of key skills for employability in global companies. Create quizzes that require students to self assess their understanding of what it means to study Hubs and Spokes course as part of induction.
2. Create a guiding coalition who support the change	Academic staff and project development staff work together and co-present at introductory sessions.	Present within the induction the voices of senior researchers and academics staff explaining the benefits of studying Hubs and Spokes courses for students and their future employability. Recruit former students who were highly successful as collaborators to provide face-to-face and online mentoring and guidance for students new to Hubs and Spokes courses.
3. Formulate a vision and strategy for direction and motivation	Create a 5 minute movie introducing blended learning – link to course web site. Scaffolded introduction to online tools used by students within each course.	The change that students need to make was given a name, distinct from blended learning, called 'Advanced Collaboration for Excellence'. We had recognised that this was what we were doing as staff developing courses and this is also what students needed to do to be successful as students, but more so to be high achieving engineers. Creation of an induction experience that allowed students to self-assess their needs and undertake development as required (Moodle Lesson; Figure 3). The students were required to complete the induction experience prior to commencing any Hubs and Spokes course. Transfer of any training of online tools embedded within courses to the induction experience.
	Making it happen	
4. Communicate vision to students	Embed a block on all course web sites with a Hubs and Spokes logo and link to other Hubs and Spokes courses. Provide aligned assessment and rubrics to students at the beginning of the course that explained the importance of reflection and collaboration as measurable criteria.	Emphasise Advanced Collaboration for Excellence by building the concept into all communications – web sites, news forums, discussion forums, email signatures etc. – by all members of the guiding coalition. Build in peer assessment activities that evaluate feedback quality (Topping, 2008) when this plugin module is available for our Moodle LMS.

Kotter's framework applied to students	What we had previously done to support each stage	What we are or planning to do to further scaffold students transition towards change
5. Empower students to act by removing perceived barriers	Provide (loan) headset microphones to allow students to participate in virtual classrooms. Provide workshops that facilitate students leading virtual meetings of their team members. Create a time budget - a study planner that spells out what time needs to be spent on what activities each week.	Self assessment of collaboration skills as an early activity – with guidance on how to develop. Arrange for collaboration tools to be available at call for students, instead of having to wait for teacher to make sessions available. Require students to write a regular leadership log about their advanced collaboration experiences to better understand obstacles that are negatively impacting on their progress.
6. Plan for and acknowledge a few short term wins to demonstrate progress	Early assessment and feedback on reflection pieces assessing collaboration skills (week three) to demonstrate appropriate writing style and collaborative skill development.	Incorporate ePortfolio activities that require presentation of collaboration achievements in the course for marketing to future employers.
Making the change stick		
7. Consolidate gains using credibility to encourage more change	Link to more Hubs and Spokes courses in web site.	Actively promote Hubs and Spokes courses as further opportunities to collaborate and network with future work and research colleagues.
8. Integrate into culture	Continue offering Hubs and Spokes courses.	Recruit past students to support new intake of students. Collaboration prizes awarded by popular vote (students and/or employers looking at ePortfolios) - 'most likely to be CEO' award. Supported research collaborations for students who have evidence of strong collaboration skills. Follow progress of graduates of note and celebrate successes.

Supporting students entering cross-institutional blended learning

Students expectations on entering a blended learning course need to be actively addressed as a part of the process to ensure misconceptions associated with the term 'blended' (Oliver & Trigwell, 2005), do not negatively impact on their engagement. For instance, when students sign up for a fully-online course they anticipate the constraints in communication that may exist and balance this loss against the flexibility gained through online study. Similarly when a student signs up for a face-to-face course, they are aware of the operating constraints (e.g. physically attending sessions) as they enter into the course. However, in a blended course, the *modus operandi* is often unknown. Effort needs to be made to help students understand what the blend will mean to them and how they will need to adapt to the change and why.

Diamond (2005) lists a number of elements which are necessary pre-requisites to effective change in higher education environments, and describes how these elements can be put in place using the Kotter model. We were aware of the importance of 'setting the stage' for the shifts in cultural priorities which we were seeking. Kotter emphasises the essential nature of all eight steps in his process (Kotter, 1995). However, the first three steps – creating a sense of urgency, forming a powerful coalition for change, and presenting a vision – are perhaps the most critical in formulating the meaning and motivation which will give the change process its impetus (Fullan, 2007). In implementing these three steps, we were (and still are) laying a solid foundation for change.

Communicating the vision through an induction experience

In order to communicate this vision of Advanced Collaboration for Excellence, and to outline the professional realities which made the changed learning approaches urgent and vital, we designed an induction experience which students were required to complete prior to undertaking Hubs and Spokes courses (Figure 3).

Figure 3: Screen grab from Hubs and Spokes Induction experience

Within this site, we used a number of different motivational strategies to convey our key messages. For example, we presented evidence from engineering professionals describing the modern engineering workplace, we used multimedia resources to demonstrate and explain vital employability skills for young engineers, and we have linked to professional bodies (such as Engineers Australia) to outline the relevant competencies which our courses support. We also presented the collaboration between UniSA and ANU as an opportunity for the students to benefit from the complementary sharing of expertise between the two institutions.

We were very aware of the importance of Kotter's second step – the creation of a powerful guiding coalition. A group of 'committed, reputable and trustworthy supporters who had a strong relationship with others across the organisation' was essential if the changes were to encompass the entire Hubs and Spokes student community (Dawson *et al.*, 2009, p. 71). In the Hubs and Spokes context, this needed to include senior staff and academic staff from both institutions, tutors and student leaders, and practicing professionals. We had a number of champions amongst the senior staff, including the ANU Pro Vice-Chancellor for Innovation and Advancement, and the Dean of Teaching and Learning for the Engineering Division in UniSA, and we were able to use the Induction web site as a means of passing words of encouragement from these staff to the students. We were also fortunate enough to have a dedicated project support team which was able to communicate with and offer support to the academic staff and the tutors, to enhance their understanding of the changes which were being implemented and foster their enthusiasm. The support team established communities of practice for the academics, so that they were able to share their approaches and experiences with the newest collaborators in our team. We also approached students who had successfully completed Hubs and Spokes courses, and who were likely to be influential ambassadors for the Hubs and Spokes vision. These students were given the opportunity to act as mentors to other students who were new to this style of teaching and learning, via discussion forums in the Hubs and Spokes Induction.

Ultimately, we were able to present a strong case for change to the student community because the change we proposed within our courses reflected a wider change within the professional engineering industry. The collaborative approaches and tools which were embedded in the Hubs and Spokes courses were approaches which professional engineering practice is embracing in the move to Collaborative Engineering – the systematic approach to integrated, engineering design and processes, in which designers, engineers, resources, and models are distributed and work together across the internet (Kamrani & Nasr, 2008). This meant that our vision for course delivery was strongly aligned to the type of professional environment in which the students could expect to be working in the future (Sheppard *et al*., 2008). Moreover, the ‘Advanced Collaboration for Excellence’ focus of the Hubs and Spokes course design aimed to foster student skills of team work, communication, co-operation and global awareness – skills which engineering employers were increasingly emphasising as more important than technical abilities for professional success.

Leading change has been characteristically a long term process (Kotter 1995; 2007). Unlike industry however, we have opportunities in higher education to restart the process of change with each new student cohort entering into Hubs and Spokes learning environments. Annual course offerings and regular evaluation provide opportunities for us to rethink, remake and reinvigorate our culture and vision to better communicate this to students.

By considering change management process as part of evaluation, course development teams can be revitalised to see student engagement in blended learning environments in a more holistic way, including in- and out-of-course experiences and multiple perspectives (Adams *et al*., 2011). Kotter’s eight step principles can help teams to move from the role of academic or instructional designer for a course, to change managers for a way of learning that is more appropriate for students transiting to professional life.

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From face-to-face teaching to online teaching: Pedagogical transitions

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Abstract: This paper will share the experiences of two instructors as they moved from teaching in a face-to-face environment to blended teaching and then to online teaching. It will describe the four-year journey and shed light on the issues, perspectives and practices as the instructors reflected on the changes to their pedagogical practice and the resulting online student engagement. Data included three 1-hour interviews and an analysis of online discussion postings. The instructors reflected on their values, beliefs and assumptions about teaching and learning. As higher education has embraced online education as a way to reduce costs, increase flexibility, and enhance access to students it is important to gain an understanding of the perceptions of instructors moving into online teaching. This study found a change in the beliefs and teaching presence of the instructors from their initial resistance to online teaching to an approach which is mindful of the student experience and promotes a dialogical approach to online learning.

Keywords: online teaching; teaching presence; changing pedagogical practice

Introduction

The infusion of Information Communication Technologies (ICTs) into learning and teaching has occurred in all sectors of education. It has changed the nature of face-to-face (f2f) teaching and enabled the rapid growth of blended and online courses. ICTs offer new opportunities but also new challenges for both instructors and students. As the number of online courses grows it is essential that we have an understanding of the roles and practices of an effective online teacher. Laurillard (2002) asserted that “if there is to be innovation and change in university teaching—as the new technology requires, as the knowledge industry requires, and as students demand—then it follows that academics must become researchers in teaching” (p. 22).

This paper explores the journey of two academics as they moved from face-to-face teaching to blended teaching and then to teaching fully online courses. It is a result of academics researching their teaching as recommended by Laurilliard (2002). The study investigated how this journey initiated changes in the beliefs and pedagogical practice of the two academics from 2007 - 2011.

Changing teaching spaces

The changing nature of both the student body and available technologies have required academics to change their approaches to teaching to gain improved learning outcomes (Hativa & Goodyear, 2001). Academics who have commonly taught in a face-to-face environment are under pressure to embed ICTs into their face-to-face teaching and to work in blended and online modes. The literature is inconsistent in describing blended learning largely because it has been enacted in practice in a variety of ways. Blended learning may also be known as flexible learning, mixed mode, or hybrid delivery. Elliot Masie (2002) defined blended learning as “the use of two or more distinct methods of training” (p. 59). In their publication which examined the extent and quality of online education in the United States, Allen and Seaman (2003) quantified a blended course as “having between 30% and 80% of the course content delivered online” and an online course as one where “at least 80% of the course content [is] delivered online” (p. 6).

Technologies enable instructors, students and others to participate in teaching and learning at a time and place convenient to them. Universities have been successfully offering distance education for many decades, where teaching and learning occurred ‘off campus’ (Oliver, 2002). Coldeway (1995) discussed four different approaches to using technology in higher education However, these approaches were established over fifteen years ago and technology has developed significantly since that time, therefore these approaches should be viewed from a more contemporary perspective.

1. Same time, Same place – This is a traditional face-to-face approach where the instructor and learners are in the same geographical location at the same time. However, today some people might consider using synchronous technology tools such as Wimba and Elluminate, or Skype to interact with others at the same time in the same virtual space. This virtual space replicates many aspects of face-to-face spaces with all participants having access to the same resources, files and synchronous discussion at the same time.
2. Different time, Same place – Participants in the learning and teaching process interact in the same space but at a time they choose; for example, in asynchronous online discussions.
3. Same time, Different place – This could be viewed as individual students working independently but at the same time, not located at the same place. Or today, it might be considered to be parallel to Same time, Same place where students from geographical different places connect synchronously using different mediums, such as video conferencing, phone, Wimba, or Skype.
4. Different time, Different place – Learners and instructors are separated geographically and also by time. Email is an example of this, where the participants choose the time and place of the asynchronous interaction.

These changing teaching and learning spaces are impacted by the use of technology. The move from traditional face-to-face teaching toward technology enabled, blended, and fully online teaching initiates a role shift. This paper explores the changing beliefs, roles and the changing nature of academics work as a result of inserting technology into teaching and learning spaces.

The changing role of the instructor

The transition to online teaching and learning from a traditional face-to-face approach challenges the expectations and roles of both instructors and learners. For some instructors, when they change the place of teaching, they feel that their identities are under threat. Many instructors see their professional identity being tied to their past face-to-face teaching where they had a high level of expertise. “[I]f educators are changing teaching places, they need to redefine themselves in light of the change in landscape” (Meloncon, 2007, pp. 37-38).

Redefining professional identity and teaching practices takes time. Without training many instructors try to replicate existing course design and pedagogical practices when they move from face-to-face teaching to blended or online teaching (Bonk & Dennen, 2003). The replication of traditional methods does not capitalize on the dynamic nature of a technologically enhanced teaching and learning environment. Some academics fail “make a transformational shift in their approach to teaching from one of disseminating information to one of creating learning environments where students co-construct knowledge through interactions” (Vaughan, 2010, p. 61) and they are under pressure to re-examine their philosophy and their pedagogy.

The move from face-to-face to blended and online teaching is quite confronting. The nature of teaching, roles and workload distribution changes as instructors teach in blended and/or online courses (Coppola, Hiltz, &

Rotter, 2002; Young, 2002). Many experienced or expert face-to-face teachers find themselves as novices or beginners when first teaching online. In some cases it could result in a resistance towards online teaching (McQuiggan, 2007).

A major challenge, identified by Yang and Cornelious (2005), when instructors move from a largely teacher directed face-to-face environment to an online environment, is to redesign learning towards a constructivist approach. This often results in a change in: roles and responsibilities; use of technology; relationships; presence; and a perceived lack of prestige.

Presence can be defined as “the ability to automatically identify the status and availability of communication partners” (Hauswirth et al., 2010, p. 1) and provides an impression to others that you ‘are there’ or present. Teaching presence has been defined by Anderson, Rourke, Garrison and Archer as “the design, facilitation, and direction of cognitive and social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes” (Anderson, Rourke, Garrison, & Archer, 2001, p. 5). They go on to explain that teaching presence involves three key roles: instructional design and organisation; facilitation of discourse; and direct instruction. The indicators for each teaching presence category are presented in Table 1 below.

Table 1: Teaching presence categories and indicators

Categories	**Indicators**
Instructional design and organisation	• setting the curriculum; • designing methods; • establishing time parameters; • utilising medium effectively; • establishing netiquette; and • making macro-level comments about course content.
Facilitating discourse	• identifying area of agreement/disagreement; • seeking to reach consensus/understanding; • encouraging, acknowledging, or reinforcing student contributions; • setting the climate for learning; • drawing in participants, and prompting discussion; and • assessing the efficacy of the process.
Direct instruction	• presenting content/questions; • focusing the discussion on specific issues; • summarising the discussion; • confirming understanding through assessment and explanatory feedback; • diagnosing misconceptions; • injecting knowledge from diverse sources; and • responding to technical concerns.

Source: Modified from Garrison, Anderson and Archer (2000)

The indicators listed in Table 1 provide examples of what an instructor does within each of the three categories or roles of teaching presence. Instructional design and organisation refers to the planning, management, and structural decisions made in a course (usually prior to the students entering). When effectively facilitating discourse academics are guiding and developing productive conversations so as to deepen students' knowledge. Direct instruction requires deep discipline knowledge to enable the shaping of learning experiences and to diagnose students' misconceptions.

The categories of teaching presence might be seen by students as the visible actions or verbal contributions that the instructor makes throughout the course. Teaching presence is an indicator of the quality and quantity of the leadership and the interactions made by the instructor. It is the role of the instructor to provide intellectual leadership for the course and shape the learning experiences of the learners through the teaching presence categories of design and organisation, facilitation of discourse, and direct instruction.

Technology in learning and teaching does bring with it a change to the role of the instructor and the nature of teaching. This is a concern if instructors are ill equipped to deal with the changing nature of teaching online because teaching presence does impact on student satisfaction in online courses (Shea, Frederickson, Pickett, & Pelz, 2003; Shea, Pickett, & Pelz, 2004). Table 2 below presents different researchers' views on the role of the online teacher. From this summary it could be suggested that effective online teachers need a range of skills and knowledges, particularly in the areas of: management; pedagogical approaches which will effectively enable the design, facilitation and assessment of the course; content knowledge; ability to support the social and emotional well-being of the students; and technical skills.

Table 2: Online Teaching Roles

Berge (1995)	**Garrison, Anderson and Archer (2000)**	**Berge and Collins (2000)**	**Goodyear et al. (2001)**	**Morris, Xu and Finnegan (2005)**	**Weltzer-Ward (2011)**
Managerial		Manager	Manager/ Administrator		Managing
Pedagogical	Design and Organisation	Editor	Designer	Course customiser	
			Assessor	Grading and Assessment	
	Facilitating discourse	Discussion leader	Facilitator	Course facilitator/ Process facilitator	Guiding discourse
Social		Firefighter/ Filter	Adviser/ Counsellor		Supporting
	Direct instruction	Content expert	Content facilitator		Instructing
Technical		Helper and marketer	Technologist		

Table 2 presents a chronology of different points of view on the role of online teachers. These different perspectives of the online teacher indicate that although researchers have used different labels for the roles of online teachers, the common types of activities include management, design, organisation, facilitation, and instruction. Interestingly, the process of facilitating discussion appears to be a key role when teaching in the online space as it explicitly appears in five of the six frameworks summarized in Table 2. In general, the different roles presented are not specific to online teaching but are the visible elements of teaching in any environment, although how the roles are enacted are different in face-to-face teaching when compared to online teaching. It is through these roles that an instructor guides student learning and improves the student learning journey with the aim of enhancing student learning outcomes.

The increase of technologies in education, to enhance learning and teaching, means that it is important to understand the perspectives of academics as they travel the continuum of teaching with and through ICTs from face-to-face teaching to online teaching. It is important also to improve the quality of the learning experiences and student satisfaction while academics 'find their feet' in these new learning and teaching environments.

Methodology

This paper will present a case study of two academics as they moved from face-to-face to blended and online teaching. Data were collected over four years using archived online discussions and three 1-hour semi-structured interviews. Participants were interviewed when they designed and taught their first blended course (after having significant experience in teaching face-to-face). After the conclusion of semester the interview data and the data from the online discussions were presented to the instructors in a second interview for them to comment on. A third interview was conducted after they had taught a course fully online. The constant comparison method (Lincoln & Guba, 1985) was used to analyse the data, looking for recurrent and emergent themes to identify patterns. The online discussion archives were analysed to identify which categories of teaching presence the instructors' online posts were aligned to.

To build an understanding of the change that academics experience when the when moving from face-to-face to blended and online teaching the following questions were explored:

- What change in pedagogical practice did academics report when moving from face-to-face to blended and online teaching?
- How do the perceptions of instructors change over time when moving from face-to-face to blended and online teaching?
- What influenced change as the instructor moved from face-to-face to blended and online modes of teaching?

This research was set in a regional university where academics were pressured to move from face-to-face teaching towards blended and fully online teaching to accommodate the increased economically, geographic, socially and culturally diverse student population.

The first instructor, Anna, was an early childhood educator, who had also worked in primary schools. She had also worked as a fitness instructor and had managed her own personal training business prior to becoming an academic. The second instructor, Sean, was an enthusiastic ICT user who had been: a multi-aged primary teacher 1 – 7; a small school primary principal; an advisory visiting teacher for intellectual impairment; a support teacher for learning difficulties; and a guidance counsellor for years 1 – 12 and in alternative education programs before joining the university.

Data analysis and findings:

This section will describe the change in perceptions and in pedagogical practices as the two instructors moved from teaching face-to-face to blended and online teaching over a four-year period. Figure 1 indicates pedagogical change at three junctures of the instructors' journeys. Teaching presence in this figure refers to the most common types of instructor online posts when analysed using the categories provided by Garrison, Anderson and Archer (2000) as described in Table 1 above.

Figure 1: Instructor changes in perceptions and modifications of pedagogy

Stage one was when the instructors, who were highly experienced in face-to-face teaching, were first introduced to blended teaching. At this stage they were concerned with the student expectations of them online and in particular, the perception that they were available 24 hours a day, seven days a week. Both instructors were initially sceptical and resistant to including online elements to their face-to-face course. Other researchers have also found that instructors often resist changing their teaching approaches to integrate ICTs into their practice, most commonly due to lack of training, lack of support, or time pressures (Finley & Hartman, 2004; Garrison & Anderson, 2000; Pajo & Wallace, 2001).

The instructors did see the benefits of flexibility for students studying in blended courses. Their students had easy and ongoing access to a wider range of materials and they were also able to choose when and how they would interact with the course content, their instructor, and their peers. At this beginning stage the online space was largely a repository of documents or links to websites with incidental use of discussion forums.

The online discussions had limited student interaction, yet strong instructor participation. The online discussions were teacher dominated with many public one-to-one conversations between the instructor and a student rather than many-to-many discourse. The instructors responded immediately to student posts. This supports the research of Vandergrift (2002) who commented that "[i]t was difficult for [the] teacher not to respond immediately to a truly brilliant insight or, on the contrary, to confusion, muddled thinking, or misinformation" (p. 83). The instructors were concerned that the discussion was more formal and there was a permanent record and this impacted the way they contributed to the online discussion.

The majority of the instructors' posts in online discussions were those which encouraged, acknowledged and reinforced student posts; within teaching presence these are categorised as facilitating discussion posts. This was in contrast to the research of Morris et al., (2005) who found that beginning instructors rarely provided acknowledgment or feedback to the students. The next most common type of posts were those where the instructor presented content and questions, and this falls in the direct instruction category of teaching presence.

After the initial interviews and online discussion forums were analysed the stage one data were presented to the instructors. After viewing the data analysis to this point both instructors made immediate changes to their practice. For example, Anna commented that rather than be "quick to get in and respond to students immediately" she started to "sit back to see if other students respond" and she also began to invite students back into the conversation.

The second stage in their journey was when the instructors had some experience teaching in blended courses and they were about to design and teach a fully online course. The instructors had increased confidence in their ability to complement their face-to-face work online and had made changes to their pedagogical approach. They felt they were 'letting go' of their old ways of teaching and started looking for new ways to engage students. When discussing student engagement online Sean questioned, "How do I get them in?" The instructors were exploring interaction online.

Both of the instructors regularly participated in a range of professional development activities to gain knowledge, experience and different perspectives of online teaching. They actively searched for relevant professional readings and engaged in pedagogical conversations with other instructors experienced in online teaching. They also increased their personal reflection on blended teaching and learning, especially when beginning to design and develop the new online courses. Both Sean and Anna have found that they presented less content within their courses in order to provide students with more time and space, with theaim to increase quantity and quality of the online discussion. Sean suggested that "the more I pour in the less room there is for others to contribute".

In the face-to-face and online elements of their blended courses the instructors provided models and scaffolding. They made links between the face-to-face and online activities and the online discussions to increase higher-order thinking and to promote enhanced student engagement. Both instructors had success using open-ended questions of a contentious nature or real world issues as stimulus for online discussions. However, the instructors were still concerned about the frequency and depth of student contributions to online discussions. They started to wait for students to respond rather than stepping in immediately and they also provided less detailed responses.

During stage two, their teaching presence included specific links to netiquette through direct instruction. While facilitating discourse they drew in the participants and prompted further discussion. They continued to encourage, acknowledge, or reinforce student contributions while also inviting the students back into the discourse.

During the third stage, the instructors were teaching in face-to-face, blended and fully online courses. Anna stated that she was "more comfortable working online". Looking back Sean revealed that he was "embarrassed about what [he] used to do online". He noted a marked change in his online pedagogy and his attitude towards teaching online. At this stage both instructors found they were less critical and more open to new ideas about teaching through technology. Sean found he became "experimental and curious about what is possible in the online space" and he is "now looking for ways to address barriers to access and participation in the curriculum" when teaching online. Both Anna and Sean have seen "quality outcomes" from their past experiences which has helped them developed confidence, they have embraced the challenge of teaching online, and they continue to look for ways to improve their practice.

One of the big changes at this stage was that the instructors were "mindful of the online learner experience". They also found that while working in three different modes they were able to "translate learning from one mode to another" to enhance the efficiency and effectiveness of their teaching. Anna reflected that she was "continuously thinking of ways of engaging students online".

The instructors considered that they had changed their concept of the online area to one of a teaching space rather than a repository. Sean reflected that he "now questions what type of pedagogy can be applied to the space. This new space makes pedagogical demands on the teacher". Anna suggested that she "needs to re-think curriculum design" for the space and also the pedagogy of the space. Sean suggested that he needed

> "to be mindful of the space. Space affords and demands different pedagogies. Just as in face-to-face teaching when you change the layout of the classroom and organization of the desks you need to teach in different ways and students will interact in different ways. The same occurs in an online space".

When using the online areas as a space rather than a repository; Sean was particularly interested in looking at ways to improve interaction. Both instructors aimed to have an ongoing post/response cycle between students rather than teacher-dominated or teacher-led discussions. At this stage they had higher expectations of themselves and their students in online discussions. They found that in online discussions students and instructors have the opportunity to sit back, reflect and think before replying – giving a considered response. Sean observed that participants "don't need to shoot from the hip; we can all refer back to learning materials etc. before responding" and other researchers (Garrison, Anderson, & Archer, 2001; Meyer, 2004; Vaughan & Garrison, 2005) have had similar findings.

Sean also identified four different modes of interaction between the participants that he has tried to encourage. Interestingly Sean's types of interactions expand on two of the interactive relationships presented by Moore (1989): Learner – Teacher interaction and Learner – Learner interaction.

- Instructor interacting with students;
- Students initiating interaction with instructor;
- Instructor facilitating student-to-student interaction (teacher led); and
- Students' initiating student-to-student interaction.

In stage three, the instructors focused on a dialogical approach to teaching and learning online. The online discussion forums were established with specific expectations of how they might "contribute to teaching and learning activities". This has impacted on the design and management of other courses. Anna suggested her online discussion forums "were much more productive. Students share their personal philosophy and appreciate the opinions of others". Both instructors have found that higher-order thinking can be made more explicit in online discussions. This finding is supported by Garrison, Anderson and Archer (2000) who suggested that "the reflective and explicit nature of the written word encourages discipline and rigor in our thinking and communicating" (p. 91).The instructors tried to encourage critical thinking responses in the discussion forums where students' thinking is more visible. Anna commented that she also "uses Bloom's thinking taxonomy to audit her courses" to track the types of learning and assessment activities that form part of the course.

The instructors both had strong feelings about their need to be 'present' in the online space just as they do in face-to-face classes. Sean went on to comment that "it is not just about being present in the online space, it is about what we do when we are online that makes a difference". This aligns with past research which found that "there is growing evidence that teaching presence is a significant determinant of student satisfaction, perceived learning and sense of community" (Garrison, Cleveland-Innes, & Fung, 2010, p. 32). Students expect their instructors to be present online and these two instructors also felt it was key to successful online teaching.

Both instructors suggested that they have been on a "steep and ongoing learning curve". This was especially obvious when they moved from blended teaching to fully online teaching. They have both been adjusting their philosophy and practice. Based on their experience over the four years, they saw a change in role from content provider to facilitator. This change from "intellect-on-stage and mentor towards a learning catalyst" (Volery & Lord, 2000, pp. 222-223) was not a change in their underlying philosophy, however they have both reconceptualised what effective online learning and teaching might entail and this resulted in a significant and ongoing change in pedagogical practice. Interestingly, Sean suggested that he finds online teaching "very demanding. It is more demanding that face-to-face teaching in terms of time and thinking required". Other studies (Hartman, Dziuban, & Moskal, 2000; McKenzie, Waugh, Bennett, & Mims, 2002) would support his comment that many academics perceive that designing for online learning and teaching online is more time consuming than face-to-face courses.

Outcomes

In answering the initial research question "What change in pedagogical practice did academics report when moving from face-to-face to blended and online teaching?", this study found that there was significant change. The growth was spiral in nature: as they gained more experience in teaching blended and online courses the instructors experienced new roles and explored the expectations of what those roles might entail while developing expertise, knowledge and skills for online pedagogy. There was a paradigm shift in how the instructors communicated with their students in online discussions and also for the ways that they designed online courses to initiate the act of learning. The instructors also took into account the student experience when designing new online courses. The focus was not limited to the experience of the instructor. Universities can't expect that instructors can and will move from being a novice educator to an expert online teacher without time, experience and support. These elements enable the instructor to develop and teach in ways that enhance the student learning journey.

The second research question asked "How do the perceptions of instructors change over time when moving from face-to-face to blended and online teaching?" When first asked to teach in a blended mode the instructors were resistant. There was initial scepticism regarding the ability to gain comparable learning outcomes in blended or online environments when compared to face-to-face teaching. During the four-year journey while preparing to teach in blended and online courses the instructors underwent a transformation in teaching assumptions, beliefs and practices. After teaching in only one online course the instructors were positive in their approach to teaching online and the resulting student outcomes.

The final research question investigated "What influenced change as the instructor moved from face-to-face to blended and online modes of teaching?" This study makes clear the impact of critical reflection, dialogue and support as instructors move from the high level of comfort and expertise in face-to-face teaching to a very confronting and novice position when first teaching online. There was a progression of change which was enhanced by personal reflection and also the opportunity to see an analysis completed by a 3rd party and the opportunity to discuss it. During this study, the opportunity to discuss the data from Stage 1 provided the stimulus for instructors to reflect on their pedagogy and make immediate changes to their practice. It required intellectual courage for the instructors to be involved in this research and to have someone else analyse their online discussions and then discuss how they constructed, deconstructed and reconstructed their philosophy and practice. The instructors also searched for professional development and professional readings to support their pedagogical journey.

With only two participants from one regional university, within the discipline of teacher education, it means that the outcomes of this study are highly individualised and there is limited ability to generalise. However, these findings can provide the opportunity for future research and institutional discussions. Future research may explore the journey of other instructors across a range of disciplines and institutions. Also it would be useful to practitioners for research that investigates the role and expectations of students, particularly for those whose education has recently moved from face-to-face to fully online.

Conclusion

This paper explored the journey of two instructors as they moved from face-to-face teaching to blended teaching to online teaching over a four-year period. The instructors experienced a change in role and also a significant change in comfort level and acceptance of the effectiveness of online teaching and learning. The move to teaching online was a catalyst for the instructors to question and reflect on their philosophy and practices about teaching. What worked for the instructors in the traditional face-to-face classroom was not as effective in the online space.

As the work of academics moves from a largely face-to-face mode to blended and online modes they should be provided the opportunity to critically question their own practices and discuss with their peers the adoption of new pedagogical practices for the new teaching spaces. This may provide a better understanding of teaching and learning processes in the online environment. For this type of dialogue to be successful there needs to be a climate of support, the participants need to be receptive to feedback from their peers, and they should engage meaningfully in reflective practice.

Moving some or all of the learning online requires changes to both pedagogy and practice to ensure effective learning outcomes. "The challenge is to systematically explore the integration of pedagogical ideas and new communications technology that will advance the evolution of higher education as opposed to reinforcing existing practices" (Garrison et al., 2010, p. 31). For many instructors their attention has not yet shifted from the technology tools to the pedagogical practices and use of the tools. This has an impact not only on instructor identity but also on the effectiveness of the teaching and the perceptions and satisfaction of the learners.

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Equity in a digital world: engaging Indigenous learners

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This paper reports on an action research project investigating whether the integration of computer-based homework with face-to-face delivery can enhance learning opportunities for 36 Indigenous adult learners enrolled in Certificate III in Spoken and Written English at Batchelor Institute of Indigenous Tertiary Education in the Northern Territory. The impetus for the project was concern over learners' slow rate of progress through the course in the two years prior to the project.

Four action research cycles were conducted during the 2008 academic year to investigate student levels of participation in, and responses to, computer-based homework. The findings show that the use of computer technology enhances opportunities for homework participation; however, these opportunities are mitigated by factors linked to three thematic areas: access to computer technology; lifestyle factors; and attitudes towards learning and homework.

Keywords: Indigenous, action research, English language, literacy, technology, engagement, equity

Indigenous education

In Australia there is a substantial education gap between the Indigenous population and the wider Australian population (ABS, 2008). Only 36% of Indigenous Australian 17 year olds are reported to be attending secondary school as compared to 66% of non-Indigenous Australians of the same age. It is clear that the Australian education system has failed to adequately provide for Indigenous students, particularly in respect to fostering English language, literacy and numeracy outcomes, and this has a flow-on effect to success in post-school education and employment.

There are very high rates of participation in Vocational Education and Training (VET) from Indigenous students from remote areas across Australia; however, this level of participation 'has not to date translated into improved labour force participation or well being' (Young, Guenther & Boyle, 2007, p. 23), nor does it even equate to certificate completions (Young, Guenther & Boyle 2007:10). Only 25% of Indigenous people, as compared to 47% of the Australian population, have a non-school qualification (ABS, 2008). Indigenous participation in VET is clustered at Certificate I and II level pre-vocational courses (Anderson, Wallace, Christie & Kennedy, 2009, p. 4; Young, Guenther & Boyle, 2007, p. 10). While Certificate III is the level generally regarded in practical terms as an entry level vocational qualification (Stanwick, 2006), the prerequisite English language, literacy and numeracy skills for engaging in training at this level are higher than those possessed by many Indigenous adults in the Northern Territory (Kral & Schwab, 2003).

Against this background of inequitable educational outcomes, this paper reports on an action research project which focused on improving the engagement of and outcomes for a group of Indigenous adult students in the Northern Territory (NT). The impetus for the project described in this paper was concern over learners' slow rate of progress through an English language and literacy course in the two years prior to the research. Historically, progress had been adversely affected by extended periods between intensive workshops when students were not involved in formal study, as well as by low and irregular levels of attendance. The students' interest in using digital technologies in the classroom suggested the possibility of linking homework to computer-based activities which would provide opportunities for learning outside of the classroom. Rather than perpetuating a culture of blame for low attendance and slow progression, this research project sought to build an understanding of the barriers that were impeding students' progress. It also sought to identify the factors contributing to positive outcomes, as well as to explore the role of computer and digital technologies in improving student engagement, progress and outcomes.

Context of the research

This research took place at Batchelor Institute of Indigenous Tertiary Education (BIITE), a dual sector (VET and Higher Education) educational provider located 100km south of Darwin in the NT. The participants in the research were a group of 36 Indigenous students enrolled in Certificate III in Spoken and Written English (CSWEIII). The group comprised of 30 female and 6 male students. The majority of the students, 31 in total lived in remote or very remote Indigenous communities and 34 of the students spoke an Australian Indigenous language as their first language. The students enrolled in the course to improve their English language and literacy skills as a pathway into, or concurrent with, VET courses or as a stepping stone into tertiary preparation courses and ultimately into higher education degrees.

Course delivery was conducted in the 2008 academic year over 13 weeks of intensive delivery in one or two week 'workshops'. An additional 75 hours of individual study was built in to the course to allow students to complete the 400 nominal course hours in one academic year. Over the research period attendance at workshops ranged widely. Only two students attended all workshops delivered. 58% of students attended less than half of the workshop weeks and only 19% of students attended more than 80% of the workshops conducted. The implication for students of low attendance and low rates of participation in the components of home study was slow progression through the course.

Technology: a conduit for engagement and progression

In the two years prior to the research a range of digital technologies were used in activities to develop English language , literacy and digital literacy skills in the CSWEIII course. The students embraced the use of technology and were very interested in developing digital literacy skills to use in the learning environment as well as for work and social purposes. The digital tools used in the project were those which were available, reliable, effective and easy to use. The tools used in the classroom during workshops and subsequently for homework activities were also linked to skills that students indicated themselves that they wanted to develop.

As the learning environment was predominantly classroom-based, limited use was made of computer-based tools to present information, whereas a strong focus was placed on collaborative, interactive and co-creation tools such as discussion forums, wikis, and glossaries. Links to websites, audio and video files were also incorporated into the course through a Learner Management System (LMS), Moodle. Many of the audio and video files were developed by the students during class activities and were then used as the basis for additional learning activities in the LMS. A range of digital tools, such as Marvin animation software, were used during to develop student skills in using technology, to engage their interest, and to enhance opportunities for collaborative and communicative learning. Feedback indicated that the students enjoyed working with a range of computer-based and digital tools and activities, as well as with more traditional modes of delivery and types of activity.

Homework activity during the project included asynchronous activities through the LMS, as well as other activities including preparation for oral presentations, writing emails, and activities based around external websites. Synchronous activities were not conducted between workshops due to difficulties with computer access, technological support and logistical issues. Some tools that were used successfully in class (such as Marvin, and video-making) were not suitable for students to use between workshops as they required specialist software and hardware.

While the incorporation of technology into an educational program may appear to be routine, there are a range of socio-economic and geographic factors that impact on the participation of Indigenous people in technology driven educational delivery. In the NT, with a sparse population spread over a large geographic area, online education at first sight appears to be an attractive option for learners who may otherwise not have had the opportunity to gain formal educational qualifications without having to travel away from home or moving to another place to attend face-to-face classes (Kilpatrick & Bound, 2003, p. 7). However, nationally the level of internet access is much lower for Indigenous households (43%) when compared to that of non-Indigenous households (63%) (ABS, 2008a). This difference is exacerbated by the fact that for Indigenous Australians home internet access decreases significantly as remoteness increases, while in other sectors of the population there is minimal difference in the levels of internet access between major cities and very remote areas. The pattern of internet access has particular relevance to this project, given that 79% of the Northern Territory's Indigenous population live in Remote and Very Remote areas (ABS, 2008). Nationally only 8% of Indigenous people living in remote areas had home internet access at the time of the 2006 Census (ABS, 2008b).

Yet despite these issues, in Northern Australia Indigenous people use digital technologies, when they can access them, for a range of purposes. The interest exhibited by students in using technology in this project is consistent with the literature about Indigenous engagement with technology in Australia, and in particular in the context of remote communities in the NT. Indigenous people have for some time embraced recording technologies, appropriating it for their own social and political purposes (Christie, 2005; Verran & Christie, 2007) and in particular for recording of ceremony. More recently, Kral has identified that for Indigenous youth, 'life is increasingly connected to mainstream practices, technology and a non-traditional lifestyle' (2010, p. 10). In particular, the use of digital technologies has provided young Aboriginal people who are 'seeking new ways of expressing a contemporary Indigenous identity' (Kral, 2010, p. 10) with the tools to mediate 'between old and new knowledge and new technologies to create new forms of cultural production' (Kral, 2010, p. 10).

The action research project discussed in this paper explored whether the students' observed enthusiasm for using computer technology could be harnessed to encourage participation in homework activities, and in so doing provide opportunities for students to practice and develop their English language and literacy skills in the periods between intensive workshop blocks. This was set against a backdrop where the digital divide was seen clearly to exist.

Action research

Description and rationale

Action research is 'a cyclical, dynamic, and collaborative process' (Stringer, 2004, p. 4) which combines 'joining of practical action with the pursuit of theoretical understanding' (McTaggart, 1991, p. 6). Action research is designed around cycles of planning, implementation, observation and reflection. The term action research was coined by German social theorist Kurt Lewin. Lewin was influenced by John Dewey's vision for reform of educational research in the early 1900's which included the political acts of 'demystification, domestication and democratization of the scientific method' (McTaggart, 1991, p. 2), as well as by the politics of the Second World War and the social changes occurring in the post-war era including the upheaval in race relations in the USA. The linking of theory and praxis provided the philosophical underpinnings of Kurt Lewin's vision for the re-conceptualisation of research to encompass 'the study...of the social processes which lead to committed social action' (McTaggart, 1991, p. 7).

Action research is an approach that is highly relevant in the field of educational research. It both complements and enhances the normal teaching activities of planning and implementing a teaching and learning sequence, observing the results and reflecting on what happens in order to commence a new revised cycle of planning and action. Action research is equally relevant as an ethical approach to conducting research in an Indigenous context in order to counter Indigenous disadvantage, contribute towards immediate improvements in people's lives, as well as providing a theoretical base for more wide-ranging social change. Nganampa Health Council in Central Australia, for example, actively promotes the incorporation of research with action in order to improve the lives of Aboriginal people with the philosophy: 'if you're conducting a survey of toilets, take a plumber with you to fix the broken ones' (Miller & Rainow, 1997, p. 96). Action research provides a practical and systematic approach to gaining insight and information that leads to solving practical problems or improving a situation, through building understanding and promoting change.

Data collection methods

In the project described in this paper, four cycles of action research were conducted. Within the cyclic process, multiple approaches were taken towards collecting data. These included a background survey, five reflective surveys, three focus groups, and a review of documents created by students as well as computer-generated reports on student access to the Learning Management System, and seven semi-structured interviews. The mixed methods approach to data collection allowed for triangulation of data and for comparison between what students said and what they did with respect to participation in homework activities. The collection of data was carried out and reviewed continuously over the duration of the research period and drove the direction of each of the four cycles of action.

The four cycles of action research

The first cycle of action research included the background survey, which was conducted to establish students' levels of access to internet-enabled computers and other digital technologies in their homes and communities, their attitudes to homework, and in particular to computer-based homework activities. Initial data was also obtained on homework participation and on the barriers students experienced in participating in homework, as well as factors that enabled their homework participation, through two reflective surveys.

The data obtained in each cycle of research guided the subsequent cycles. One of the early findings was that most students experienced some barriers to participating in computer-based homework when they were in their communities. Based on this feedback, the second cycle of research explored student participation in computer-based homework during a campus-based workshop and found that there were also barriers to homework participation when students were on campus, though for reasons different from when the students were in their communities. In both locations, there were similar levels of homework participation.

The third action research cycle was conducted over five months. During this period, homework participation was made an assessable component of the CSWEIII course. Despite the change of homework participation from optional to mandatory, and the students' greater confidence and skills in using computer technology at this stage of the project, monitoring attitudes and behaviours in the third action research cycle revealed that making homework assessable had little impact on homework participation levels for this student cohort.

The fourth action research cycle was one of consolidation, reflection on the teaching and learning that had occurred over the project, and planning for the future direction of the course after the completion of the project. The reflective survey conducted during the fourth cycle of action research found little new information, suggesting that data saturation had been reached. Semi-structured interviews were conducted with seven students during this research phase and these provided insight into students' social use of computer technology, as well as their reflections on and appraisal of the use of technology in classroom and homework activities over the research period.

The cyclical and participatory nature of this research included the students' active involvement in the research process. The students were not used to providing this level of input into the planning and evaluation of their own learning, but benefitted from it in a number of ways. Apart from the opportunity to explore the use of digital technology outside of the classroom, students were given the chance and the tools to become more reflective learners and their feedback during the research period, particularly in focus groups and in semi-structured interviews, indicated that they became more aware of and more in control of their own learning as a product of the research process.

The findings: Access, Lifestyle and Attitude

Through the cycles of action research a large volume of rich, descriptive data was produced. The data were analysed from a thematic perspective and from this analysis three themes emerged: access, lifestyle and attitude. The first two themes provide an understanding of the uneven nature of students' participation in computer-based homework while the third theme, 'attitude', was identified through a process of inductive reasoning and is a variable that explains why some students participated in the learning opportunities presented by computer-based homework, regardless of the limitations linked to access and lifestyle, while others did not.

Access

The first theme to emerge from the data relates to the broad area of 'access' to computers and the internet. This theme was a central concern for the Indigenous students who participated in the project. Despite the seemingly ubiquitous nature of information and communication technologies in the daily lives of most people in Australia, there is a gap between those who can access and apply those technologies and those who can not. This gap, or digital divide, threatens to 'exacerbate existing social and economic inequalities between countries and communities' (Australian Institute for Social Research, 2006, p. 4-5).

The digital divide clearly exists for the students who participated in this research and has four key components: lack of ownership of computers over which the students have discretionary use; limited access to computer and internet facilities in their communities; variable levels of communications service provision and infrastructure across remote communities; and lack of technical and academic support for computer-based learning outside of the formal teaching and learning environment.

The background survey identified that all of the participating students had access to a computer with internet connection in their home community. While none of the students said that they owned a computer or had one at home, computers were available at various locations in their communities, such as in the local council office, the workplace, a local library or a BIITE library or community study centre. Subsequently, in reflective surveys and focus groups, some students reported that, although there were computers in their communities that they had indicated that they could use, the reality was somewhat different.

The poor access to public-access computer facilities that was identified in this research has been noted in the literature (Papandrea & McCallum, 2006; Sawyer, 2004) as a factor limiting Indigenous use of the internet. A number of students initially stated that they could access a computer in their workplace to do homework; however, this did not eventuate in practice. While students were at work they were engaged in the duties associated with their employment, and after hours their office or workplace was locked and the computer inaccessible. Where community facilities did exist, they were not suitable for sustained periods of learning. The predominant use of public computers is for transactional purposes, for internet banking, communication with friends and family and for leisure purposes. The location of community computer facilities in public spaces is a factor which limits the successful use of computers for study and education purposes due to the limited numbers of computers available, and time pressure on their use.

For extended study purposes students require access to computers for prolonged periods of time in an environment dedicated to learning. Community facilities are particularly important ‘where private households are unlikely to pay for these services themselves. Remote Indigenous communities fall within this category. Residents have low incomes and low levels of education and technical expertise’ (Daly, 2005, p. 8). However, this research found that in the communities where study centres were located, students reported that these were generally locked up unless a lecturer was visiting the community. Students indicated a high level of frustration at having such facilities in their communities going unused.

Improving telecommunications services to Indigenous communities is part of the response required. Both nationally and in the Northern Territory, improved internet service provision is being promoted as the panacea for remote access to digital technologies, for example, through the proposed rollout of the National Broadband Network. The issue of access as identified in this research is, however, far more complex and encompasses ‘technological, educational, political, financial and social aspects, with each dimension in turn having a number of layers’ (Candy, 2004, p. 63).

Given the difficulties students faced in accessing internet-enabled computers over the action research project, the homework participation rates of between 37% and 47%, for students attending workshops, were a significant achievement. They are also testament to the students’ interest in using computers as a tool to enhance their learning opportunities although current levels of access to digital technologies deny to students the opportunity to fully participate in the knowledge economy. As Kofi Annan, the Secretary-General of the United Nations (1997 – 2006) noted, ‘being able to access ICTs is a privilege enjoyed by a minority of the global population, but for those living in societies where opportunity depends on being able to bridge the digital divide, the deprivation compares to lack of food, shelter and basic survival sources’ (ANTA, 2002, p. 8).

Lifestyle

Throughout the research period the students continually juggled competing ‘lifestyle’ demands, with the immediate needs of family, work and cultural demands generally taking precedence over homework. The theme of lifestyle thus emerged as a critical one in understanding the complex factors that influenced students’ participation in homework tasks.

Throughout the research period, students stated that they wanted homework. Yet during the reflective surveys and focus group discussions students gave many reasons as to why they had done minimal homework. Across the four action research cycles, which reflected different models of homework, less than 50% of students attending workshops participated in homework activities. Furthermore, apart from the extended amounts of time spent on homework when there was in-community support by a lecturer, the time spent by students who did engage with homework was minimal. Reports of computer usage show that 62% of all incidences of computer- based homework were for periods of less than 10 minutes, with only 8% extending more than one hour. Students repeatedly said that they did not have time to do homework and it is clearly the case that, even when they did, it was for periods of time that precluded more than cursory engagement.

Many of the lifestyle factors that were found in this project to influence homework participation are similar to those that impact on course-completion in the VET sector as a whole (Department of Finance & Deregulation 2009, p. 65; Kirkby, 1999, p. 4; McMillan, Rothman & Werrert, 2005, p. 6), although cultural demands and factors such as poor health and household overcrowding are additional factors that complicate the lives of Indigenous students. Across the VET sector nationally, students report that employment demands reduce time available for study and increase job-related stress and tiredness (McMillan, Rothman & Werrert, 2005, p. 6). In addition, family and personal reasons also impact on course completion, particularly major life changes, domestic violence, the death of a family member, weddings, pregnancies, birth, marriage breakdown, moving house, accidents, major illness and custody battles.

The lifestyle issues impacting on Indigenous students' course attendance and homework participation, while similar in some respects to those of other VET students, are more extensive and exacerbated by cultural factors and factors associated with the low socio-economic status of Indigenous Australians. Lifestyle issues emerged in this project as a major theme, one of a complex web of factors impacting on the participating students' involvement in computer-based and non-computer-based homework.

Attitude

The identification of the third theme of 'attitude' is an attempt to conceptualise and articulate differences in the level of student participation in computer-based homework that can not be explained by the variables associated with access and lifestyle alone. The term 'attitude' covers the students' approaches to learning and to the use of computers and other digital technologies, their levels of intrinsic motivation, their sense of identity or view of themselves as learners, and the disparity between students' statements and their actions. Indeed, the theme of attitude is an attempt to explain students' behaviour with respect to homework participation after taking into account the variables of access and lifestyle.

In this project, students exhibited positive attitudes towards the value of homework as demonstrated by 91% and 100% of students who indicated in the second and fourth reflective surveys respectively that they wanted homework. However, with actioned homework levels consistently lower than 50% across the research period, there were inconsistencies between students' expressed intent and their actions.

The theories of Argyris and Schon (1974) provide an explanation of the complex relationship between espoused and enacted beliefs by explaining that individuals engage in both conscious and unconscious reasoning processes which are not necessarily aligned. While a person may assert a belief (espoused theory), such as the importance of doing homework, their actual world-view and values are implied by their behaviour (theory-in-use), for example by spending the weekend with friends and family and not doing homework. When there is a lack of alignment between a person's stated beliefs and their actions, Argyris and Schon suggest that the person may not be aware of their theory-in-use, the world-view implied by their behaviour. Conversely, an alignment between what a person says and does reflects congruence between their espoused theory and their theory-in-use (Anderson, 1997).

For a few students who participated regularly in homework, their espoused beliefs were reflected in their actions; however, for others a stated intention to do homework such as 'Yes, I absolutely want to study between workshop and I'm ready and sure to do it' (Reflective Survey 4 – Student 3), was not reflected in homework participation, suggesting a lack of awareness that the world-view and values implied by their behaviour were different to those on which they believed their behaviour was based (Anderson, 1997).

The distinction between espoused beliefs and actual behaviours can also be explained in terms of learners' multiple identities (Wallace, 2009). When learners have a strong sense of themselves as competent learners and when their identities and values as members of a family and community are recognised by the educational system, they are more likely to act in ways that support their learning. On the other hand, where a student's identity as a learner is not strong, and where that identity is in conflict with the values of their family, peer group and community, the student is less likely to persevere with education.

In the context of this research, the lack of participation in homework activities by some students could be partially explained by suggesting that they do not have a strong sense of themselves as learners, and that possibly the imposition of homework conflicts with the values of their families and communities and their own identities as community and family members. Wallace asserts that only when a learner's desire to achieve an educational goal, such as to get a qualification, can be articulated as a need, are students able to 'develop ways to reconcile their identities as learners' (Wallace, 2009, p. 43) with their identities in the community.

For many of the students who did engage in homework activities, personal traits such as a positive attitude, motivation and perseverance appeared to be enabling factors. For these students, homework participation was done against the odds, often despite problems in gaining access to a computer and the internet and managing the competing demands and responsibilities of their study, work, personal, family and community selves. As identified in this research, a student's stated desire to participate in computer-based homework does not necessarily translate into action; however, a positive attitude, which can be conceptualised as congruence between espoused theory theory-in-action or a strong learner identity, does appear to be a factor which influences participation in homework activities.

Recommendations and ideas for future research

The research described in this paper into the use of technology to provide learning opportunities outside of the classroom was based on a small-scale action research project with a group of Indigenous learners studying CSWEIII at BIITE. However, the findings from this project are likely to resonate with educators delivering other courses at BIITE as well as with educators from other educational institutions working with Indigenous learners. The observations from the project and the findings align and add value to the work of other researchers in the areas of Indigenous learning and literacy in the Northern Territory (Kral, 2010; McCrae-Williams, 2010; Nicholls, 2007; Nicholls, 2008; Wallace, 2009). Therefore, it is proposed that the themes that emerged from this research are likely to be relevant to other educational programs being delivered to Indigenous people in the Northern Territory as well as in other geographically remote locations in Australia.

The following recommendations are intended to assist in addressing the digital divide that exists between Indigenous and non-Indigenous Australians and enhance learning opportunities for Indigenous people.

1. Embed technology skills in vocational education and training, including in English language, literacy and numeracy courses for Indigenous learners to provide opportunities for IT skills development, an essential prerequisite for participation in the knowledge economy.
2. Provide Indigenous learners with a choice of delivery modes to access training. As online learning becomes more prevalent, online courses should be provided as an option and not as a substitute for face-to-face and mixed-mode delivery. There is clear evidence that Indigenous people still have problems accessing the technologies that are promoted as being the means of addressing the tyranny of distance and providing them with access to education and learning at a distance.
3. Increase scope of funding for communications technology in remote Indigenous communities. The Federal and Northern Territory Governments should ensure that, in addition to funding infrastructure costs and the one-off capital costs associated with purchase of digital communications equipment, adequate funding is allocated to Indigenous communities for the ongoing costs associated with the provision and maintenance of communications technologies. These include costs of internet service provision, training and employment of local people to maintain and facilitate use of the technologies, upgrading equipment and software, and purchase of items such as paper, ink, headphones and CDs.
4. Support Professional Development of educators in the use of new technologies. Educational providers should proactively support the ongoing professional development of teaching staff in the use of new technologies and in the exploration and development of pedagogical approaches that optimise the possibilities for teaching and learning that are afforded by new technologies.

This research study could be further developed in a number of areas, as outlined in the following subsections.

1. Research into mobile technologies in teaching and learning. The ubiquity and relatively low cost of mobile technologies along with their increasing functionality present opportunities and new directions for teaching and learning with Indigenous learners that are worthy of investigation. In part, the solution to the problems around accessibility to communications technologies and the internet could be addressed through the use of mobile technologies. In particular, mobile phones present an opportunity for Indigenous people to own and take control over digital tools that can support their learning, from anywhere and any time, without being dependent on third-party intermediaries to provide access.
2. Research models of flexible delivery for Indigenous learners. Because the digital divide clearly exists for Indigenous learners, further research is required into the development of models of online and flexible learning, and into ways in which digital technologies can be integrated into educational practice, for Indigenous learners. This could involve the development, delivery and evaluation of an online elective module of a course such as CSWEIII, in tandem with continued delivery of face-to-face modules.
3. Research into the connections between formal and informal learning. During the research, students identified that they engaged in activities in the workplace by themselves and with others which provided opportunities to practise English language and literacy skills. Research should be conducted into the development of content and assessment that integrates formal learning outcomes in English language and literacy with students' work and everyday activities and interactions.
4. Research into alternative measurement of student outcomes. There is a strong argument for asserting that there is currently an overemphasis on measuring student outcomes in terms of module and course completions (often as a reporting mechanism for funding bodies) with little formal recognition of other social benefits and outcomes of training, such as social capital outcomes and development of networks afforded by the use of digital technologies in

English language and literacy programs for Indigenous learners. The link between social capital and increased socioeconomic wellbeing (Balatti , Black & Falk, 2009, p. 40) suggests an imperative for doing such research.

Conclusion

There is a strong focus, in Australia and worldwide, on the online and mixed-mode delivery of educational programs. The Indigenous students participating in this study were enthusiastic about embracing the opportunities of digital learning but, as this research shows, technology on its own will not deliver improved educational outcomes for Indigenous learners. As often happens in action research, the spirals of investigation have not provided definitive answers, but rather have increased awareness and understanding of myriad issues involved in computer-based learning for the group of Indigenous adult learners in the Northern Territory who participated in this research. Additionally, the study highlights directions for further enquiry to improve Indigenous participation and success in education, and to maximise the benefits that digital technologies can provide in achieving this aim.

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ascilite community mentoring program and collaborative community mentoring program: When I succeed, we succeed!

Dr Shirley Reushle – Facilitator
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And, a range of mentors and mentees from the programs

Abstract and Symposium Plan

This symposium is an opportunity to hear from a group of mentees and mentors about their 2011 projects. It is also a great opportunity to find out about the programs and how you can be involved in 2012 as either a mentor or mentee.

The Community Mentoring Program (CMP) involves a collaboration between two ascilite members for the purpose of achieving an agreed goal through dialogue, action and reflection. Mentoring can play a beneficial role in enabling participants to increase their knowledge and experience, enhance career prospects and improve job satisfaction. There are few experiences as powerful as connecting with other people who are united by the need to work collegially and to resolve mutually shared problems. ascilite initiated the Community Mentoring Program in 2003 and approximately 40 members have taken part over the 8 years. The Program has proved to be a valuable addition to the ascilite suite of activities to support its members. The CMP provides wonderful opportunities for a participant to expand a career portfolio and establish support networks that are so important for creating a better working environment and realise aspirations for the future.

The Collaborative Community Mentoring Program (C²MP), piloted in 2011, matches a pair of consulting mentors who have devised a shared project or theme concept with up to 6 corresponding mentees who have their own projects that will fit within or relate to the proposed theme to form a collaborative peer-group. The C²MP aims to build on the strengths of the Community Mentoring Program and extend the reach and benefits of mentoring across the ascilite community. A dedicated area for the Program is hosted in the ascilite hub's Moodle environment and is used for synchronous and asynchronous interaction, focused discussions, sharing of ideas and resource building. There are clear parallels between social constructivist models for online learning and collaborative mentoring. Digital technologies provide significant opportunities to link dispersed individuals and groups for interaction and collaboration.

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Collaborative Community Mentoring Program (C²MP) – Addressing the changing demands of a professional community of learners through engaging digital networks

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The notion of mentoring is ancient. The original mentor was described by Homer as the "wise and trusted counsellor" who Odysseus left in charge of his household during his travels. In modern times, the concept of mentoring has found application in virtually every forum of learning. Greater use of communication technologies has provided significant opportunities for relationships to form and grow in digital environments and with the ease of linking dispersed individuals and groups using these technologies, opportunities for interaction and collaboration are extensive. This paper investigates the concept of collaborative mentoring in digital environments and explores strategies and technological tools for supporting and developing shared meaning and conducting rational discourse. The ascilite pilot Collaborative Community Mentoring Program (C²MP) is provided as an example. An early attempt at building a model for collaborative mentoring in digital environments is explored using an adaptation of a three-element Community of Practice framework, progress of the pilot mentoring program is reported and a process for evaluating the pilot is outlined.

Keywords: mentoring, digital, interaction, collaboration, Collaborative Community Mentoring Program, evaluation

Introduction

There are few experiences as powerful as connecting with other people who are united by the need to work collegially and to resolve mutually shared problems. Professional mentoring can have a significant beneficial effect on the life or career of an individual, and traditionally has often been as a result of personal one-on-one contact. A mentor can offer knowledge, insight, perspective or wisdom that is especially useful to another person (sometimes referred to as a mentee). Mentoring has often been used to assist promising junior executives climb the career ladder. It usually focused on a dyadic, mentor– protégé model involving a more skilled senior person sponsoring and encouraging a junior person. In more recent times, the concept of mentoring has focused more specifically on career direction and progression, goal setting, role modelling, networking, establishment of support systems, and a revitalisation of self (Willcoxson & Aniftos, 2002; McCormack & West, 2006). Peer mentoring has also been highly effective and while it may be important that the mentor should be experienced and able to share the wisdom of that experience with the protégé, it has not been necessary for the mentor to be at a very senior level within an organisation. Peer mentoring tends to reflect a non-hierarchical nature of the process, a characteristic that can address problematic issues in senior–junior mentoring relationships such as power, dominance, dependency and transference.

Mentees invariably report a range of benefits gained from access to advice and networks provided by interacting with a mentor. This includes the expansion of self-confidence, taking a more positive approach to problem solving, achieving greater research and study outputs, extending knowledge, expertise and experience and success in applying for jobs which are more rewarding and offer greater challenges (Gardiner, 2005). What is not so widely known and is frequently contrary to initial expectations is that mentors have reported an increase in their own networks across organisations, greater knowledge of other areas and disciplines, and being able to give greater focus to their own career development needs.

Since 2003, ascilite has conducted a Community Mentoring Program (CMP) as part of its suite of activities to support its members. Approximately 40 members have taken part over the eight years with the program proving to be a valuable service to those members. In a membership survey conducted by ascilite in 2010, data revealed that 59.6% of respondents regarded the community mentoring program as a worthwhile initiative but a significant minority (36%) was not sure about the value of continuing the program. Not only that, the majority of respondents (82.8%) had seldom or never engaged with the program. Upon consideration of how this service might be modified to increase engagement and spread the "reach" of the Program, the ascilite Executive chose to pilot a collaborative program (referred to as C²MP) which was introduced in early 2011 and runs in parallel to the existing CMP.

Collaborative Community Mentoring (C²MP) – a pilot program

The C²MP aims to build on the strengths of the Community Mentoring Program and extend the reach and benefits of mentoring across the ascilite community. The Program has been guided by the following assumptions:

- collaborative activity supports the creation of community (Palloff & Pratt, 2007) and the concept that: when I succeed, we succeed.
- collaborative activity can help alleviate isolation by purposefully connecting scholars with one another. This community learning experience will provide more opportunities to extend and deepen understanding, test out ideas by sharing them with a supportive group, and receive critical and constructive feedback from a number of colleagues.
- there are clear parallels between social constructivist models for online learning and collaborative mentoring.
- digital technologies provide significant opportunities to link dispersed individuals and groups for interaction and collaboration.
- digital technologies also provide an excellent way to "capture" the interactions, referred to by Reushle (2005) as VIP communication: **V**isible, **I**nstant and a **P**ermanent record.
- knowledge-building discourse is a crucial element of this process which results in refining and transforming ideas and knowledge "through the discursive practices of the community – practices that have the advancement of knowledge as their explicit goal" (Scardamalia, 2002, p.12).
- scholarly rigour can be enhanced through working in interdisciplinary and collaborative teams.
- this opportunity will encourage ascilite members to work collaboratively and engage creatively on shared learning, teaching and research questions and challenges.

A staged process for the implementation of the pilot C²MP is outlined in Table 1.

Table 1: C²MP process for implementation

Stage	Action
1 Call for Expressions of Interest (EOIs) from potential mentors and mentees with an interest in a collaborative mentoring arrangement	EOIs advertised through the ascilite Bulletin, ascilite hub, ascilite mailing list
2 Two mentors (based on common interests) brought together and asked to devise a shared theme/project	C²MP Chair to organise
3 Promote this shared theme/project through ascilite community networks to seek interest from mentees and match paired mentors with teams of 3 or more mentees. To form a collaborative peer-group, mentees will have their own projects that will fit within or relate to the proposed theme.	C²MP Chair to propose matches, seek agreement of participants; templates for Mentoring Agreements and Project Proposals distributed to teams. Agreement used as the basis for establishing shared goals, group guidelines and for determining roles and responsibilities
4 Establish mechanisms to support the interactions and collaborations	Collaborative space established in the ascilite hub; C²MP Guidelines made available; webinar conducted; regular contact with teams via synchronous web conferencing (3 weekly)
5 Plan and conduct symposium-type event at ascilite 2011 conference	C²MP Chair to negotiate with ascilite Conference Chair; call put out amongst C²MP participants for symposium presentations
6 Ongoing evaluation of program using action research	Conducted by CMP Chair in consultation and collaboration with ascilite Executive and Program participants, and critical friend/s
7 Decision on extension of the program beyond the 2011 pilot	To be guided by the outcomes of the evaluation

Tools used for the support and development of the C²MP

The ascilite hub has been used as a central point of contact for participants in the Program. A dedicated area for the Program is hosted in the hub's Moodle environment and is used for social interaction, focused discussions and the sharing of ideas (through the forums), resource building and planning (using the wiki), seeking and providing feedback (and clarification of ideas), and linking to the web conferencing facility (Wimba). Regular synchronous gatherings are conducted in the Wimba classroom.

In addition to the Moodle application, participants are encouraged to use other media for communication, information sharing and knowledge construction including Skype, Facebook, Twitter, Google docs and so on. A wiki in the Moodle space has been set aside for exploring other media for interaction and collaboration and participants are encouraged to seek out and test applications and then share their experiences with the other Program participants.

Model for collaborative mentoring

The affordances of digital technologies were recognised as a means for bringing a dispersed group of like individuals together. Using a well tested Community of Practice framework (Wenger, 1998; McDonald & Star, 2008) but implemented in a digital environment has given the participants in the Collaborative Mentoring Program an opportunity to explore ways and means of extending and enhancing the existing mentoring program (CMP). As noted by McDonald and Star (2008), the term "community of practice" emerged from Lave and Wenger's (1991) study that explored learning in the apprenticeship model, where practice in the community enabled the apprentice to move from peripheral to full participation in community activities. Wenger, McDermott and Snyder (2002, p. 4) describe communities of practice as:

> Groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis.

Asynchronous interaction and collaboration in the ascilite hub has been accompanied by regular synchronous gatherings using the web conferencing facility Wimba which incorporates VoIP (Voice over Internet Protocol) for natural communication, a limited interactive whiteboard, text chat, and application sharing facilities. This has enabled C²MP participants to structure their interactions according to Wenger's (1998) combination of three fundamental Community of Practice elements:

1. A *domain* of knowledge that creates a common ground and a sense of common identity (builds member capacity)
2. A *community* of people who care about the domain and create the social fabric of learning (grow a learning community)
3. A shared *practice* developed to become effective in the domain (innovations are noted by the participants and this saves reinventing the wheel)

Communities of Practice should not be confused with project teams, task forces and even regular meetings and do not have formal institutional structures or hierarchical leadership. Many of these traditional organisational structures do not foster participation as this generates too many questions and raises issues of power and control. For this reason, the C²MP rejects meeting-style activity, preferring to refer to any synchronous activity as "gatherings". The focus for any activity will most likely emerge from member negotiation and there is continual potential for new direction. Active participation and collaborative decision-making is encouraged and members may assume different roles with hierarchical, authoritarian management replaced by self-management and ownership of work (McDonald & Star, 2008). The community focuses on authentic tasks and activities and members are able to share, debate and build expertise within a safe and supportive community.

Evaluation of the program

A contextually appropriate process (Figure 1) as an adaptation of Salmon's (2002) action research framework and Reushle's (2005) research framework is being used for the evaluation of the pilot.

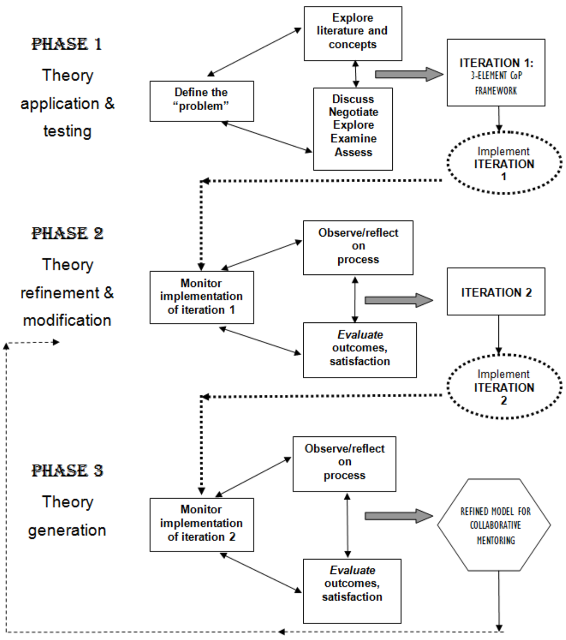

Figure 1: Evaluation process

Analysis of findings will be conducted in a cyclical way and emerging insights and trends identified will shape and refine the focus of the subsequent iterations of the pilot. The evaluation will focus on both the process and outcomes of the project, assessing the progress of the pilot's associated activities and their impact. Questions relating to the experience gained by participating, benefits, self-perceived knowledge advancement , support and feedback received from mentors and the other community collaborators, perceived value of the discourse and lessons learned will be explored and will inform the decisions taken on the future direction and sustainability of the C²MP. Indicators of success will be increased domain knowledge, intensity of discussions, reflection on and in practice, project progression/completion, publication output and a strong sense of community that provides professional support for members.

Because the C²MP is in its early stage, evaluation data, findings and recommendations will be reported upon at a later point in time.

Conclusion

Network-enhanced interaction can fulfill some pragmatic human needs at certain points in time by providing access, convenience, flexibility, utility, speed, and cost-effectiveness. Anecdotally, it appears that it can provide far more than this, as illustrated in this paper. Apart from having access to several experienced colleagues during the conduct of the Collaborative Community Mentoring Program, mentees are also able to interact and collaborate in a resource rich environment. The Community of Practice three-element structure has been used to provide a framework for the regular synchronous gatherings and to ensure that each of the essential elements of a Community of Practice model is addressed. This structure also provides some evidence of direction, aiming to value add for time poor members and make best use of time committed. Action research is an emergent process that takes shape as understanding increases and it is this - the responsiveness to the situation, and the striving for real understanding - which supports it as an appropriate process for evaluating the pilot Program. The evolving nature of action research provides flexibility to change or adapt C²MP to reflect the emerging data and circumstances and its participatory paradigm means that the Program is conducted *with* the participants, rather than *on* or *about* them.

Even though the pilot has been running for a short period of time, the process is already creating as many questions as answers. How might this approach be applied in other contexts? For instance, might it be a solution as we face the issue of providing quality supervision to increasing numbers of research and higher degree students scattered across the globe? Might the approach be used to provide professional development opportunities to dispersed groups of professionals in industry? Although this current work is aiming to articulate a model for the provision of collaborative mentoring opportunities for ascilite members, just how generalisable this approach will be to other contexts is not yet evident but certainly worth exploring.

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Digital Teaching and Learning Ecosystem (DTLE): A Theoretical Approach for Online Learning Environments.

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NPS: Better choices, better health

Abstract

Reviewing the literature on digital ‘ecosystems’ applied to computer science, a gap has been identified. This analogy has never been used to describe the complex interactions between student-interface, student-teacher, student-content and student-student. These interactions are crucial to gaining an in-depth understanding of online learning environments and to promoting effective e-learning practices. The aim of this research is to develop a theoretical framework to describe these interactions by using the DTLE model based on the ‘ecosystem’ approach. For educators the model will help to design, describe and evaluate current online learning practices. For learners, it will help to explain how teaching and learning occurs in their studies and will assist them to seek greater value from their learning experience. Additionally, the DTLE model will provide a practical methodology to rank online units in terms of design layout, navigability and accessibility, content, interactivity, assessment, and student engagement.

Keywords: Digital ecosystem, ecological approach to learning, ecosystem analogy.

Background information

An analogy can provide a means of building theory, a meaningful way to understand complex situations and scenarios. Analogy can and should be used to inform the analysis of findings in educational research in general, and science education in particular. The merit of analogy in research lies not in any absolute measure of the similarity between the target and the analogue. Rather, the worth of analogical analysis lies in the mental inquiry it promotes, the knowledge produced by this inquiry, the cognitive engagement of researcher and others, and the communication produced. To be productive, the analogy should be contentious enough to provoke and challenge thinking but agreeable enough to resonate with others’ experience of the phenomenon under study (Aubusson, 2006).

Biomimicry is a discipline that seeks solutions by emulating nature’s designs and processes, where there is considerable opportunity to learn elegant solutions for human-made problems (Benyus, 2002). In this regard, the ecological approach, combined with information technology, can open a new way to understand online learning. The key concept is the idea that teaching and learning can be seen as a process of transformation of information into knowledge. The subject, interface, content (abiotic factors), the teacher, e-learning officer, and the students (biotic factors) are embedded in a content where complex interactions occur and shape the quality of the learning outcomes.

The term “Digital Ecosystem” has been used to describe a variety of concepts in the area of Information Technology (IT), Information and Communications Technology (ICT) and also in e-learning. In IT the term refers to an existing networking infrastructure on the Internet (Chang and West 2006; Boley and Chang 2007; Briscoe and De Wilde 2008; Bo 2009; Briscoe and Marinos 2009), while several companies offer a Digital Ecosystem service or solution which involves enabling customers to use existing e-business solutions (Bennett, 2006; Kulkami and Kreutzer, 2006; Vandenberghe, 2006). In the ICT area it is used for e-business and e-commerce, to create so-called business ecosystems (Iansiti and Levien, 2004; Nachira, 2002; Papazoglou, 2001). In e-learning, our major focus, “Digital Ecosystem” or “Digital Learning Ecosystem” has been cited as an ecological model of learning and teaching (Frielick 2004), understanding e-learning infrastructure (Gütl and Chang 2008; Gütl and Chang 2008) and implementation (Uden, Wangsa et al. 2007), and recently has been proposed as an aid when designing new learning tools (Ficheman and de Deus Lopes 2008).

The ecological approach has never been used to describe the complex interactions between student and interface, student and teacher, student and content, and student and student, which shape learning outcomes. Analysis of these interactions is crucial for the in-depth understanding of online learning environments, and to standardise and promote effective e-learning practices.

Aims of the study

To further develop the Digital Teaching and Learning Ecosystem (DTLE) theoretical framework based on the ‘ecosystem’ analogy. Our model will use the ecological approach in order to gain in-depth understanding of online learning interactions and how they affect the quality of learning.

To standardise e-learning design practices by describing a model to assess and rank the quality of online learning environments, taking into account elements such as design layout and navigability, accessibility, content and interactivity, assessment and student engagement.

Research Questions

(1) Is the ecosystem analogy in e-learning a valid tool to gain in-depth understanding of the complex interactions which occur in online learning environments?
(2) Is it feasible to describe a model that evaluates and ranks online learning environments based on elements such as design layout, navigability, accessibility, content and interactivity, assessment and degree of engagement of learners?

The DTLE Model

Digital Teaching and Learning Ecosystem (DTLE) is an analogy with what in ecology is called an “ecosystem”. An ecosystem consists of all the organisms living in a particular area (biotic component), as well as all the nonliving, physical components of the environment with which the organisms interact, such as air, soil, water, and sunlight (abiotic component). The entire array of organisms inhabiting a particular ecosystem is called a community (Campbell and Reece, 2008). This model will use ecological terms like *abiotic* and *biotic components, niche, populations* and *communities, biodiversity* and *environment*. The principles to be used will be: *symbiotic relationships*, *balance* and *adaptation.*

The Digital Teaching and Learning Ecosystem (DTLE) model (Figure 1), as an analogy with ‘ecosystem’ in ecology, has two major components: the biotic and the abiotic component. The biotic component comprises two subcategories: organisms cohabiting in the Teaching Niche (lecturer, tutor and e-learning officer) and; organisms cohabiting in the Learning Niche, (students enrolled in the unit or course). The abiotic component comprises the physical devices that students use to access content (desktop computers, laptops, netbooks, tablet computers, mobile devices, etc); the internet connection (broadband, Wi-Fi, 3G, etc); the e-learning interface or portal, and ; the content, which can be static or dynamic (communication tools, collaborative tools and assessments). The source of energy which powers the DTLE is Teaching and Learning, which can be seen as a transformative process where information generates knowledge.

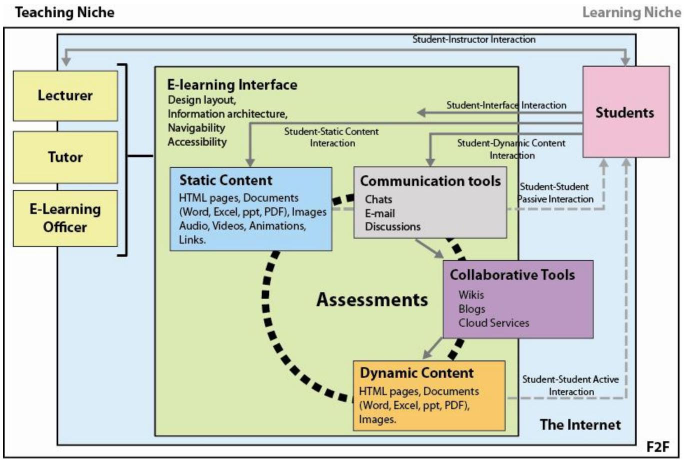

Figure 1: Digital Teaching and Learning Ecosystem (DTLE)

Roles of each of the components of the DTLE

The biotic components of the ecosystem have specific roles. The Lecturer is responsible for the unit and has direct input in terms of approaches to be used, as in face-to-face (F2F) lectures and online delivery. In contrast, the Tutor is responsible for executing approaches suggested by the Lecturer. The E-learning officer is responsible for maintaining a consistent layout across the entire site and also making sure good practices for e-learning sites are followed. The Students' role is to learn and to follow recommendations from Lecturers and Tutors, to understand the unit outline and learning guides, and to ensure they meet the requirements to pass the unit.

Abiotic components also have roles which contribute to the organisation of the system. Electronic devices like desktop computers, laptops, netbooks, tablet computers, mobile devices etc., in conjunction with the Internet, allow access to online content. The internet connection could be a 56k modem (very rare these days), broadband internet, Wi-Fi or 3G network, and it will make content more or less accessible for students. The e-learning interface or portal is the virtual place where lecturer, tutor, e-learning officer and students log in to browse the content. The content is the source of knowledge for the DTLE and has two categories: static content and dynamic content. Communication tools make it possible for students to interact while working online. These tools can be asynchronous like e-mail, message boards, forums and discussions threads, or synchronous like chats, skype, instant message services, etc. Collaborative tools, (wikis, blogs, cloud services) are vital to create interactive and engaging e-learning sites, as they allow the students to work in teams. The student assessment ring can be included inside the interface if academics use online quizzes. Otherwise it can be included in face-to-face teaching. This can be seen as a process of transformation of information (static and dynamic content) and interaction (communication and collaborative tools) into knowledge.

Interactions between components.

The DTLE as an ecosystem in ecology is complex and involves biotic-biotic and biotic-abiotic interactions. The following interactions can be identified in our model:

Biotic-biotic interactions: Interactions within the Teaching Niche (lecturer - tutor, lecturer - e-learning officer, tutor – e-learning officer). Interactions within the Learning Niche (student - student interaction). Interaction between Teaching Niche and Learning Niche (student - tutor, student - lecturer and student - e-learning officer).

Biotic-abiotic interactions: Interactions across Teaching Niche and Interface (lecturer - interface, tutor - interface and e-learning officer - interface). Interactions across Learning Niche and Interface (student interface and student - content).

From the point of view of online collaboration, the student –student interaction is crucial. At this point we can further apply the analogy with symbiotic relationships. Symbiosis means living together. It describes a close and often long-term interaction between different biological species within an ecosystem. These relationships can be defined as mutualism, commensalism and parasitism (Campbell and Reece, 2008). In online collaborative environments, a team may exhibit one or more of the following relationships: (1) Mutualism will occur when all the students from the group have a 'benefit'. In other words, a group where all students collaborate evenly and they all learn from each other in a constructive manner; (2) Commensalism will occur when some of the students from the group have a 'benefit' and the others are not significantly hindered or helped; (3) Parasitism will occur when some students from the group have a 'benefit' while others are hindered or 'harmed'. E.g., one student works hard and the others contributed with trivial comments. This case can constitute what is described as "social loafing in online collaboration" (Wagner and Prasarnphanich, 2007). The students who work hard do not get anything from their peers in terms of the stimulation of ideas and the development of critical thinking, as the group environment does not promote active learning for them. All these interactions will be further developed with the development of this model, and tested in online learning environments.

Methodology

This study will use a mixed methods (Tashakkori & Teddlie, 2003) design, which is a procedure for collecting, analysing and "mixing" both quantitative and qualitative data at some stage of the research process within a single study, to understand a research problem more completely (Creswell, 2002). The main theoretical framework to be used will be analogical interpretation (Abusson, 2006). The analogy will be made in two parts, the first part is the target to be explained (online learning environments), and the second part is the analog (ecosystem). Target and analog will be compared, to test for a match of the key relational features (initial mapping). The well understood analog, if judged as suitable on the basis of the initial mapping, will be extended to identify more of its potentially salient attributes and then used to reinterpret the target, seeking similarities, differences and ambiguous relationships. This information will fully develop the DTLE model (Figure1). The final model will be tested in a real scenario. This could be a faculty or school which is currently working extensively to improve students' experiences using e-learning and a wide range of technological tools.

This analysis will help to gain in-depth understanding of: (1) how academics are using technological tools within their units; (2) what challenges and difficulties they are facing; (3) how they can improve the current use of these tools across their units; (4) how students learn and interact online with their peers; and also (5) evaluating the experience of learning. Investigating students' perspectives on what they learn has been proved to be effective when evaluating the effect of curriculum innovation on students' learning. This data will identify variations between groups of learners, and will allow conclusions to be drawn about the quality of students' learning. This systematic analysis is known as phenomenography and has been described in educational research (Ellis et al., 2007; Matthew *et al*., 2007; Marton and Booth, 1997; Prosser & Millar, 1989).

Additionally, the DTLE model will be used as a methodology for assessing and ranking online units based on the following elements: design layout, navigability, accessibility, content and interactivity, quality of assessments, and user experiences. For design layout, navigability and accessibility, principles and elements of design will be applied in conjunction with quality web design practices and accessibility, following the standards recommended by the World Wide Web Consortium (W3C). For content and interactivity, cognitive load theory (CLT) will be used as the theoretical paradigm to provide guidelines to assist in the presentation of information in a manner that encourages online learner activities that optimise intellectual performance. To evaluate the quality of online assessments, this study will use the methodology proposed by Hayes in 1999, which consists of a list of expectations for online assessment. To evaluate user experiences, an online survey will be designed which will cover all the elements we have discussed.

Further development

The author would like to further develop and test this model as a PhD candidate and he is currently seeking a Supervisor to undertake this project.

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Authentic assessment in elearning: Reflective and Collaborative writing in the arts

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Abstract

This paper examines the notion of authentic assessment and the role elearning can play as a teaching and learning tool to provide ‘real world relevance’ to learning in higher education. This paper will firstly, argue that educators should consider aligning course assessment to real world relevance. Secondly, it will argue that social networking tools such as weblogs (blogs) can provide one means of achieving this goal when assessment is designed to encourage collaborative learning and reflective practice. The two teaching and learning exempla’s discussed will apply the concept of the reflective practitioner to the practice of writing about the arts as an authentic assessment (Herrington, Reeves & Oliver, 2010) task that is relevant to student’s future professions as art administrators. The first discusses how students’ collaboratively write, edit and publish an online art journal ‘Artwrite’*. The second discusses student’s writing blog journals where they reflect about their art industry placements.

Introduction

To promote and engage learners in the new and often tentative online space, educators, instructors and tutors must ensure that the students feel that this environment is safe and trusted. Studies continue to reveal that students who are engaged and provided with the opportunity to collaborate online are more likely to be active participants (Mabrito, 2004). Collaborative projects that allow students to feel ownership of the learning process can encourage such engaged interaction between students as well as with the material to be learnt. One important pedagogical factor to consider when designing online courses in higher education is to create an authentic context where the content and assessment is embed and integrated into the learning experience and knowledge building.

Authentic Assessment

Good teaching practice in higher education is typified by student and teacher knowledge sharing (McLoughlin, 2002; Biggs, 1999), where students engage in learning that has real world relevance (Cronin, 1993; Jonassen, 1991) that is supported by both the teaching and authentic assessment (Herrington, Reeves & Oliver, 2010). The specified elements of design for authentic eLearning according to Lombardi (2007) include having real world relevance where the learning task is based on real life problem solving with a meaningful context for planned learning experiences. There also should be as Lombardi (2007) suggested, a learning task that provides long-term student engagement with learning that involves a variety of resources and perspectives over a sustained time where collaborations takes place to promote engaging open conversation. Authentic tasks ensure that collaboration is an imperative component of the learning task and learning outcomes. Reflection is also according to Lombardi (2007) important as it allows students time to reflect on their actions while discovering a nexus between classroom theories and 'real world' practice.

Through authentic planning, assessment and product development, the learning process is cyclic, it involves students actively participating in their learning as they move through tasks that include problem solving based in real world contexts, supported by scaffolding and modeled support that allows for the development of knowledge construction. As Herrington, Reeves and Oliver (2010) confer the learning space must inclusively cater for the needs of the students where possible through cued and modeled support that provides a critical and challenging learning environment. This learning should be based in an environment that the student would work in, learn in or utilize post task. The students must also have ownership of the product while having a sense of ownership of the learning process throughout. The issue of alignment of the goals, the course content, the instructional design, the learner task, the instructors and students' role, the technology and most importantly the assessment is imperative for effective learning design when considering assessing with technology. A blog for instance, provides a collaborative construction of knowledge and opportunities for self and peer reflection. It does take time however, to establish a student-centered approach to learning and assessment. A blog for assessment purposes when utilized as a problem-based learning tool, as a published product or as an investigative inquiry is an authentic task and as such can be more efficient and effective method in the long term.

An important aspect of providing students with an authentic context where learning can take place is to intrinsically link the content to be learnt with the assessment in a meaningful way. Authentic assessment "needs to support learning in general and be driven by the learner, to foster the attributes we expect of graduates and help learners prepare for a lifetime of learning" (Falchikov & Thomson, 2008, p.50). Designing relevant worthwhile assessment that focuses on student learning as opposed to 'marking for marking sake' has been a concern for educators' for many years as they come to terms with the move to integrate an assessment driven form of education into the curriculum. Transferable skills and university graduate attributes have begun to drive assessment away from the reliability and validity issues of recent years to a more life-long skills focus. Taking this into account educators need to consider more closely how the assessment they design, corresponds with the learning outcomes they envisage students to achieve, along side the life long relevance of the knowledge and skills they anticipate they should acquire.

Collaborative learning

When participating in online courses in higher education, many students can feel isolated from and disengaged with the content, learning process as well as other learners. It is important that students are encouraged to not only actively engage with the course material but also to interact with fellow students in the learning process in a meaningful way. Postgraduate coursework students in particular bring with them many learning experiences built from years of learning from high school, undergraduate studies, work, family and friendships. This prior knowledge needs to be connected with their newly acquired knowledge, and can be further engaged by the use of a social and collaborative online environment to extend their face-to-face learning. As students utilize the synchronous and asynchronous tools and peer review processes in authentic elearning tasks they collaboratively and cooperatively work towards promoting learning through both communication and reflective practice. When utilized as a journal or digital diary (Gleaves, Walker & Grey, 2008; Rourke & Coleman, 2009) a blog can promote and enhance a student's developing writing skills in both reflective and reflexive text. As an assessment tool, blogs can be used as reflective diaries for group presentations, demonstrating the learning of each student in the group though posts and comments.

Reflective practice

Paramount to the notion of reflective practice is 'recognising' the value of learning from experience as well as the importance of linking past knowledge and experience to new knowledge. Korthagen (2001) defined reflection as the "mental process of trying to (re)structure an experience, a problem or existing knowledge or insights" (p.58). Another factor behind this perspective is getting students to recognise the relevance of these new learning experiences and to discover the nexus between classroom theories and 'real world' practice. As Ashcroft & Foreman-Peck (1994) recommended, "the critical part of reflective practice is that it requires a commitment to learning from experience and from evidence, rather than to learning certain 'recipes' for action" (p.3). Hence students need to be taught how to be a reflective practitioner especially when training for a profession, by taking into account that there are many factors that inform their future 'real-world' practice. Glowacki-Dudka & Barnett (2007) recommended, that reflective practice "becomes critical when it is applied within organizations and communities to examine the collective assumptions of the work" (p. 43). The reflective practitioner ultimately through further understanding their own practice and by being receptive to other's philosophical stances, develops a theoretical perspective that enhances their understanding of their professional practice through as Beale (2007) suggested, a cyclic pattern of planning, experience, observation and reflection. As Schön (1983, 1987) advocated, reflection is an important part of the learning process as reflectivity allows the students to see the fundamental relationship between their actions and their framing of a situation, this is where old and new knowledge and understandings can collide and be constructed. As many researchers have acknowledged, reflection is a continuous cycle (Kolb & Fry, 1975; Boud, Keogh & Walker, 1985). Students need to be provided with opportunities in higher education to not just accomplish an assessable end product but also to look back on what they have learnt and think about how this could be utilized in the future. For when "learning and context are separated, knowledge itself is seen by learners as the final product of education rather than a tool to be used dynamically to solve problems" (Herrington & Oliver, 2000, p.2). Through peer shared writing students can as Korthagen (2001) suggested, "become aware of their mental structures, subject them to critical analysis, and if necessary restructure them" (p.51). This can be achieved through reflective online diaries and peer reviewed journal writing, as the learning and teaching exempla's in this paper will discuss.

Exemplar one: Publishing an art journal

Artwrite is an essential part of two writing classes at the College of Fine Arts, UNSW, Writing for Different Cultures and Audiences (in the Master of Art Administration) and Writing for Art and Design (Bachelor of Art Theory). Writing for Different Cultures and Audiences is delivered as a blended online teaching and learning model. The production of this online journal is based on the assumption that there is no point in writing to a disinterested examiner when work can be published to an interested audience. The use of *Artwrite* as a teaching and learning tool is a prime example of authentic assessment, where the assessable task is directly related to the students learning (Wiggins, 1990). The first issue, written and edited by second year students in the Bachelor of Art Theory was published as a photocopied Word Document in June 1992, from 2004 to the present *Artwrite* has been published as a professionally presented publically accessible blog. The history of the publication mirrors the rapid changes in desktop publishing over the last decade and is now published each semester by the editorial team from the class at http://blogs.cofa.unsw.edu.au/artwrite/?p=915. Through peer review, the class editorial committee selects the blog submissions posted throughout the course for a final published peer reviewed journal. In Writing for Different Audiences and Cultures course students collaboratively build the blog *Artwrite*, learning and reviewing openly, building trust and developing the ethos prevalent in the arts industry of open peer to peer review. Students in this course had long assisted each other to edit their work for publication, but the speed of online communication means they can have their work subjected to several layers of editorial correction, which gives them an approximation of the kind of editorial intervention they are likely to experience in the workplace (Rourke, Mendelssohn, & Coleman, 2008). A further aim for this course was to give students realistic expectations of how publishing operates as many may choice to work in this field in the future. There is another further benefit from publishing online, *Artwrite* is one of the publications harvested for the National Library of Australia's Pandora archive (http://pandora.nla.gov.au). Articles published here are also well ranked in Google searches. Therefore the course gives a further reward for the student writers (Rourke, Mendelssohn, & Coleman, 2008).

Exemplar two: Writing an Internship blog journal

All students enrolled in the MArt Admin. are also required to complete a work-integrated 240 hour learning internship that enables students to gain practical and supervised experience in the field of art administration. These Postgraduate students are also required to create a blog journal of their Internship experiences and read and comment on other student's Internship journals. They are required to collaborate in this process with the objective that it is important to develop in students the attribute of collegiality and empathy for future arts industry workers who may someday cross paths in the closely-knit art world. Digital diaries not only offer this connectivity but as Davi, Frydenberg and Gulati (2007) suggested, they allow students "to become a part of the blogging phenomenon that is increasing in the real world" (p.1). It was important from the beginning of the Internship journal that the students were given ownership of the process, so to address this factor students were asked to come up with their own class journal blog etiquette. The points on this list provide some insight into what aspects of the Internship journal were important to the students. They felt that frequent postings were necessary and that these entries should be anecdotal, they were aware that no racial/religious/gender/lifestyle prejudices or offensive language should be included. The students saw the importance of working collaboratively and offering positive advice. "Confidentiality", they wrote, "was sacrosanct" and that no details should be left on the web "that may come back to haunt you". Respecting other's privacy and intellectual property by not disseminating or copying material was another factor they initially insisted upon. The issue of anonymity was optional "as the use of aliases and avoiding references to people and places could be potentially confusing" and possibly detrimental to people about to embark on a careers in the arts industry. They felt that images were essential, including video of curatorial practice, gallery invites and openings including a rule that students should read and comment regularly on other student's blogs. Finally students expressed the need for their peers to "keep their sense of humor" throughout the whole journaling process as they worked for experience and no reimbursement. An important aspect of the Internship blog is that it is not given a grade mark from the educator this removes the focus off the student producing an assessable 'criteria driven' end product. As a result the motivation to write the Internship blog journal comes from the student and their need to want to share their experiences of the art industry with others. The focus is on developing and nurturing other more essential life-long skills, students learn the value of constructive criticism, empathy, and the moral obligation of assisting others with kind words, while improving their ability to communicate their thoughts, knowledge and understandings of the art world in both visual and written form.

Conclusion

In higher education the cases for using blogs as an eLearning tool and for assessment have been written about for many years (Drexler, Dawson & Ferdig, 2006; Farmer, Yue & Brooks, 2008; Rourke & Coleman, 2009; McMahon, 2010) from the first weblog used as lists to the web author/publisher role that blogs now play. Technological literacy and multi modal learning in these online communities requires new modes of thinking, ways of learning as well as new approaches to assessment. The use of technology for the sake of technology is not educationally sound, nor does it prepare students for the future. As Nunes and MacPherson (2006) confer, "learning activities must be authentic…embedded in realistic and relevant contexts" and "learners must be provided with the opportunity to explore multiple perspectives on an issue" (p.4) through learning experiences that are driven by sound educational choices and pedagogy. For these students blogging in the visual arts provides peer support in a community of practice, opportunity to reflect as well as providing the chance to experience 'real-world' opportunities. Students should be encouraged to reflect on their learning as they have the opportunity to as Oravec (2002) suggests, "gain a sense of empowerment and personal identity while learning how to interact with others online" (p. 621). Social networking tools such as weblogs can provide one means of achieving this goal when online courses design their assessment to encourage both collaborative learning and reflective practice.

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Mix and match : m/e-learning and engineering curriculum

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This paper describes how and why various technologies – mobile devices and web services combined with tools available in online learning management systems – are being used to support individual, team and situated learning in one university's engineering programs. The tools include mobile devices for peer marking, online peer review and marking tools, online tools to support team formation and collaboration and online tools for individual learning. Games and simulations are also being introduced. All of these are helping to develop the curricula in ways that enhance graduate attributes such as design problem solving, critical thinking, teamwork and communication skills, and in some cases they are also saving staff time. By mapping and analysing in technology use in relation to different theoretical perspectives on learning, we are able to suggest what might be the next steps in an integrated action research approach to developing the use of learning technologies.

Keywords:e-learning; m-learning; engineering education; team learning; situated learning; distributed cognition.

The undergraduate engineering context

The context for this study is the Faculty of Engineering Faculty of the University of New South Wales (UNSW) in Sydney, the largest Engineering Faculty in Australia with around 9000 students. Many classes have several hundred students. Most of the teaching academics are required to prioritise research output, and at the same time respond to demands from accreditation bodies and industry for a curriculum that develops communication and teamwork skills, critical thinking skills and engineering design problem solving skills.

Internationally, there are moves to include more design project work in undergraduate engineering curricula (Campbell et al., 2009). This is a continuing challenge in a discipline that also requires students to have a thorough grounding in basic concepts (Goldsmith, Reidsema, Campbell, Hadgraft, & Levy, 2009). The Australian Learning & Teaching Council has been funding a number of national projects that address one or both of these. In this context, curriculum development initiatives reflect the same tensions between theory and practice, and the need to balance individual learning with team project work. There are two aspects of this tension – the student learning experience and the teacher workload. Our efforts have been aiming to improve the former without increasing the latter.

The paper is an account of our experience of using and developing a range of technologies to solve particular educational challenges, as presented to us by the teachers we work with. We map the educational needs against the tools that are proving useful in addressing these needs – as suggested by Laurillard (2008), and we use both individual and social learning theory to analyse these maps. In this context, the educational needs are those of the teachers as well as those of the students, because both form essential parts of the academic educational system.

Our approach is practice-based educational research, in that we observe and analyse emergent practice within one discipline context. Only a few of the examples described have been evaluated for learning effectiveness independently of the routine (and confidential) institutional course and teacher evaluations. Our aim here is to examine how the disciplinary curriculum development priorities in engineering have been influencing academics' choice of learning technologies, in relation to the types of learning required and the teaching work involved.

Educational theories

A broad range of educational theories is needed to make sense of the numerous learning activities that build engineering graduate attributes. We categorise them here under three headings: individual learning, social learning and situated learning, because these correspond to the complementary requirements for discipline concepts and theory, teamwork and communication skills, and critical thinking in a professional context. This approach provides different lenses through which we can make sense of the complex system that constitutes disciplinary learning and teaching.

Individual learning

Several learning models focus on the individual cognitive construction process, through which each student will learn to articulate or use knowledge explicitly. In an academic context, where individuals have to demonstrate conceptual understanding in a discipline to gain a degree, and especially in Engineering Science, the individual perspective fits many of the formal learning processes. Some theories focus on the supports and filters needed to present activities and information to learners using learning technologies. For example, scaffolding can be built into the design of a learning activity to help students build the skills they need in stages (McLoughlin, 2002; Winnips & McLoughlin, 2001). Cognitive load must be managed, to enable the learner to absorb and process information effectively (Sweller, 2008).

Threshold concepts within disciplines are ideas that lead to a qualitative and irreversible change in understanding, which then shapes subsequent learning and behaviour (Meyer & Land, 2006). Threshold concepts integrate and transform previous knowledge and may sometimes even lead to a transformation in the learner's worldviews and sense of identity. They are also troublesome to learn, because the learner can initially find them alien and counter-intuitive, or simply incoherent because of their complexity. In undergraduate engineering, there has been particular concern about high failure rates in engineering mechanics, related to problems with threshold concepts (Prusty & Russell, 2011). This leads to additional demands on teacher workloads, and on the whole teaching system, because students then require additional tuition to allow them to progress.

The conversational model of learning with technology (Laurillard, 2002) brings the teacher into the picture, by framing the learning activities and technologies as mechanisms and media for the exchange of conceptual knowledge between learner and teacher. Environments and activities for experiential learning complement discursive activities such as lectures, tutorials and written examinations. The underlying assumption in this model is that the student primarily is acquiring concepts that the teacher has already mastered, although there may also be some learning with and from peers (Figure 1). In Engineering Science, this model is valid way of thinking about learning. There is an established body of knowledge, relatively uncontested, that students need to acquire in order to work with the physical world. If they cannot reliably calculate forces on a bridge or within a car engine, their engineering designs will fail, unless of course someone else, or something else, can do the calculations for them.

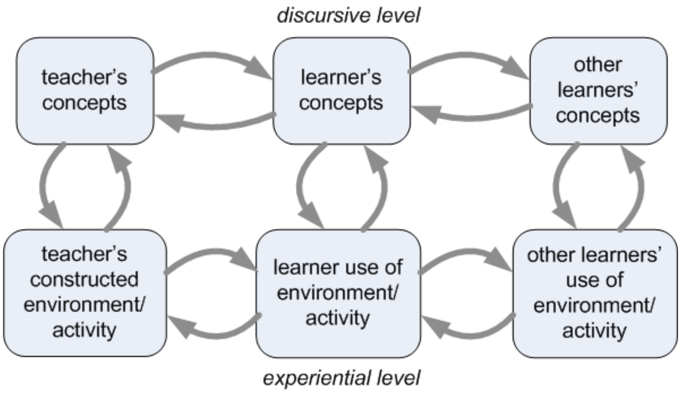

Figure 1. The conversational model of learning (based on Figure 1 in Laurillard, 2008)

Social learning

Social learning theories focus on how people learn in and from a social context, and a number of writers apply the idea of social constructivism to online learning (Huang, 2002; Kim & Baylor, 2006; McLoughlin, 2002). There is also a view that knowledge not only is socially constructed in the individual, but exists beyond individuals. Distributed cognition views knowledge as embodied in patterns of teamwork, organizational processes or systems, and in the technologies that support shared activity (Salomon & Almog, 1998). Computer technology provides cognitive tools that the learner can use individually or in groups to construct their own representation of knowledge, for example by doing calculations that help them transcend the limits of memory or problem solving (Jonassen & Reeves, 1996). Viewing learning as a distributed cognitive process is particularly relevant for engineering students, because their discipline's knowledge is embodied in artefacts and techniques.

Salmon's (2000) 5-step e-moderating model provides a practical framework for facilitating social learning online, by showing how learner progress from needing support for basic access, information exchange and socialisation, to interacting online with peers to construct new knowledge, eventually becoming independent developers of new knowledge. In engineering, students often work together on team projects that are supported by online communication tools, so they will often be required to progress to the higher levels of this model.

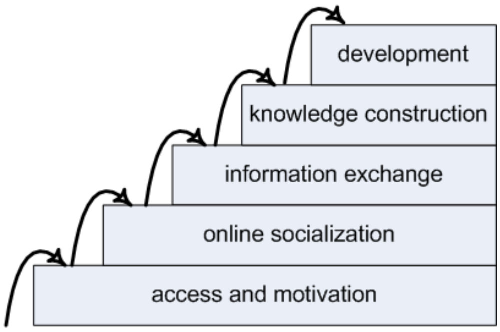

Figure 2. The 5-step e-moderating model (adapted from Salmon, 2011)

Situated learning

Situated learning theory focuses on learning in a real-work context (Boud & Solomon, 2000). This underlies the idea of communities of practice (Wenger, 1991; Wenger, 1998), a concept often referred to but which may be hard to achieve in practice (Eraut, 2002). Many engineering degree programs, like ours, include a work-based component. However, there is also a need to provide realistically complex experiences in which students can integrate the various cognitive and social aspects of their learning in as authentic a context as is possible in the academic environment. Project work tackling real world problems is more engaging and motivating, and helps to build graduate attributes such as the ability to engage with the ethical and social dimensions of engineering.

Theories in action

It is extremely unlikely that engineering academics are consciously thinking in terms of all these theories when they design learning activities. Although many are familiar with some educational models, this is not the focus of their attention while they are teaching, and perhaps cannot be, in 'the heat of the classroom' (Atkinson & Claxton, 2000).Their expertise is as discipline-based teachers and not as educational researchers (Borrego, 2007). The majority of the practitioners are simply seeking pragmatic solutions for a particular class or context, and will not be carrying out broader educational evaluations of the general effectiveness of the technologies for learning.

As pointed out by Schön (1987), reflective practice in higher education may require stepping outside the context of professional practice in order to reflect effectively. Eraut (2000) refers to this as 'deliberative learning'. Laurillard (2008) argues for a research-style approach to innovation with learning technologies, and for identifying generic learning designs or patterns. In analysing our own Faculty's learning technology developments, we hope to provide some insight into how this might work in one disciplinary context. Therefore, rather than focusing our study on particular projects that are explicitly set up as research, we provide a contextual overview of a range of initiatives, many of which are practice-based.

We are aiming to find out how the requirements for curriculum-level learning outcomes in engineering are being supported and enhanced by different types of educational technology in terms of:

- Individual learning
- Social and team learning
- Situated learning
- Teaching work.

Methods

Here we are presenting and analysing a context-specific case study of developing uses of educational technology within an Engineering faculty. We have gathered the information as participants in the process – as part of our role in providing educational development support. In this role, we are able to take an overview that forms part of continuing educational action research, in which we are combining the principles of reflective practice, as defined by Schön (1987) with a reflexive approach to information gathering and analysis. Reflexivity in research, as described by Alvesson & Sköldberg (2000), implies that we continually question the underlying assumptions in our research methodology and data collection methods.

As a starting point for the action research, we have compiled short pragmatic descriptions of educational technology uses in our Faculty, outlining the types of learning activity they are used for, and the function of these activities in relation to the required graduate attributes, as expressed by the teachers involved. This is the first cycle of continuing action research that aims to develop a better theoretical framework for selecting educational technologies to support disciplinary curriculum development priorities, as suggested by Laurillard (2008). At this stage, our focus is on the teacher intentions in adopting the technologies.

We have grouped the technology applications into three categories:

- mobile devices (e.g. phones, laptops, iPods, iPads)
- online tools (both within and outside institutional online learning management systems)
- virtual contexts (e.g. VR, online games, simulations and role plays).

The mobile and online technologies, although they are often used together, have in our case mostly been used for classroom and online activities respectively. Both involve technologies that are widely available to staff and students in universities. The 'virtual contexts' category is described separately because the role of the technology is not just as a medium for teachers and students to communicate, and to exchange and develop ideas. The technology provides environments in which learners temporarily engage with a different reality or take on a different identity. Also, some (but not all) of the examples use specialised software and hardware.

We have mapped the various projects, activities or techniques in these categories onto the educational theories outlined above. Also, as a first step in identifying the costs and benefits from the teaching perspective (Laurillard, 2007), we include in the mapping some consideration of efficiency gains. The aim of mapping in this way is to begin building a deeper and more systemic model of how learning technologies can support practical curriculum development in engineering.

Technology applications

The following is the grouped list of the types of learning activity that various technologies are supporting.

Mobile devices

The Faculty has 100 iPods. These have been used with an external web polling service for classroom voting and peer marking.

We have also developed a mobile marking application that provides marking rubrics for iPod, iPad or iPhone linked to a web server. We have built a simple web application that allows the teacher to build a scoring rubric on items, activities or groups.
classroom voting
The aim of classroom voting is to make lectures more interactive, by asking the students for their views or to answer specific questions about the topic being discussed, anonymously. The responses are displayed live using the external web service rather than specialised local software and hardware (often called 'clickers'). The advantage of using this method is that students can also use their mobile phones or their laptops. So our own iPods only need to be issued for those that have no web-enabled device with them. For encouraging a more socially interactive form of learning in lectures, an effective strategy is to ask students to answer in teams of four, on the assumption that at least one in four will be carrying a mobile device.

peer marking
We have also used the web polling service to record and monitor live peer feedback in student 'bearpit' presentations on their team projects in a 4th year Mechanical Engineering Design course. The mobile marking application for iPods and iPads has been used for peer marking of poster presentations.
practical classes

The Educational Technology team are working on a mobile application that allows students to answer questions while they do practical work in a lab or other site where they are observing. The software can deliver videos along with questions or instructions on what to observe in a lab or on a site visit.

teacher marking
Our iPod/iPad application can eliminate tedious paper-based marking of student presentations, posters and project work by allowing the markers to enter scores on an iPod application that presents the marking criteria and standards. The application can also display images for reference during marking. Scores are automatically sent to the server and compiled in real time. It has been used for:

- 4th year thesis competition marking

- research poster marking
- an undergraduate project competition in 1st year Mechanical Engineering.

The Faculty of Medicine are interested in using the same application for oral examinations (vivas) and for use in hospitals and remote locations.

One School in our Faculty has bought all members of academic staff an iPad so that they can mark and annotate student work electronically and give students feedback. All student assignments must now be submitted in digital form, so all marking is paperless. The primary motivation for this initiative is to improve efficiency and tracking, by removing the need for handling paper copies.

Online tools

group management
Many engineering courses involve group projects in large classes, the logistics of which can be a challenge. In our 1st year design course, for example, we have over 1000 students selecting from 12 or so project options and then being allocated to project teams of 5 or 6 within each project. Each project has different resources and activities and each team also needs an online space in which to work.

In our online learning management system, students view the information on each project option, then use the online tools to select a project and gain access to more detailed information. In some projects there will be a questionnaire to support team allocation. Then the system can allocate students to teams automatically according to the criteria set up by the lecturer. The system also allows lecturers to view student activity by group or by team.

peer marking
We use a calibrated peer review (CPR) service to support peer marking of project reports in a number of courses. Students are 'calibrated' and given feedback on their ability to judge an appropriate grade in examples of different quality. Each student assignment submitted is then automatically allocated, randomly and anonymously, to several other students to mark. The final mark for each assignment can be adjusted using the marker calibrations.

Some lecturers use other external web services or customised tools as media for students to comment on each others' work.

peer feedback within teams
We use WebPA to allow students to give anonymous feedback and comments on their contribution to teamwork, using a rubric. The marks can be used to moderate individual marks allocated for team projects. But often they are used formatively, or to alert the tutor to problem teams.

quiz design
Some of our Computer Science lecturers have developed a quiz tool enhancement to improve multiple choice quiz design. Instead of the lecturers having to select marking schemes in detail, they can choose from some standard designs based on research into effective quiz design. However this is not being widely used.

adaptive online tutorials
In 2011, we are part of a project using adaptive tutorials for mechanics courses in engineering across several Australian universities. The aim is to address some of the challenges students face in learning threshold concepts in engineering mechanics. The adaptive tutorials are underpinned by a system allows teachers to monitor overall responses in a large group of students and to adjust the teaching, and the feedback given by the online tutorials themselves, to respond to common sticking points.

digital media
We use a number of technologies for capturing, editing and distributing recordings of lectures or shorter edited podcasts. The University provides a central file conversion and streaming service for these video recordings. Podcasts allow students to review what they learned in class and catch anything they may have missed, and may also replace some lectures. Lectopia provides automated sound recording of lectures, which are then available

for student to download as podcasts.

In 2008 we videorecorded lectures for a software engineering course, combining the lecturer's talk with material from his laptop (showing computer coding, animation software and web access). Each 1 hour lecture required 3–5 hours of post-editing work.

In 2010 we used new hardware and software to do the same job on the spot, so that edited high quality video podcasts with combined media were uploaded to the streaming service within half an hour of the lecture.

Virtual contexts

We have a few, but not many, examples of activities using games, simulations or online role plays, most in contexts that combine teamwork and individual assessment of learning.

serious games
The Faculty recently reviewed the 4th year undergraduate thesis – the capstone for the honours BE programs. One outcome was concern that most students beginning their thesis projects had inadequate information literacy, and that this was leading to inconsistent standards and extra work for thesis supervisors. The Faculty was awarded funding for a joint project with the University Library to develop and pilot a game-based activity that would engage thesis students in building information skills. The game is being developed and tested during semester 2 of 2011.

simulations
Many engineering disciplines use simulations as part of professional practice, and often students are introduced to these in learning activities. Particularly in disciplines such as mining engineering, where the consequences of engineering design decisions can take years to become evident, and where students often cannot be exposed to real working environments for safety reasons, simulations can provide valuable learning. Simulation activities are being used and evaluated in 1st and 3rd year undergraduate mining engineering. Whereas in 1st year students are given a fairly prescribed scenario to interact with, the 3rd year students are able to deal with more complex and open-ended simulations. Simulation activities are also used in other engineering programs.

virtual reality
Also in mining engineering, there is a 3D, 360 degree environment where students can experience simulations of a real mining environment, giving them an immersive experience (including sound) of hazardous underground events. Developed for training in the mining industry, this facility is now being used for learning through team projects using simulated scenarios.

online role plays
The Faculty has for some time had a customised environment for supporting online discussions in roles (i.e. with login in role rather than with student ID). We have also used a combination of learning management systems to run an online role play activity where postgraduate students of environmental impact in mining joined with postgraduate students in environmental health. The role play environment was set up in a separate online learning management system, with role-based log-in.

Analysis and discussion

Some of the tools are being used primarily in activities to support individual knowledge construction, while others can support both individual learning activities and social learning. Table 1 maps the technology-supported activities described above onto the types of learning, and onto efficiency gains in teaching work.

Table 1. Mapping techniques to learning

Technology-supported activities	individual learning?	social learning?	situated learning?	efficiency gains?
Mobile devices				
classroom voting	✓	✓		✓
peer marking (iPods, iPads, web services)	✓	✓	✓	✓
teacher marking (iPods, iPads)	✓		✓	✓
mobile media and questions	✓		✓	

Online tools				
group management	✓	✓	?	✓
peer marking	✓	✓	?	✓
peer feedback	✓	✓	?	✓
quiz design	✓			?
adaptive tutorials	✓			?
digital media	✓			✓
Virtual contexts				
games	✓	✓	✓	
simulations	✓	✓	✓	
virtual reality	✓	✓	✓	
online role play	✓	✓	✓	

Where there are specific challenges, such as in engineering mechanics courses with a high failure rate because students are failing to acquire skill with threshold concepts, there has been a reason to focus on tools for conversational interaction between teacher and learner, such as classroom voting and adaptive tutorials. These scaffold the learning process, presenting simple challenges with fast feedback to the student. Classroom voting does this face to face with a group and the adaptive tutorials as self-paced individual activity. In both cases this forms part of a collective conversation between one teacher and many students – up to several hundred at a time. Both technologies allow the teacher to perceive and respond to general patterns across the whole class.

Where the focus is on students gaining skill in teamwork and design problem solving, there is heavy use of online group communication and peer feedback tools. These tools not only help groups and teams to learn from each other, but also support automated organisational processes, so that the teachers have less administrative workload in setting up, monitoring and facilitating the teams.

Peer marking tools have a combined individual and group learning focus. Students are given guidance in how to mark each others' work. As they become accustomed to doing this, they learn in more depth about the criteria being used to judge their own work, and about how to learn from and critique constructively the work of others. Although not always specifically situated in a real engineering context, the activities using these tools attempt to replicate aspects of professional practice where multidiscipline teamwork, critical analysis and feedback on work by peer is the norm.

The more authentic and complex learning activities are also beginning to take advantage of virtual environments. Although these need a lot of investment to set up and are often very specialised, they can take advantage of staff experience with professional and research technologies. For full-time undergraduate study in particular, the opportunities for situated learning in the true sense are limited. Simulations and games provide an engaging and challenging alternative. Role plays are ideal for exposing students to some of the complex social and ethical issues they are likely to come across in their professional practice.

In a research-focused context, it is not surprising that the tools that help maintain learning quality and save teaching time have had more adopters than tools that require more individual work on the part of the teacher. Some of the technologies we use have been able to automate processes that would otherwise have to be created and carried out repeatedly by teachers. For example, the peer marking and team feedback criteria embody in software the experience of previous best teaching practice and team decisions. In large classes run by teams of academics, as in our first year design subject, this fits the distributed cognition model, where the teaching knowledge is spread among teams of individuals, organizational processes and systems and technologies that support shared activity. Figure 3 summarises how learning technologies form part of an open distributed knowledge system in engineering education.

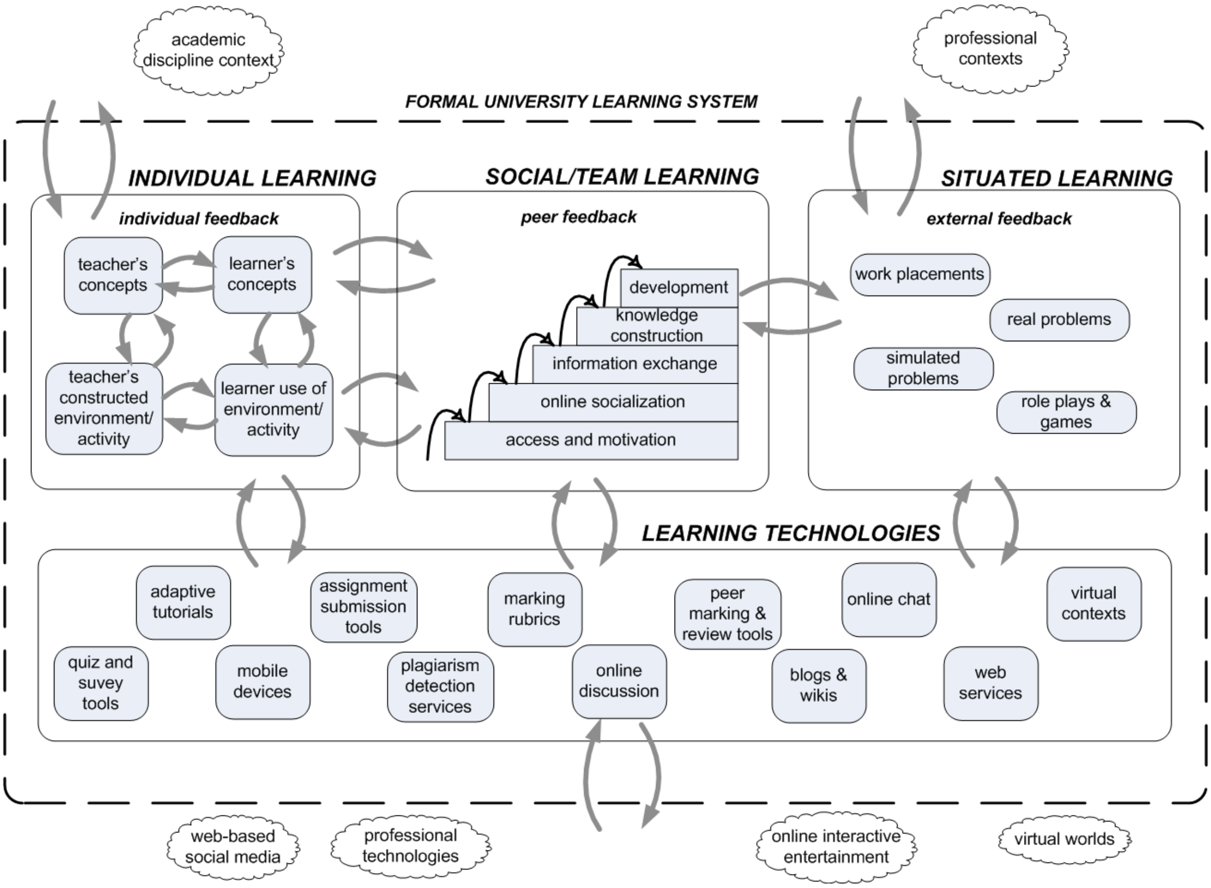

Figure 3. Learning technologies in engineering education as an open distributed knowledge system

Conclusions – next steps

We set out to identifying some patterns of innovation with learning technologies in the context of developing the Engineering curriculum within UNSW, and we have been able to relate different technological tools to some of the main curriculum development priorities, using different theoretical perspectives on the learning and teaching process.

The development of the Faculty's technology use so far has been ad hoc, adopted within particular subjects. Nevertheless, having identified where technologies have been introduced to support specific learning needs, we have been able to begin developing a framework for evaluating technology use across a whole curriculum, in relation to graduate learning outcomes required in the discipline.

Since we are aiming to be reflexive in our approach to this research, it is worth noting what we have excluded from our analysis:

- Our analysis has focused on the formal aspects of learning and cognition. We have not fully addressed the affective dimension of learning – how to engage students, the role of emotional intelligence (Mayer, Salovey, & Caruso, 2004), the nature of 'flow' in balancing skills and challenges (Csikszentmihalyi, 1992).
- We have not examined the educational effectiveness of the technological solutions chosen, but have merely reported on use and teaching intentions. This raises a question about whether the teacher perceptions and intentions about using the technologies are broadly complete and accurate. While some of the examples in this paper have been evaluated, many have not. A more comprehensive evaluation of learning experiences and outcomes might provide more complete picture.
- We are aware of some student project teams who have chosen to set up their own Facebook or Google groups to coordinate their work, instead of using the online learning management system as set up by their teachers. As indicated in Figure 3, these are outside the scope of the formal university learning and teaching system and the technologies that support it. However, in a healthy open system, the boundaries between formal and informal are highly permeable.

- We have mapped only what we have evidence of within our own Faculty, from actual use in one Australian metropolitan university. The same exercise with the same technologies might generate an entirely different pattern in another disciplinary context, because the nature of the learning needs and the learning activities is different (Russell, 2005). The institutional context, and even geography, will also influence technology use. A multi-campus regional university, for example, is may place more focus on technologies that support remote teacher and peer interactions for campus-based study, in addition to home or workplace-based.

Overall, our analysis provides an example of a structured reflection on how digital technologies can be used and adapted fit particular curriculum development needs, using educational theory. In this sense we have begun to carry out a research-style approach to innovation with learning technologies, advocated by Laurillard (2008), at the level of curriculum. In Engineering at UNSW, next steps are to develop and refine the evaluations of effectiveness of each of the solutions. A similar process of mapping of technologies onto their affordances for individual, social and situated learning, and for efficiency gains, could be applied in other disciplinary and institutional contexts at the level of curriculum design for graduate learning outcomes.

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The impact of learning technologies on workload

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Abstract and Symposium Plan

Over the past decade, most Australian universities have moved increasingly towards online course delivery for both undergraduate and graduate programs. In many cases, online teaching is becoming part of routine teaching loads. Yet detailed and accurate workload data are not readily available. This symposium is timely as it addresses an issue of immediate National and International concern relevant to all education sectors as many struggle with how to allocate workload associated with the use of learning technologies. This symposium intends to explore workload based on data collected from across four institutions and seek input from the audience as to whether it 'rings true'. This Symposium will present some of the findings and conclusions of an Australian Learning and Teaching Council project which has undertaken a robust investigation of workload in relation to the use of learning technologies. The project used a Grounded theory approach and appropriate supporting methods. Drawing on the 88 interviews undertaken across the partner institutions and consequent analysis the four team members will discuss four case studies in regards to issues, barriers and concerns; the grounded methodology, findings from the NVivo analysis and focus on the various teaching demands of online programs, and whether workload demands are lighter, heavier or the same for online teaching compared with face-to-face teaching. The group will highlight recommendations for future practice for key stakeholders from the various perspectives of the presenters. Several questions from the interview schedule and the proposed survey tool will be drawn upon to engage the audience. In particular the survey tool, newly developed, will be tested using a 'cognitive' interview technique whereby audience members will be asked for their 'understanding' of the questions. This feedback will then be incorporated into the survey.

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Blueprint For The Future: A project to ensure effective, equitable and engaging use of learning technologies

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The issues around engagement, equity and evidence-based decisions posed for exploration at the conference play out at all levels within universities: individual academics working with students; faculties developing programs; and institutional level mechanisms designed to support learning and teaching. This paper takes an institutional level perspective to the issues through the development of a quality enhancement framework for learning technologies at Macquarie University. Developed over three years, the framework is based on a continuous cycle of evidence-based goal setting, planning, managing and reviewing within a governance structure which is representative of key stakeholders across the university. Enhancing the student experience, providing quality learning and teaching and developing sustainable infrastructure are key outcomes. The impetus for developing the framework and the key elements which promote engagement, accessibility and evidence-based practices will be discussed.

Keywords: Quality Enhancement, Benchmarking, Learning Technologies.

Introduction

Macquarie University has a proud history of valuing and fostering innovation in learning and teaching. The exploration and use of emerging technologies has been integral to much of this innovation, playing a pivotal role in responding to the changing needs and expectations of students. Up until several years ago, the use of technologies for learning and teaching across the University was largely confined to core technologies including the learning management system (Blackboard) and iLecture web-based lecture recordings.

The central provision of these core technologies through the University's learning and teaching support units guarantees an environment, staffed by knowledgeable professionals, that is secure and reliable. Staff and students can use the technologies and services with the understanding that they are readily accessed, secure, regularly maintained, backed up, aligned with other university systems and applications (e.g. student management, HR systems, library services), adhere to University policy and legislative requirements (e.g. records management, privacy, accessibility, copyright) and come with support, training and professional development services when needed.

The technology landscape however, has changed. Technologies are becoming far more sophisticated and there is now a greater range of options available to support learning and teaching which are easy to access, set-up and use. It is now feasible, as opposed to several years ago, for individual academics, departments and faculties to host their own instances of open source software or to make use of freely available Web 2.0 applications such as social networking, virtual worlds, blogs, and wikis. While this opens many opportunities for the enhancement of learning and teaching, it also poses challenges, particularly in the absence of frameworks to guide their use. Without an understanding of the issues, risks and requirements associated with developing and maintaining safe and secure learning environments, the naive use of freely available technologies, despite the best of intentions, can place the university, students and staff at risk.

Web 2.0 technologies have been true to the label of being ‘disruptive’ technologies (Gartner Inc., 2008) with their use impacting the accepted way of doing things. Macquarie, like many other universities, had no institutional policy or guidelines to manage risks and to ensure the quality of the student experience in the changing technology environment. There were no broader institution-level mechanisms within which to embed policy, for example: a vision for learning technologies, backed by goals and strategies; transparent and evidence-based processes for making decisions; or quality frameworks to ensure the robustness of the technologies and their effectiveness in supporting learning and teaching.

Introducing university-wide structures to support a secure and effective environment represented a major change for the University. Fortunately, several of the preconditions for creating change identified by Kotter (1996) were present. There was recognised acceptance of the need for change, and with the appointment of a new Deputy Vice-Chancellor (Provost) with a strong commitment to quality learning and teaching, there was a champion with the power to lead change. Three years later, and after a series of sub-projects involving key stakeholders at all levels of responsibility, the outcome has been a Quality Enhancement Framework for Learning Technologies. Modelled on the University’s Quality Enhancement Policy, it sets the parameters for a systematic, future directed, continuous cycle of goal setting, planning, managing and reviewing, within an appropriate governance framework. It encourages continuous improvement in outcomes, promotes the effectiveness of university structures and activities, and supports the alignment of planning, resources and effort with the achievement of the University’s goals (MQ Quality Enhancement Policy).

The remainder of the paper will discuss key elements of the Framework and how they address the issues embedded in the conference themes of engagement, equity and evidence-based practice.

Learning Technologies Quality Enhancement Framework

Governance

The first element of the Framework to be developed was the governance process. The Management Advisory Committee for Academic Learning Technologies (MACALT) was established to advise the DVC-Provost on the creation of a learning technology environment that supports teaching, learning and research, as well as enriching the student experience. MACALT brings together organisational units and key personnel responsible for the management and use of learning technologies. It is through this Committee that all other elements of the Framework are monitored: policy and planning; management and use of technologies; and evaluation and reporting to provide evidence-based decision making.

One of the concerns of this Committee is ensuring the ongoing development and effective use of the core mainstream technologies while at the same time fostering innovation. To this end, separate streams of funding have been made available for both purposes. Funding for mainstream technologies, including development and support services comes largely through recurrent budgets for relevant organisational units. Innovation is supported through an Innovation to Integration Strategy, comprised of a four-staged process entailing explorations, small controlled trials, larger scale trials and recommendations for integration into mainstream practice, after which a business plan is developed. An Emerging Technologies Grants Scheme is the primary source for funding the explorations and trials. Evaluation of projects is based on the CICTO Framework (Gosper, Woo, Muir, Dudley & Nakazawa, 2007) which takes a whole of environment approach, assessing educational need, the ability of the technologies to support that need, and the fit with organisational infrastructure, both technical and academic. Decision-making in the evaluation of projects is based on the following principles which enable the University to look to the future, while at the same time building on the successes of the past.

- *Agility and flexibility* to enable the university to stay abreast of change
- *Enablement* to support innovation in learning and teaching
- *Enhancement* of the student learning experience
- *Sustainability* of infrastructure (reliability, security, interoperability) and academic programs
- *Quality* of teaching and learning through supporting staff in their work; and enhancing the learning experience for students
- *Alignment* with the University's strategic directions and priorities
- *Consolidation* through building on existing expertise and successful practice.

Policy and planning

Policy and planning strategies serve to signal the presence of long-range and worthwhile educational aspirations, important for ensuring transformational change (Draper & Nicol, 2009). Due to space restrictions, a discussion of planning will be restricted to the comment that planning for learning technologies is now well integrated into the University's strategic planning processes. The University's Academic Plan, supported by a cascading set of operational plans, incorporates goals, objectives, strategies and outcomes appropriate to the development of technology-enabled learning environments.

More relevant to the conference themes is the Learning Technologies Policy, the cornerstone for ensuring an engaging and equitable experience for all students. The policy, front-ended with a vision and context for its use, clearly identifies the primacy of students and their learning through the statement:

> Learning technologies are provided to enable access and enhance the student learning experience. Their use will take into account the right of students to privacy and the confidentiality of the work they produce as part of their studies. The University aims not to disadvantage students in their learning through lack of access to the technologies or knowledge and skills in their use. (Learning Technology Policy, p.1)

The policy sets out the principles for the management and use of technologies, covering both the core technologies supported on the central platform, the Macquarie Learning Technologies Platform (MLTP), and other technologies controlled through faculties and departments. The accompanying procedures provide the operational details, setting out the roles and responsibilities for all parties. These parties include: MACALT; organisational units and faculties managing technical infrastructure; and individuals /departments /faculties responsible for the use of technologies and the quality of the student experience.

Explicitly addressing the changing Web 2.0 environment is a significant feature of the policy. It is important to strike a balance between providing a secure and safe learning environment for students and allowing freedom to innovate. We were mindful of the warning by Fullan (2003) that when operating at the 'edge of chaos' it is best to resist the temptation to impose too much order; all this does is give the appearance of control. The approach taken was to empower academics to make decisions within a supportive framework. There was recognition that the conditions around the use of learning technologies vary depending on the particular technology and the learning and teaching context in which it is to be used. The solution was to enable faculties and departments to make other technologies available to their staff to support specific learning and teaching requirements on the basis of a demonstrated need that could not be met by the MLTP. A register of these technologies is to be maintained by faculties, with annual reports of activity being monitored through MACALT. Staff are to provide documented evidence that appropriate arrangements have been made for resourcing (including costs to students), compliance with university policy and legislative requirements, risk management, quality assurance, training and support, and appropriate authentication and authorisation of users. Students are to be informed of hosting arrangements and any implications for their learning are to be made transparent. In this way, the interests of the University and the students are protected within a supportive framework that enables innovation.

Management

With the potential for individuals/departments/faculties to make use of a greater range of technologies, came a need for greater transparency of roles and responsibilities. These are defined more fully in the policy and procedures. In summary, the key responsibilities lie with:

- Informatics for providing the University-wide backbone infrastructure upon which learning technologies reside.
- The Learning and Teaching Centre for developing and maintaining the MLTP, hosting core technologies and more specialised technologies to support specific learning and teaching processes. The Centre also provides academic support, training and professional development.
- Faculties and their Departments for the quality of the educational process and for the management of learning technologies, not supported by the MLTP.
- Unit convenors for decisions about the technologies to be used (in accordance with Faculty and Departmental arrangements) and for the learning experiences of students in their units.

Making these responsibilities explicit serves to alert stakeholders to their role in the creation of high quality and sustainable learning environments that ensure the quality of experiences and outcomes for all students.

Evaluation, reviews and reporting

Reflecting on what has been learnt about student engagement through the US-based National Survey of Student Engagement, Kuh (2003) warned against universities making judgments about policies and practices in the absence of student engagement data or some comparable source of information. Further, Fullan and Scott (2009) identify the use of evidence (not anecdotal) to diagnose problems and implement solutions as being characteristic of change-capable universities. This highlights the critical importance of the final element in the Framework - evaluation, review and reporting.

Institutional level reporting of systems and processes is monitored through MACALT. As outlined in the Learning Technologies Policy, reports on the MLTP are to be given at MACALT meetings, with a consolidated report provided annually covering performance of learning technologies, support and training, issues relating to maintenance, development and compliance, and quality enhancement initiatives along with their funding implications. In addition, technologies on the MLTP are to be reviewed every 3-5 years for their fitness for purpose. The first of these reviews was undertaken in 2010 with a review of the University's Learning Management System, leading to a move to Moodle in 2012. At the Faculty level, each faculty reports annually on the technologies for which they are responsible.

Benchmarking exercises and commissioned research projects which shed light on key issues in practice are also reviewed at MACALT for their implications for policy and planning. A recent example is research undertaken to gain a better understanding of students' experiences and expectations of technologies on campus (http://www.mq.edu.au/ltc/projects/student_it_experience/index.htm). This research was commissioned to inform future planning.

Concluding comments

Developing a high quality and sustainable learning environment must reach beyond the efforts of individuals. An integrated multi-faceted approach involving individuals and groups at all levels within an institution is required (Marshall, 2004). Although limited to a brief description, the Learning Technologies Quality Enhancement Framework is an example of how this can be achieved in the context of assuring and enhancing the quality of students' experiences with technologies. The framework is based on a continuous cycle of evidence-based goal setting, planning, managing and reviewing within a governance structure that is representative of key stakeholders across the university.

The development of the Learning Technologies Framework has achieved transparency, clear accountability and consistency across the University in terms of policy and practice in the use of technologies for learning. It is a work in progress and is subject to continuous review and improvement, thus ensuring its responsive to changing circumstances and the changing directions of the University.

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Macquarie University Policies referred to in this paper are available at http://www.mq.edu.au/policy

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Adoption of Twitter in higher education – a pilot study

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Twitter has experienced a tremendous growth since its inception and is considered as an effective and simple social medium for communication. Despite its huge uptake, less is known about the usage of Twitter as a learning tool especially within higher education. This study investigates the adoption of Twitter in an e-Commerce unit in an Australian higher education institution. Building on Twitter's inherent social features, an extension to Davis's original Technology Acceptance Model (TAM) is devised by including intrinsic and extrinsic motivation behaviours as predictors of Twitter usage. The empirical evaluation does not provide support to the original TAM constructs of usefulness and ease-of-use but reveals enjoyment and social norms as the strongest predictors. The study implications suggest a mind-shift in the adoption of Web 2.0 tools as compared to that of traditional Web technologies, i.e., Web 2.0 is more about enjoyment and social presence and not merely about how useful or easy-to-use a technology is.

Keywords: Twitter, Technology adoption, Motivation, TAM, Web 2.0, Higher education.

Introduction

Micro-blog is a kind of Weblog that is restricted to 140 characters per post but is enhanced with social networking facilities (McFedries, 2007). One of the earlier studies on micro-blogging highlights three distinct features: information sharing; information seeking; and, friend-ship wide relationships (Java, Song, Finin, & Tseng, 2007). Other studies such as Humber et al (2008); Krishnamurthy et al (2008); and, Naaman et al (2010) found Twitter to be highly social. These features make micro-blogging worth investigating in higher education (Ebner, Lienhardt, Rohs, & Meyer, 2010) especially given the importance of social presence in current education setting. Although Twitter user accounts have reached over 200 million worldwide, documentation of its use within the higher education has been somewhat limited.

This paper aims at investigating adoption of Twitter in an e-Commerce unit in an Australian higher education institution. In order to achieve our goals we chose to use Technology Acceptance Model (TAM) as the baseline. TAM is considered as the most researched model in Information Systems (IS) research to investigate adoption of new technology and posits that user perceptions of usefulness and ease-of-use determine attitudes towards using a technology which further leads to usage intentions (Davis, Bagozzi, & Warshaw, 1989).

Web 2.0 is mostly about social interactions and exchange of information. The link between web 2.0 tools, social interaction and enjoyment within the higher education setting has been widely documented (C. Hsu & Lin, 2008). Similar inherent features are also seen in Twitter (Wigand, 2010) but the intention to adopt Twitter as part of higher education has not been investigated much in higher education. Therefore, we extended TAM by including intrinsic and extrinsic motivational behaviours in terms of perceived enjoyment and subjective norms respectively. Given the trends and the huge web 2.0 uptake in higher education for pedagogical usage it is therefore important to assess the motivations behind certain technological usage. In that direction, this research is expected to shed some light towards helping educators to better design and deliver teaching and learning activities involving Twitter.

Background

Twitter is the fastest growing Web 2.0 technology in comparison to all micro-blogging platforms (CrunchBase, 2011). Micro-blogging became quickly popular due to its communication features which allowed the exchange of information in 140 characters or less with the ability to include hypertext links. Comparatively, though there has been an increase in the usage of Twitter at higher education worldwide, a report from Faculty Focus in 2010 has noted that Twitter's potential has yet to be harnessed (Faculty-Focus, 2010). Most higher education institutions are currently using Twitter for sharing information among peers and as a real time news source but there has been little or limited examples of pedagogical use. Therefore, our work intends to extend research on Twitter usage in higher education by looking at the motivation and the social influence Twitter provides. Research has linked the importance of social presence to a range of critical factors such as student satisfaction and development of a community of peers (Dunlap & Lowenthal, 2009). Twitter could facilitate this by allowing them interact with other students and possibly the wider online community in real time, thus enriching the student experience, particularly the "social presence" aspect.

To investigate the adoption of Twitter, we adopted Technology Acceptance Model (TAM) from IS research. TAM is considered as being robust and parsimonious for predicting user adoption of a variety of new technologies (Raaij & Schepers, 2008). In order to investigate the impact of student motivation on Twitter adoption we extended the original TAM by including perceived enjoyment and subjective norms (representing intrinsic and extrinsic motivation constructs respectively) as key predictors of Twitter adoption in addition to TAM's key constructs of perceived usefulness, perceived ease-of-use, and behavioural intention.

Methodology

Participants for the study were made up of second year undergraduate students from a local higher education institution. As part of their program students were required to undertake an e-Commerce unit which ran for 12 weeks. They were exposed to micro-blogging and were encouraged to use Twitter as part of weekly tutorial. The usage of Twitter was not assessed as part of the unit but was monitored by the instructor constantly. The survey was conducted at the end of the semester where all students were invited to take part and out of 45 students 27 responded. All the constructs used in the survey were adopted from the previously published scales.

Results

The proposed model (as shown in Figure 1) was tested using the PLS (Partial Least Squares) approach, which is considered as a powerful tool in analysing structural models involving multiple constructs and multiple indicators. PLS is also considered an effective approach as compared to LISERAL or EQ when sample sizes are small (Cavusgil, Sinkovics, & Ghauri, 2009), like in our case.

All our constructs demonstrated a good level of reliability and validity. For example, the factor loadings for all our constructs were greater than the threshold of 0.60 as suggested by Chin (1998). The t-values also provide evidence for convergent validity. In our case, all the values exceeded the threshold of 1.96 as suggested by Gefen and Straub (2005). Internal consistency also appeared significant for all of our constructs since the composite reliability values exceeded the minimum of 0.70 as suggested by Nunnally and Bernstein (1994). Discriminant validity was met using the Fornell and Larcker test, where the square root of the AVE (Average Variance Extracted) of each construct exceeded the correlation shared between that construct and other constructs in the model as suggested by Fornell and Larcker (1981).

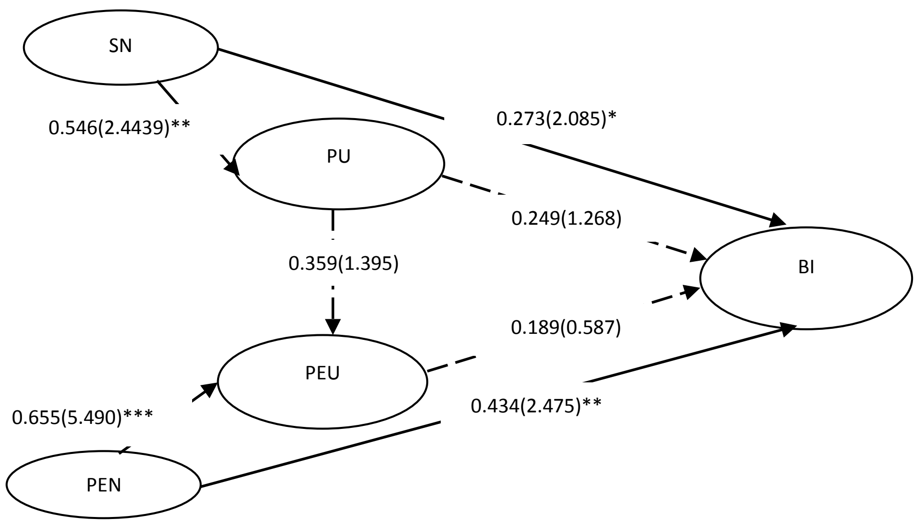

Figure 1: PLS results for extended TAM

The structural model was evaluated by examining the significance of path coefficients and the variance explained (R^2) by the dependent variables. Figure 1 summarises the PLS results for students' intentions to use Twitter. The strength and significance of each relationship are represented by the path coefficient values, with t-values in parentheses. The solid lines represent significant relationships while the dotted lines represent insignificant relationships. R^2 is indicated next to each dependant variable (BI, PU and PEU).

Surprisingly, none of the original TAM relationships was supported by the data as the effect of perceived ease-of-use (PEU) and perceived usefulness (PU) on behavioural intention (BI) appeared insignificant. PEU also didn't influence BI though PU. However, both perceived enjoyment (PEN) and subjective norms (SN) directly and indirectly influenced BI (students' intentions to use Twitter), with coefficients of 0.617 (0.434 + 0.655 x 0.189 + 0.655 x 0.359 x 0.249) and 0.409 (0.273 + 0.546 x 0.249) respectively. In addition, perceived enjoyment and subjective norms also directly influenced PEU and PU respectively. The positive relationships imply that the more the students enjoy using Twitter and exhibit social influence the more likely they will perceive Twitter ease-to-use and useful and ultimately adopt it. Overall, perceived enjoyment (PEN) appeared to be the strongest determinant that influenced students' intentions to use Twitter. The proposed structural model explained 80% of students' intentions to use Twitter, which is a highly significant finding.

Discussion

The aim of this study was to examine adoption of Twitter in a higher education setting by analysing the impact of intrinsic and extrinsic motivational behaviours on Twitter usage. This was achieved by formulating an extended TAM including perceived enjoyment and subjective norms as significant predictors of Twitter usage. The empirical evaluation of the proposed model provides several insightful findings. First, perceived enjoyment being the strongest predictor implies that the more the students perceive Twitter enjoyable, the more likely they will perceive it easy-to-use and ultimately adopt it. A number of previous studies have also confirmed the significant role of enjoyment in adopting new technology (see (Lee, Cheung, & Chen, 2005); (Wigand, 2010); (Chang & Chin, 2011); and, (C. L. Hsu & Lu, 2004)). Second, subjective norms being the second strongest predictor also implies that the students value their peers' opinion about usefulness and intentions of using Twitter. Finally, the original TAM constructs failed to influence the adoption of Twitter, which is in sync with some recent technology adoption studies such as Heijden (2004) and Holsapple & Wu (2007) highlighting the inability of TAM to explain adoption to today's highly interactive, social and multi-user technologies.

This study has made several useful contributions. First, it contributes to the adoption of Web 2.0 technologies, especially Twitter adoption within higher education. Although some attempts have been made to analyse Twitter adoption in Government organisations (Wigand, 2010); mass convergence and emergency events (Hughes & Palen, 2009); and the enterprise (Gunther, Krasnova, Riehle, & Schondienst, 2009), this study is the first to examine Twitter adoption in an Australian higher education context. Second, the study reveals that the adoption patterns of Web 2.0 technologies are more focused on enjoyment and social presence rather than 'usefulness' and 'ease-of-use', which had been more prominent in explaining adoption of first generation of Web technologies such as email or Web sites. Third, the strong impact of intrinsic motivation (enjoyment) on Twitter usage also highlights the learning patterns of today's students who prefer to have the element of enjoyment in their learning activities and are more likely to use an educational technology if it's fun or enjoyment. Nevertheless, today's learners also value their friends' opinion (subjective norms) when adopting a technology as evident in our study. This also implies that in order to provide a richer learning experience for students, educators must include enjoyment and social presence elements as key ingredients of their learning objects. Finally, the study re-iterates the need to perform more technology adoption research around Web 2.0 in order to evaluate the insignificant role of traditional TAM constructs.

A key limitation of our study is the small sample size. We intend to conduct similar studies in larger cohorts to strengthen our findings. Another limitation is the self-reported data which might have caused common method bias (CMB) in the study. However, the conduct of Harman's single factor test did not confirm the presence of CMB in our data. The complete details of un-rotated factor analysis are not included in the paper due to space limit but available upon request.

Conclusion

The study provides some early insight into the usage and adoption of Twitter in a higher education context. The empirical evaluation of the proposed model highlights inability of traditional TAM constructs in explaining the adoption of Web 2.0 technologies thus reiterating the need to conduct more studies on Web 2.0 adoption. The study reveals the dominance of intrinsic motivation over extrinsic motivation in explaining the adoption of Twitter and argues the need for elements of enjoyment and social presence in designing academic activities. Once a technology is received well and is deemed enjoyable the likelihood of extending it to further educational usage is high. In this light, the paper brings an important contribution towards the usage of Twitter in higher education that may pave way to further utilisation of Twitter for pedagogical usage. We also aim to conduct similar studies in other courses and among cross institutions / cultures in order to get a better understanding of the adoption of Twitter in higher education settings.

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CHANGING DEMANDS, changing directions.
Wrest Point | Hobart Tasmania Australia | 4–7 December 2011

Do the ACODE benchmarks still cut the mustard or is eLearning maturity just a dream? There is light at the end of the tunnel.

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Dr Philip Uys. Director, Strategic Learning & Teaching Innovation.
Institution: Charles Sturt University, Australia

Abstract and Symposium Plan

The symposium will first review a series of benchmarking activities that have been undertaken over recent years using the ADODE Benchmarks. It will provide a number of options for participants as to the different ways in which these benchmarks can be used and it will seek to work with participants to help them establish a plan of action for their own institution. As these benchmarks can be used at different levels and in different ways, in their entirety or in part, this activity will provide participant, with keys for using these benchmarks at whatever level they might find most appropriate in their institution. Different perspectives on the usefulness of these benchmarks will be canvassed with a view to establishing the best way forward for participant. But more importantly, this session will seek to empower individuals to provide contextualized leadership in this area eLearning quality once returning to their institutions.

Participants in this symposium would be those who are interested in conducting future benchmarking activities in the area of e-learning, potentially using these benchmarks to conduct either an internal audit of what their institution has in place, or for those looking to plan for an inter-institutional activity, for more broad-ranging quality purposes. Each panel members has considerable experience using the ACODE benchmarks and other quality instruments to help their institutions navigate their future in eLearning. Each also have responsibility, in varying degrees, for their own institutions response to current trends and can provide participant with an inter-institutional perspective of the importance of benchmarking to help establish strategic direction in the area of e-learning.

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Using Microblogging to facilitate Community of Inquiry: An Australian tertiary experience

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Abstract

The usage of Twitter as part of tertiary learning is growing and is increasingly a common scene. However, most institutions use Twitter for social information exchange rather than deep pedagogical use. Here we experiment with Twitter based on the Community of Inquiry (CoI) approach using two undergraduate cohorts from Australia and America. Both cohorts were asked to exchange messages and discuss on a given topic for three weeks via Twitter. Our findings show that all three types of presence from the CoI model, viz. cognitive, social and teaching, can be facilitated by the use of Twitter in teaching. This demonstration of the use of microblogging for pedagogical use is a significant contribution to the higher education literature since previous studies' findings are largely limited to aspects of social presence.

Keywords: Microblogging, Community of Inquiry, Twitter, Tertiary Education

Introduction

In this paper we explore the use of Microblogging, one of the social media, in conjunction with a traditional Learning Management System (LMS) for students in a second year undergraduate eBusiness face-to-face course at an Australian university.

From a number of perspectives, including in particular the social constructivist one, interaction and community can be considered fundamental to the learning experience. This position can be seen in the educational literature as far back as in the work of Dewey, who maintained that both the psychological and sociological aspects of the educational process were equally important (Dewey, 1959 cited by Garrison, Anderson & Archer, 2000). Taking such a position leads to the notion that, rather than conventional conception of a class as a group of students enrolled in a unit being taught by a teacher, it is desirable to conceive of a community of learners who are engaged in the purposeful, mutual construction of knowledge facilitated by staff member(s) (Ebner, Lienhardt, Rohs & Meyer, 2010). A widely used model to describe this kind of learning community is the Community of Inquiry (CoI) model developed by Garrison et al. (2000).

The study was motivated by anecdotal evidence and observation that students were spending less time interacting with each other outside of class. This meant that student interaction could be limited to the class time in their specific tutorial groups. Possible explanations for this phenomenon could include changing lifestyles, increased pressure to work and long commutes to and from campus. While the LMS based discussion forums were available to the students to allow them to interact outside of class hours, these boards were hardly used at all. The LMS is a website that requires students to go to the website and log in to see whether there has been any activity (as opposed to "pushing" information out to them). Further, the design of the LMS precludes students from interacting with other students not enrolled in the same unit through it. We consider both of these facts subtle but significant barriers to their widespread use for the kind of informal, spontaneous interaction we considered was missing.

Background

In this section, we provide a brief background regarding the use of microblogging for education. We also introduce the CoI framework and discuss our rationale for adopting microblogging as a tool to facilitate CoI.

Microblogging and Twitter

A microblogging platform allows users to post brief messages for public view. The messages appear in reverse chronological order. Microblogging combines aspects of blogging and social networking and as such is considered one of the "social media". Users can "follow" other microbloggers so that they have access to a "feed" of posts with recent posts appearing at the top. Microblogging has become very popular since the inception of Twitter in 2007. Despite several other microblogging platforms having become available, Twitter remains the most popular and in the literature reference is often made directly to the use of Twitter for education rather than to the use of microblogging (e.g. Ling 2007, Dunlap & Lowenthal 2009a, Dunlap & Lowenthal 2009b, Rodens 2011). Although the microblogging platform used in this study was Twitter, it is worth noting that other platforms can also be used depending on student/instructor familiarity, linguistic and cultural preferences, availability, etc.

The key features of microblogging are the ability to publish posts that are very brief (up to 140 characters in the case of Twitter), the ability to include abbreviated hypertext links and the ease and mobility with which such posts can be made. Twitter, for instance, allows posting via Short Messaging Service (SMS); mobile computing devices such as mobile phones and tablets; instant messaging (IM) services, email, etc. These are all in addition to a conventional web-based interface and custom application software.

The pragmatic implication of the multiple channels of accessibility is that the flexibility thus afforded may be well suited to any scenario where a diverse group of people with differing levels of technological equipment and ability can all interact in a common forum. This flexibility can be particularly powerful, we argue, in online and blended education, where in our view the ideal is to have the technology be adaptable to the needs of the learner rather than vice versa.

The preliminary studies in the education literature on the use of microblogging in education suggest that it has significant potential, despite some drawbacks. For example, a report describing the use of Twitter to complement a traditional LMS found that it encouraged free-flowing, just-in-time social interactions between students and staff (Dunlap & Lowenthal, 2009). Ebner et al. (2010) studied the use of Twitter by Masters' students at an Austrian University. They concluded that there was great potential for microblogging as a tool to support informal learning and collaboration by students. It also allowed for the staff to provide feedback to students and get a feel for the overall "learning climate." Badge, Johnson, Moseley and Cann (2011) studied the networks that emerged between students using twitter and concluded that there were a number of potential applications for it as an educational tool, such as as a peer-to-peer support tool, an administrative tool (e.g. to broadcast announcements), and adding an "extra dimension" (p. 97) to time and location sensitive events.

However educators have recognised some drawbacks in the use of Twitter, such as the possibility of it being distracting and addictive (Grosseck & Holotescu, 2008, cited by Dunlap & Lowenthal, 2009a). This may be related to findings around Twitter usage generally (i.e. outside the tertiary education context) such as Java et al. (2007) and Krishnamurthy et al. (2008), which emphasised the social aspects of Twitter usage. The latter, claimed that the frequency of updates correlates directly to the number of followers if they were also friends. Huberman et al. (2005) on the other hand studied the activeness of a user based on individual's social circle and concluded that there are three types of distinct user activities; information seeking, information sharing and social activity. However, most of these studies report the social presence within twitter. Other studies focused relied content analysis on the '@' reply/mention function in Twitter such as Honeycutt and Herring (2009) which lead to categorisation of tweets. Similarly, Naaman et al. (2010) analysed a random sample of 3379 tweets and produced nine message categories by extending work done by Java et al. (2007) to evaluate message content. The categories were: information sharing (IS), self-promotion (SP), opinions/complaints (OP), statements and random thoughts (RT), me now (ME), question to followers (QF), presence maintenance (PM), anecdote me (AM) and anecdote other (AO). The study found that typically there are two types of Twitter users. Users in the first group (80% of all users) are engrossed in disseminating messages about themselves, while the second group (20% of all users) are far more informative, conversational and more involved with their followers. The latter proved to be more interesting thus attracted more followers given the benefits of information sharing, chance of discussion and chances of being heard by a larger crowd. These findings suggest that much twitter traffic is non-factual. Educators acknowledge the possibility that Twitter usage could potentially suffer from such drawbacks, however in general their findings suggest that the potential benefits outweigh the drawbacks, e.g. Dunlap & Lowenthal (2009a, 2009b) and Junco et al. (2011) report improved student engagement and a positive effect on grades from Twitter usage in conjunction with an LMS.

An interesting aspect of using microblogging to complement a traditional LMS is the fact that students can take the discussion beyond the barriers of the traditional classroom. Most LMSs allow access to the discussion only to fellow students in the course. For many discussions, this is perfectly appropriate. However, topical discussions and debates can benefit from more open discussion, e.g. with students from other courses and institutions or by tapping into discussions and debates in the wider society. Being able to participate in such discussion may also be a possible contemporary alternative to the kind of social, free-flowing, informal interaction that used to take place between students on-campus outside of formal classes. Such interaction may be limited due to altered student lifestyles, as students often have more demands on their time, meaning they spend less time on campus outside of class (Dunlap & Lowenthal, 2009a; Dunlap & Lowenthal, 2009b; Ebner et al., 2010).

The Community of Inquiry Model

The Community of Inquiry (CoI) model proposed by Garrison, Anderson and Archer (2000) provides a conceptual framework for characterising the overall higher education experience in terms of the interaction between three elements: cognitive presence, social presence and teaching presence (see Figure 1).

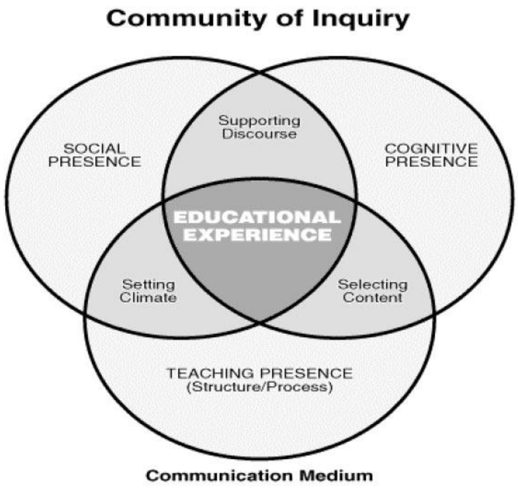

Figure 1: Elements of the Educational Experience (Garrison et al. 2000).

CoI has been used extensively in research about Computer-Mediated Communication (CMC) in education (Garrison et al., 2009).

The CoI model proposes that learning occurs through the interaction of three elements, viz. cognitive presence, social presence and teaching presence. Cognitive presence refers to the extent to which the participants in the community are able to construct meaning through their communication. Social presence is the extent to which participants in the CoI project their personal characteristics to the community. This goes beyond a simple notion of a sense of belonging that previous work had focused on (Garrison et al., 2009). The teaching presence refers to the dual functions of educational experience design and facilitation. While the educational experience design is largely within the purview of the staff in the higher education context, the facilitation function can be shared by the staff and students.

In principle, social media applications, such as microblogging, could be leveraged to enhance all three types of presence in an educational setting. Cognitive presence can be enhanced through social media based on students' ability to build meaning through ongoing communication involving individual and social exploration of ideas to develop understanding of a particular issue. Social presence is significantly enriched based on students' capability to present their ideas and identity while developing valuable links with the community for socio-emotional support for learning. Finally, teaching presence, involving the design and facilitation of the educational experience, can be facilitated to allow "natural", informal and personal expression by staff and students. Further, it is desirable that students can also exhibit teaching presence for instance by guiding and advising others in their cohort.

CoI and Microblogging

Garrison et al. (2000) originally proposed the CoI framework in the context of ensuring that the critical components of higher education identified were in fact carried over to distance and online courses using computer-mediated communication (CMC), primarily in the form of asynchronous discussion boards. However, the framework of the higher education experience is fundamentally independent of the mode(s) of communication employed. Furthermore, subsequent work has adapted the framework for use in "blended learning" i.e. courses where a significant degree of CMC complements face-to-face communication in the community of learners and teachers (Garrison & Vaughan, 2008). For example, a report describing the use of Twitter to complement a traditional Learning Management System (LMS) found that it encouraged free-flowing, just-in-time social interactions between students and staff, thus enhancing the social presence aspect of the CoI (Dunlap and Lowenthal, 2009a). Microblogging, while having what is sometimes referred to as a "real-time" characteristic, i.e., a user receives updates almost at the same time as they are posted and are often responded to very shortly afterward, still remains asynchronous and thus is compatible with the original CoI principles. The fundamental differences from "classical" asynchronous interaction include much briefer messages and less explicit "thread" structures in most user interfaces used.

Methodology

The experimental setting was a second-year, undergraduate unit on eBusiness delivered primarily in a face-to-face mode with some online support (i.e. Blackboard LMS for materials availability). Twitter was used as the microblogging platform due to its popularity and the instructors' familiarity with the platform. The basic experiment involved setting up in-class tutorial activities that were suitable as the basis of students posting their thoughts and questions as tweets. They were encouraged by lecturers both in class and via twitter to further their discussions and share information. The purpose of doing so was to encourage student interaction across the traditional tutorial-based boundaries. In-class activities included scaffolding in the use of twitter and appropriately tagging tweets using "hashtags." Also, collaboration was undertaken with an American instructor running a similar unit to ensure that there were periods of overlap where both the Australian and the American cohorts were covering similar topics in the curriculum. They were therefore able to interact with each other using microblogging in an ad-hoc, real-time manner. The purpose of doing so was to enrich the student learning through exploring a wider spectrum of perspectives than they would otherwise. It also harnessed the power of microblogging to take the discussion outside of the conventional "classroom" boundaries. The curriculum topics around which microblogging was encouraged included privacy, ethics and censorship; these were topics common to the curricula of both cohorts.

The data set analysed for this study is the list of tweets tagged as being relevant to the curriculum-related discussions over a four-week period. The four-week period corresponds to a three week overlap in teaching times when discussion activities were scheduled for both cohorts and one following week. This is because, while the learning activities were scheduled for three weeks, the discussions continued for an extra week. The tweets studied here are those posted by students and staff over the four-week period of interest that met at least one of two criteria. The first criterion is that the tweet was annotated with at least one of the hashtags "#leb215" and "#cse2642" (corresponding to the two unit codes). The second criterion is that the tweet included at least one of the participants' twitter username in an @ mention. Satisfaction of either one of these criteria was deemed sufficient to identify the tweet as relevant to the experiment. The dataset includes tweets by both the American students and staff (referred to hereafter as Cohort 1) and the Australian students and staff (Cohort 2). Note that this is a subset of tweets posted by the cohorts during this period; other discussion took place, which was tagged differently. Such discussion would not be related to the scheduled teaching activities and is therefore not included in the analysis here.

A content-analysis approach using a coding scheme adopted is adapted from Garrison et al. (2006) was used to analyse the tweets. The coding scheme used is shown in Table 1, which uses the elements and indicators from Garrison et al. (2006). Our adaptation of the coding scheme for the microblogging environment is illustrated via the examples and coding guidelines in the same table.

In the initial attempt at coding, each tweet was to be assigned the single category that it was deemed to fit best into. This would parallel the message level coding discussed in Garrison et al. (2006). To increase reliability of the results, two coders were used. The initial level of agreement between the coders was approximately 77%. As part of the negotiation process, both coders (two of the authors) decided that many of the tweets were rich enough to satisfy multiple categories. So the two coders agreed to assign up to two categories to each tweet; a "primary" category which seemed most applicable and, where necessary, a "secondary" category was also assigned. Not all tweets were assigned a "secondary" category. This form of categorization is comparable to other tweet analysis research such as Naaman et al. (2010) and Sinnappan et al. (2010). While Garrison et al. (2006) advise caution in using this approach, they acknowledge that the nature of the research and the purpose of the discourse may warrant its use. Given the exploratory nature of this study, in the breadth versus depth dilemma described by Garrison et al. (2006), we have chosen to focus on the depth of analysis with a view to gaining greater insight (Morse 1997 cited by Garrison et al. 2006). After negotiation and the use of secondary category, negotiated coder agreement was 98.5%.

Table 1: Coding Scheme adopted, after Garrison et al. (2006)

Element	Category (Code)	Indicator	Brief coding guidelines	Example Tweet
Cognitive presence	Triggering event (CTP)	New topic introduced, Sense of puzzlement	Includes new resource and opinion or ask for comment	I found an article about WikiLeaks http://yhoo.it/hrJ6dN #cse2642
	Exploration (CEX)	Information exchange	Comments on previously raised resource, expresses an opinion on a previous tweet, expression of opinion with no linked resource	Some peoples in the government want to get WikiLeaks branded as a terrorist organization #cse2642
	Integration (CIN)	Connecting ideas	Draws connections from multiple tweets, multiple @s AND multiple URLs, multiple hashtags and multiple URLS	@Iserguy @VickyBlueWoody Do AUS parents need edu on how2censor??? http://tinyurl.com/25dd66w http://tinyurl.com/2g529bx #cse2642 #leb215
	Resolution (CRE)	Apply new ideas	Resolves an issue, brings a discussion to a close, uses ideas from learning material to settle an argument.	N/A
Social presence	Affective (SAF)	Expressing emotions	Emoticons, text-based expressions of humour eg LOL, LMAO, emotionally loaded words like ridiculous, includes emotionally laden value judgements e.g fantastic, brilliant	http://bit.ly/99BFZo This my not be ethical but I still LOL'ed so hard over the ignorance contained in this article #cse2642

	Open communication (SOC)	Risk-free expression	Bold statements, controversial statements (indicates a level of comfort making them), personal confessions	@dr_at_work the theory "never against a government" seems perfect in China. lol
	Group cohesion (SGC)	Encouraging collaboration	Replies with an opinion, or asks for clarification, e.g. RT with agreement, RT with disagreement, @mention, multiple @mentions, reply with URL	@Iserguy I think it does, it doesn't allow for every side to freely express themselves #cse2642 #leb215
Teaching presence	Design and organization (TDO)	Setting curriculum and methods	Communication on the units, methods, etc Typically staff-staff communication.	@stefaniemarkham saying hi from down under. looks like #cse2642 is going well. we #LEB215 will soon participate in your discussions.
	Facilitating discourse (TFD)	Sharing personal meaning	typically retweet or reply with extra/counter resources, soliciting clatrification, asking for explanation	RT @Reeseandchips:@Armein78 violent video gmes make children mre aggrssive #leb215 #cse2642 -what does this say..http://bit.ly/9IFcgW
	Direct instruction (TDI)	Focusing discussion	Provides guidelines on topic and/or format of discussion	@waacyweng can you retweet and add #leb215 in all ur tweets with #cse2642 students

Results

In this section we describe the results of the experiment while the detailed analysis and key findings are presented in the next section. Table 1 shows the general breakdown of tweets for both cohorts according to CoI elements. Given that this experiment was a non-assessable component, the response was considered encouraging from both cohorts as approximately 57% from Cohort 1(20 from 35 students) and 60% from Cohort 2 (27 of 45 students) participated in the experiment. In total there were 324 tweets; 163 tweets made by local students (Cohort 2) and 161 tweets by American students (Cohort 1). On average per person Cohort 1 has just over 8 tweets while Cohort 2 had 6 tweets for Category 1. For Category 2, Cohort 1 had more than 4 tweets while Cohort 2 had over 3 tweets.

As shown in Table 2, Cohort 1 had 161 tweets in Category 1 and 88 for Category 2 while Cohort 2 had 163 tweets for Category 1 and 98 for Category 2. Thus on average each tweet represented 1.57 codes though Cohort 2 (1.6 codes) had marginally “richer” tweets than Cohort 1 (1.55 codes). On the whole, a significant proportion of the tweets were defined by codes such as CEX, SGC, CTP and TDC. Other codes were not expressed and were found to be less significant as a consequent researchers decided not to report these. One such code in particular was CRE, which was not accounted due to fact that there were no arguments or conflict in information shared between the cohorts.

Table 2: Breakdown of tweets by CoI element code for both cohorts

Code	Cohort 1, n = 20(of 35)		Cohort 2, n = 27(of 45)		Total, n = 47(of 80)		Total (%)	
	Category 1	Category 2	Category 1	Category 2	Category 1	Category 2	Category 1	Category 2
CTP	78	2	4	0	82	2	25.3	1.1
CEX	72	1	122	2	194	3	59.9	1.6
CIN	3	0	0	0	3	0	0.9	0.0
CRE	0	0	0	0	0	0	0.0	0.0
SAF	1	2	3	2	4	4	1.2	2.2
SOC	0	1	1	2	1	3	0.3	1.6
SGC	4	82	4	92	8	174	2.5	93.5
TDO	3	0	5	0	8	0	2.5	0.0
TFD	0	0	22	0	22	0	6.8	0.0
TDI	0	0	2	0	2	0	0.6	0.0
Total Tweets	161	88	163	98	324	186	100.0	100.0
Average Tweets	8.05	4.40	6.04	3.63	6.89	3.96		

As mentioned in the methodology section, certain tweets were agreed to warrant a secondary category, which, while important, would not be a fair standalone characterization of the tweet. Consider, for example "*@Rin789 I agree that people should know the real facts, not filtered information from censoring through the internet #cse2642 #leb215".* Both coders agreed that the primary category (Category 1) for this tweet was CEX, as it clearly responds to a previous tweet but doesn't contain an additional linked resource. However, as it had an @mention, there is an element of the SGC category present too. The interpretation here is that this tweet is primarily taken as indicator that information exchange is taking place. However, the manner of the information exchange is such that collaboration is being encouraged. To reflect this phenomenon, we agreed that the secondary category (Category 2) should be weighted half that of the first. This would mean that two tweets of a certain code in Category 2 would equate to 1 tweet from Category 1. The weighted average thus calculated for both cohorts is presented in Table 2.

It can be seen that CEX was almost 50% of the total weighted average which indicated the nature of the whole experiment which was to exchange information between two cohorts. For example "*@ebzero89 adults should* *be able to view any content. But when it comes to kids there should be some form of censorship #cse2642 #leb215*". In this tweet a student is extending the discussion on censorship by including another student using the @ symbol to further the discussions. Further the student has directed the discussion to both cohorts by using the hashtag #cse2642#leb215. Both, @ mention and hastag have been crucial in driving student discussion in this experiment. It is noted that both SGC and CTP had almost similar percentages at 23 and 20 respectively. This shows that 1 in every 5 tweets was seeking support and collaboration while also initiating a new dialogue either by posting a new resource, seeking opinions or asking for comment. For example "Should *the ACMA blacklist be public? http://goo.gl/kbg0 #cse2642 #leb215*". Here a student is asking a question directing it to both cohorts with regard to the *Australian Communications and Media Authority's (*ACMA) blacklist and whether it should be made public.

A small percentage of students were found to post comparatively more CTP coded tweets in attempt to initiate new topics of discussion. Though this is encouraged however this behaviour should be monitored as too many questions would initiate many threads of dialogue thus diluting depth of the discussion. It would be advisable for a student to have 20% CTP overall and this would be taken into consideration when this experiment is conducted next. Though this was not monitored in this experiment the exact ratio was reflected in Table 3 coincidently. A typical example of SGC tweet would be "*How easy or difficult is piracy in Australia? #cse2642 #leb215*". Here a student is clearly asking a question about privacy in Australia to both cohorts without any other link to other information resource or citing a previous tweet. Similar SGC tweets were accounted for more than 93.5% on average in Category 2. It was also noticed that Cohort 1 had only 3 teaching related codes (TDO, TFD or TDI) as compared to Cohort 2 of 29 of which was mostly made up of TFD (22) aimed at facilitating the course. For example *"RT @Rin789: Would u create open srce sftware n why #cse2642 #leb215 yes & reason is tht the revenue means has changed, it's no more strategic".* Here the instructor is answering a post from a student in connection with open source software linking it to revenue models. The instructor also cites the tweet in the process of answering by linking both cohorts using the hashtags #cse2642 and #leb215.

Analysis and Discussion

Beyond Social Presence

The first finding we draw from the data is that the Twitter usage considered through the CoI lens strongly indicated a cognitive presence, over and above the social presence. This can be seen in the aggregates shown in Table 5, where cognitive components (67%) outweighed the social components (25%).

This may seem to contradict the descriptive statistics from previous studies on Twitter messages, such as Java et al. (2007), Krishnamurthy et al. (2008) and Naaman et al. (2010) which emphasised the social aspects of Twitter usage. In particular, Naaman et al. (2010) concluded that 80% of the tweets were personal, random notes about the posters, while only 20% were genuine information sharing. These findings suggest that most tweets are non-factual. However, this was contrary to our findings in this experiment. Collected messages as shown in Table 3 clearly demonstrate the existence of not only social components (SAF, SOC, SGC) but more so cognitive components (CTP,CEX, CIN) and teaching components (TDO, TFD, TDI). This clearly shows that Twitter as a platform offers more than just social interaction. The primary reason our findings differ from that of Naaman et al. (2010) is that our dataset is drawn from a particular context, whereas that study looked at an arbitrary set of tweets which could have been from varying contexts. Our findings are consistent with previous work such as Sinnappan et al. (2010). While Dunlap & Lowenthal (2009a) largely focus on social presence in a tertiary education setting, they reflect on the potential of Twitter usage contributing to the cognitive and teaching presences. Our findings, although preliminary, support their reflection.

Despite the importance of deep discussion which is often highlighted by the code CRE, it was found that the code was not expressed throughout this experiment from either cohort. This could be attributed to the short duration of time in which the experiment was conducted and also to the design of the learning activities. Both cohorts were more inclined to share information and to argue factual details. In future, appropriate learning tasks could be designed with appropriate time to get students to discuss and engage in deeper discussions.

Table 3: Weighted Average Tweets by CoI element code for both cohorts

Code	Weighted Aggregate (Cohort 1)	Weighted Aggregate (Cohort 2)	Weighted Aggregate (both cohort)	(%)*
CTP	79.00	4.00	83.00	20
CEX	72.50	123.00	195.50	47
CIN	3.00	0.00	3.00	1
CRE	0.00	0.00	0.00	0
SAF	2.00	4.00	6.00	1
SOC	0.50	2.00	2.50	1
SGC	45.00	50.00	95.00	23
TDO	3.00	5.00	8.00	2
TFD	0.00	22.00	22.00	5
TDI	0.00	2.00	2.00	0
Total	205	212	417	100

* Percentages were rounded to the nearest figure

Encouraging levels of Participation

On average this experiment had almost 60% participation from both cohorts and the findings demonstrate a healthy composition of CoI components across both cohorts. Though this was not an assessable component of their study, the number of tweets and the richness of each tweet suggest that students were keen to participate and contribute. Another factor supporting this is the fact that the discussion continued for a longer period than the duration of the assigned learning activities.

Limited Teaching Presence exhibited by students

Although there was 7.6% teaching presence as shown in Table 5, most of the tweets corresponding to teaching instructions were made by the instructors. This suggests that a low teaching presence from students was exhibited in the tweets. In a more mature CoI, we would expect that a larger number of participants could potentially contribute to the discussion in a manner that would indicate teaching presence. This could be facilitated in the future by designing learning activities that encourage selected students take lead in class discussions and activities for a stipulated time, and in duration of the sequence of activities, every student has the opportunity to participate in an instructor role.

Comparison between cohort characteristics

From the results in Table 2 it could be noted that on average both Cohorts made a comparable number of tweets. However, on a per student basis, cohort 2 was less prolific than cohort 1 by two tweets. However, further analysis (Table 4) shows that on average the number of links introduced per tweet was equal across both cohorts. Cohort 2 used direct mentions using the @ symbol slightly more frequently than cohort 1. These additional @ mentions are also reflected in the higher proportion of tweets labeled SGC in Table 2 for cohort 2.

Table 4: Average number links and direct mentions

	Cohort 1	Cohort 2
No of urls per tweet	0.15	0.15
No. of direct mentions per tweet	0.51	0.78

As the students were engaged with the same learning activities, we conjecture that the slight difference in the usage levels and patterns may be attributed to differing levels of comfort with Twitter prior to the start of the experiment. The instructors of both cohorts noted that not all students had pre-existing Twitter accounts, and those who had accounts had not necessarily engaged in academic use of Twitter. This was also evident in the style of tweets that were made by both cohorts at the start of the activity. The constraint of communicating in Twitter requires modification to normal sentences to embed more flesh in the message in one attempt. It is understood that familiar Twitter users converse and interact in a lingo specific to Twitter unlike normal written sentences. Here, parallels could be drawn with the short messaging service (SMS) texts that are laden with abbreviations and emoticons. A polished Twitter post requires compromised spelling conventions, removal of vowels, violation of grammar, eschewing prepositions and heavy usage of internet jargon and acronyms. Though Twitter has recently allowed users to post more than 140 characters per message with the "long update" feature, most messages are still less than 140 characters. Further, to communicate efficiently, twitter users need to be conversant in using symbols @ (to include and mention other users), re-tweeting (RT), sending a private message (D) and using hashtags and shortened urls.

The scaffolding materials for the learning activities in the study did include methods of effective communicating using Twitter and using client-side software (e.g. Tweetdeck) to manage tweets. If this is to be investigated more thoroughly, student levels of familiarity with and perceived ease of use of twitter will need to be measured pre- and post-participation in the learning activity.

Limitations

There were several limitations to this experiment. First, we had a small sample size of 47 participants across both cohorts. This could have introduced some bias to the study, as more students would have resorted to more 'noise' and non-class discussion eventuating in a different composition of CoI components. Second, though both cohorts were using Twitter independently throughout the semester this experiment only ran for 4 weeks where they were asked to collaborate and exchange messages. A longer experiment would have yielded more representative data on both the cohorts and their progress throughout the semester.

Table 5: Aggregated Percentage of tweets for each CoI element

CoI Element	Aggregate(%) Cohort 1	Aggregate(%) Cohort 2	Aggregate(%) Both cohorts
Cognitive Presence	37.05	30.46	67.51
Social Presence	11.39	13.43	24.82
Teaching Presence	0.00	6.95	7.67
Total	48.44	50.84	100

Conclusion and Future Work

This experiment supports and extends research done by Junco et al. (2011) (cited by Rodens 2011), Ebner et al. (2010) and Dunlap Lowenthal (2009) showing that Twitter has potential for pedagogical use. However, unlike these studies our work goes beyond demonstrating only social presence. We demonstrate that Twitter can be used to enhance and complement all “presences” in CoI. Though the experiment was conducted in a short period of time the findings are significant towards extending the research done on Twitter within the tertiary education space. This is especially true when many tertiary institutions that currently use Twitter limit their usage to mere social activities (Faculty Focus, 2010). Further, this also encourages other educators who are intending to adopt Twitter to facilitate their teaching and learning activities as it was reported that many educators shy away from Twitter when it comes to classroom activities (Faculty Focus, 2010).

We are the first known study to have used Twitter to form CoI between an Australian and American tertiary institution. Though both cohorts were only engaged in exchange of information and discussion only for four weeks the experiment demonstrates that outside class learning is feasible and better still as it involves peers from other institution. This has paved the way to engage with other tertiary institutions in future for real time and asynchronous discussion. In future, authors might extend the idea of CoI to include other higher education institutions over a longer period of time.

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Determining higher education student attitudes towards engaging with online academic writing skills programs

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The Learning Centre at Curtin University has recently released its academic writing skills programs in an online format which in 2010 had attracted over 3000 hits from students. In order to determine the effectiveness of these online programs and to predict when students are likely to engage with them, a questionnaire containing quantitative and qualitative items was added at the end of these online programs. The Theory of Planned Behaviour was used as a framework in order to determine students' attitudes and planned use of such online academic writing skills programs. The collected data revealed that, while students felt anxious with starting such programs, the instructional design process employed in the development of these resources made them intuitive, interesting and useful to the vast majority of participants. Circumstances in which students are likely to engage with such online programs in the future were also identified.

Keywords: Online learning, academic writing program, engage, student attitudes.

Introduction

The Learning Centre (TLC) at Curtin University provides academic support programs aimed at improving students' academic writing skills. The three PowerPlus Writing Programs, Better Sentences, Essay and Grammar, covers areas of academic writing which students tend to have most difficulties with including sentence structure, punctuation, grammar and essay construction. These programs have been traditionally delivered in face-to-face seminars which were only convenient for students able to attend the Bentley campus. In a move to provide equitable access to these programs for all students, TLC has recently made the three PowerPlus Writing Programs available in an interactive online format to all Curtin enrolled students and staff. During 2010, over 3000 students had accessed these non-compulsory online programs. This paper focuses on examining the students' perceived attitudes towards this online resource for predicting when they are most likely to seek such assistance with improving their academic writing skills. The findings from this study will also inform practitioners, wishing to implement voluntary online learning programs, of several issues encountered by students using similar online learning systems.

Background

Australian universities are currently under pressure to admit increasing numbers of students from a wider variety of backgrounds into their courses, which has led to growing concern over the quality and standards of students' academic discourse and writing abilities (Devereux, Macken-Horarik, Trimingham-Jack, & Wilson, 2006). Other factors such as students' changing expectations of higher education have also created increasing numbers of students who are less willing to engage fully with university life and academic discourse while taking on long hours of part-time employment (James, 2001). In some cases, while attempting to overcome these obstacles or to simply spend less time on an assignment, students may intentionally choose to carry out pre-meditated academic dishonesty by committing plagiarism (Park, 2003). However, in many other cases, what appears to be straightforward premeditated plagiarism may, in fact, be a symptom of students' difficulty with developing and engaging in appropriate academic discourse and writing (Dawson, 2004; Park, 2003).

This symptom has brought on increasing pressures for academic staff responsible for assisting students to complete the course requirements including the writing of assignments. The view that students are seen as customers creates a tension between accommodating their expectations and, hence, lowering academic challenges, while at the same time attempting to raise their academic abilities (Devereux et al., 2006). In order to improve students' academic abilities, universities typically provide resources for students including a central support area dedicated towards helping students develop their academic writing skills. 'The Learning Centre' within Curtin University provides such support for students through the delivery of freely available face-to-face workshops. A major drawback to the face-to-face workshops, however, has been with not being able to provide access to all Curtin enrolled students, particularly those unable to personally attend the Bentley campus. Demand for academic writing support has been increasing in recent years from all areas of the university including students studying undergraduate, graduate and postgraduate courses. Hence, an online version of these workshops, referred to as the online PowerPlus Writing Programs, was developed and released in an attempt to provide equitable access to the learning resources within the program for all students unable to attend the face-to-face workshops. The face-to-face workshops ran at specific times throughout the year; whereas, the online version was made continuously available to students to complete at anytime of their choosing. These online programs utilise web-based technologies, including elements such as Flash animations, which allow for interactive self-paced learning. The instructional design process that was employed with the design and development of these online programs will be the topic of another paper.

With the launch of the online PowerPlus Writing Programs, a concern for the facilitators and developers have been with how well students will perceive the effectiveness of these programs. Questions were also raised concerning what attitudes students will demonstrate towards using the online PowerPlus Writing Programs' interactive technologies and what circumstances students will be in when they are most likely to engage with these programs. To assist with providing answers to these questions, an online survey was administered that included elements of the Theory of Planned Behaviour (TPB), which has been used in other studies to investigate people's use of technologies.

Theory of Planned Behaviour

In an attempt to understand and predict people's uptake of new technologies introduced into workplace organisations and institutions, investigators have employed The Theory of Planned Behaviour (TPB) as a theoretical framework, which is an extension of Fishbein and Ajzen's (1975, 2010) Theory of Reasoned Action (TRA) model. The TPB, proposed by Ajzen (1991) and further developed by Ajzen and Fishbein (2005), has been applied to a number of studies in an attempt to understand and predict people's behaviour including Internet purchasing, participation in Web-based surveys and use of technology-based support systems (Bosnjak, Tuten, & Wittmann, 2005; George, 2004; Workman, 2005). These studies investigated relationships between attitudes towards the behaviour, subjective norms, perceived behavioural control, intention and actual behaviour, while acknowledging the importance of influences coming from cultural, personal and situational factors (Ajzen & Fishbein, 2005).

Several other researchers have employed Davis' (1986) Technology Acceptance Model (TAM), an adaptation of Fishbein and Ajzen's (1975) TRA model, to determine perceived technology usefulness and usage intentions by taking into account social influence and cognitive processes (Siragusa & Dixon, 2009). While the TPB and the TAM model share similar components (attitude toward behaviour, subjective norm, and behavioural intentions), the TPB has a stronger emphasis on behavioural control as well as providing more detailed information regarding each of its components relating to specific samples of people (Mathieson, 1991). Siragusa and Dixon (2008, 2009) provided more detailed descriptions of the differences between the TPB, TRA and the TAM model and the relationships between the components of the TPB. As this study is concerned with behavioural control factors for a specific group of students, the TPB was considered to be well suited for this investigation.

Studies that have utilised the TPB revealed that there are significant links between attitudes and beliefs and links between attitudes and behaviours, and that attitudes form the foundations of one's beliefs which influence one's behaviours (refer to Siragusa & Dixon, 2009 for further details regarding this link as well as application and limitations of the TPB). Workman (2005), for example, employed the TPB in an empirical study that investigated the use, disuse and misuse of an expert computer system designed to provide recommended courses of actions to the user. The study used the TBP in order to examine attitudes, perceptions, and social influences, which are seen as influencing factors on technology adaption. Workman asserted that when people have favourable attitudes towards a particular technology, those people are more likely to use that technology. He also argued that people are also influenced by subjective norms; that is, one's perception of significant others' like or dislike towards a particular technology which is likely to encourage or discourage one from using that technology. People's perception regarding their control or ability in the use of technology influences their perceived ease of technology use; that is, as one's perception of control increases, one's use of technology also increases accordingly (Workman, 2005). In their examination of people's intention to participate in Web-based surveys, Bosnjak et al. (2005) agreed with Workman by asserting that the more favourable the attitude and subjective norm regarding a particular behaviour, and the greater the perception of behavioural control, the higher the likelihood of a person's intention to carrying out that behaviour will be. Similarly, George (2004) maintained that one's particular behaviour is influenced by his or her intent to perform that behaviour; the intent is informed by one's attitudes towards that behaviour, subjective norms and one's perceived ability to successfully engage in the behaviour. Hence, this study presupposes that the likelihood of students willing to engage with the interactive online PowerPlus Writing Programs will be influence by their attitudes towards using online resources, their significant others' likes or dislikes towards these resources (subjective norms), and their perceived ability (behavioural control) in being able to engage with the online resources.

This study utilises the TPB in order to explore students' intentions to engage and interact with the interactive online PowerPlus Writing Programs by exploring their attitudes towards using such online programs, their perceived social pressure to do so, and by their perceptions of control with using these resources. Figure 1 summarises the main components of the TPB including the background factors which may also influence students' willingness to engage, as described by Ajzen and Fishbein (2005). The development of the survey described in the next section includes all the main components from this TPB framework as well as some of the background factors relevant to the student sample.

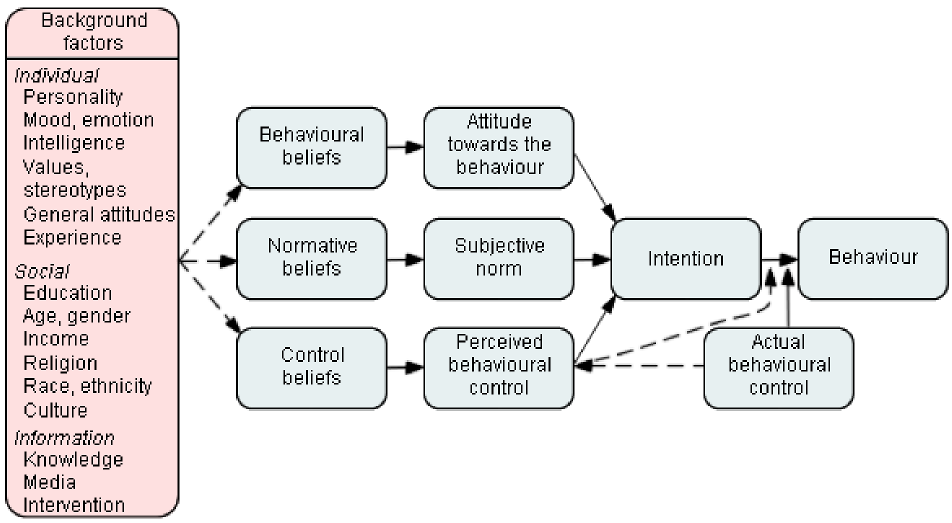

Figure 1: Theories of reasoned action and planned behaviour (Ajzen & Fishbein, 2005)

Methodology

This study employs a mixed methods approach, combining quantitative and qualitative methods. This triangulation combines the strengths of both methods while obtaining different perspectives of the same phenomenon through the collection, analyses and combination of collected quantitative and qualitative data within a single study (Creswell & Plano Clark, 2007; Greene, Kreider, & Mayer, 2005; Siragusa & Dixon, 2008). Data collection in this study involved asking students who accessed the online PowerPlus Writing Programs to complete an online questionnaire which appears as the last page at the end of the program. As participation of the online programs is voluntary to all Curtin students, the sample is made up of those students who chose to complete the online PowerPlus Writing Programs and then complete the online questionnaire. The questionnaire contained 40 items: 29 quantitative items and 11 qualitative items. The first section of the questionnaire collected the students' background information including age, gender and the country they reside in. The second section asked students to indicate their perception of the instructional effectiveness of the online PowerPlus Writing Programs including content presentation, relevance and appropriateness of level, at what level engaging with the programs had improved their writing skills, and how they believed the programs could be improved. The third section asked questions relating to each component of the TPB including the samples' behavioural beliefs and attitudes towards the behaviour, normative beliefs and subjective norms, control beliefs and perceived behavioural control, intentions to carry out the behaviour and the actual behaviour carried out (refer to Siragusa & Dixon, 2008, 2009 for further details regarding the development of survey instruments). The items in the survey were designed to be completed after students had completed the online programs to assist with predicting students' intentions to engage in similar programs or to refer back to the PowerPlus Writing Programs; if students encountered either a positive or negative experience with the programs they had just completed, then they may be encouraged or discouraged, respectively, to complete similar online programs. Upon completion of the online questionnaire, the respondents clicked on a 'Submit' button which sent their responses to the researcher via email; the following reports on the analysis of this collected data.

Quantitative Data Analysis

From February through to December 2011, 3172 individual students accessed at least one of the components of online PowerPlus Writing Programs (the online system was unable to record the amount of time they spent on each component). The sample for this study consisted of 52 students who completed at least one of these components as well as the online questionnaire. The first section collected student background information: 87% were female; 90% resided in Australia; 81% spoke English at home; and 60% were studying through the Perth based campus, 40% were studying through OUA (Open University Australia); 37% were between the ages of 15 and 29 years, 37% were between the ages of 30 and 39 years, 15% were between the ages of 40 and 49 years, 10% were between the ages of 50 and 59 years, and 2% were 60 years or over.

Section Two: Instructional effectiveness of the online PowerPlus Writing Programs

Table 1 shows the statistical summary of the items in the second section of the questionnaire relating to the online PowerPlus Writing Programs' content relevance, appropriateness of content level and presentation, and effectiveness towards improving writing skills (q9, q10, q11, q12 respectively). The items in this section were presented in a Likert-type format (1 = strongly disagree, 2= disagree, 3 = neutral, 4 = agree, 5 = strongly agree). The majority of participants responded positively to these items; one respondent answered 1 (strongly disagree) and another respondent answered 2 (disagree) to all items, a further six respondents answered 3 (neutral) to at least one of these items, the remaining 44 respondents answered either 4 or 5 (agree, strongly agree). Table 2, presents the response percentages for each of these items.

Table 1: Statistical summary of the responses to quantitative items in the second section

Items	Range of items means		Summary Statistics					
	Lowest item mean	Highest item mean	Mean	Mode	Median	S.D.	Kurtosis	Skewness

Content relevance	2.00	5.00	4.35	5.00	4.50	0.84	4.46	-1.78
Content at appropriate level	2.00	5.00	4.38	5.00	5.00	0.82	5.36	-1.94
Content appropriately presented	2.00	5.00	4.42	5.00	5.00	0.82	5.58	-2.03
Program improves writing skills	2.00	5.00	4.17	5.00	4.00	0.96	1.21	-1.18
Student n=52								

Table 2: Response percentages for each item in the second section

Item	Statement	1	2	3	4	5	pol.	mean	s.d.	cor.
q9	The content was relevant to my needs	2%	2%	6%	40%	50%	+	4.35	0.83	0.91
q10	The content was pitched at an appropriate level	2%	2%	4%	40%	52%	+	4.38	0.81	0.85
q11	The content was appropriately presented	2%	2%	4%	37%	56%	+	4.42	0.82	0.83
q12	Engaging with this program has improved my writing skills	2%	4%	15%	33%	46%	+	4.17	0.96	0.85

(N=52. 1 = Strongly disagree; 5 = Strongly agree)

The vast majority of the sample responded positively to these items, which would indicate that the majority of respondents were generally satisfied with the way in which the content was presented and had met their needs.

Section Three: Component of the Theory of Planned Behaviour

Table 3 presents a scale analysis summary of the dimensions for responses to the items relating to the TPB in the third section of the questionnaire. With each of the dimensions, seven-point bipolar adjective scales (1 = extremely unlikely, 4 = uncertain or indifferent, 7 = extremely likely) were used to assess the participants' perceptions of the item statements presented in the questionnaire. Table 3 also reports the mean (the calculated average of the mean scores for each item within each scale), mode and median scores for each of the scales. Tables 4 through to 7 shows the statements and response rates for each item relating to the TPB. For the purposes of this study, the following is based upon item-by-item analysis as the number of items in each dimension was too small to permit reliable scale analysis; this may be noted as a limitation of this study.

Table 3: Statistical summary of the responses to quantitative items in the second section

Scale	No. of items	Range of items means		Summary Statistics					
		Lowest item mean	Highest item mean	Mean	Mode	Median	S.D.	Kurtosis	Skewness
Theory of Planned Behaviour									
Behavioural Beliefs	5	4.00	7.00	5.75	5.80	5.80	0.84	-0.18	-0.44
Attitude Towards Behaviour	2	2.50	7.00	5.55	6.00	6.00	1.24	-0.41	-0.69
Normative Beliefs	2	1.00	7.00	3.86	4.00	4.00	1.79	-0.68	-0.31
Subjective Norms	2	1.00	7.00	4.56	4.00	5.00	1.78	-1.03	-0.63
Control Beliefs	2	2.00	7.00	5.10	4.00	5.00	1.50	-1.03	-0.19
Perceived Behavioural Control	2	3.00	7.00	5.71	6.00	6.00	1.04	-0.24	-0.63
Intentions	2	3.00	7.00	6.11	7.00	6.50	1.06	0.13	-1.03
Student n=52									

The response percentages for the questionnaire items relating to the TPB are presented in the following tables. Four of the 7-point bipolar adjective items (q18, q19, q21 and q33) have been negatively polarised; the negatively polarised scores have been reversed so that they are scored and displayed as positive statements. Reverse scoring has been done for these items which have been interpreted as being negative statements regarding the participants' perceptions of their attitudes and beliefs concerning the online PowerPlus Writing Programs. For example, item q18 is worded as a negative statement: "Engaging with online learning programs makes me feel angry". However, as it is reverse-scored, the mean score of 6.31 indicates that more participants disagreed with this statement from those which agreed.

Behavioural Beliefs and Attitudes

The response rates to the behavioural beliefs (the respondents' beliefs regarding their engagement with the online programs) and attitudes (their positive or negative evaluation of interaction with the programs) scales are show in Table 4. The responses were generally very positive. The highest score was for item q18 (91% – the sum of 1, 2 and 3 responses) which was reverse-scored indicating that the majority did not feel angry when engaging with the online programs; the lowest was for item q21 (60% – sum of 1, 2 and 3 responses) which was also reverse-scored indicating that more than half did not feel apprehensive engaging with the online programs. The majority of participants indicated that interacting with the programs was pleasant (85%) and helpful (76%).

Table 4: Response percentages for Behavioural Beliefs and Attitudes items

Item	Statement	1	2	3	4	5	6	7	other	pol.	mean	s.d.	cor.
	Behavoural Beliefs												
q17	Engaging with online learning programs make me feel a sense of competence				13%	33%	27%	27%		+	5.67	1.01	0.45
q18	Engaging with online learning programs make me feel angry	60%	27%	4%	6%	2%	2%			-	6.31	1.12	0.63
q19	Engaging with online learning programs make me feel frustrated	42%	37%	4%	10%	6%			2%	-	5.98	1.20	0.65
q20	Engaging with online learning programs make me feel a sense of achievement		2%		10%	23%	35%	31%		+	5.81	1.09	0.27
q21	Engaging with online learning programs make me feel apprehensive	31%	23%	6%	13%	13%	8%	6%		-	4.98	1.94	0.15
	Attitudes												
q23	Interacting with the online PowerPlus Writing Program is extremely pleasant	2%		2%	10%	25%	37%	23%	2%	+	5.60	1.20	0.50
q24	Interacting with the online PowerPlus Writing Program is extremely helpful	4%	4%	4%	8%	10%	33%	33%	6%	+	5.50	1.62	0.50

(N=52. 1 = Extremely unlikely; 7 = Extremely likely; other = null response)

Normative Beliefs and Subjective Norms

Table 5 displays the response rates to the normative belief (the participants' perception about engaging with the online programs, which is influenced by significant others) and subjective norms (their perception of relevant others' beliefs about demonstrating effective writing skills and engaging with the programs) scales. Only 27% (sum of 5, 6 and 7 responses) were influenced by friends and/or family, while 61% were influenced by their teacher/lecturer/tutor. Two-thirds (67%) indicated that relevant others believed that they should demonstrate effective writing skills, while 37% believed that relevant others think that they should complete the online programs.

Table 5: Response percentages for Normative Beliefs and Subjective Norms items

Item	Statement	1	2	3	4	5	6	7	other	pol.	mean	s.d.	cor.
	Normative Beliefs												
q26	My friends and/or family encourage me to use the online PowerPlus Writing Programs	38%	13%	6%	13%	13%	4%	10%	2%	+	3.02	2.06	0.35
q27	My teacher/lecturer/tutor encourage me to use the online PowerPlus Writing Programs	21%	2%	2%	10%	13%	19%	29%	4%	+	4.69	2.24	0.35
	Subjective Norms												
q29	People who are important to me believe that I should demonstrate effective writing skills	12%		4%	15%	15%	27%	25%	2%	+	5.06	1.85	- 0.64
q30	People who are important to me think that I should complete the online PowerPlus Writing Programs	19%	6%	8%	29%	10%	8%	19%	2%	+	4.06	2.04	0.64

(N=52. 1 = Extremely unlikely; 7 = Extremely likely; other = null response)

Control Beliefs and Perceived Behavioural Control

The response rates to the control beliefs (the respondents' beliefs about factors which may facilitate or impede their performance while engaging with the online programs) and perceived behavioural control (their perceived ease of difficulty of successfully engaging in the programs) scales are show in Table 6. The majority (86%) of participants believed that they had sufficient computing knowledge to engage in successful online learning, while 42% mildly or strongly believed that it took a great deal of effort to engage in online learning. Most of the respondents (85%) perceived that engaging with the online programs gave them a sense of being in control of their learning, while 72% perceived that they could interact successfully with ICT in general at all levels. This high level of control beliefs and perceived behavioural control may be partially explained by the fact that 40% of the respondents indicated that they were studying through OUA and that all of them chose to complete this program online.

Table 6: Response percentages for Control Beliefs and Perceived Behavioural Control items

Item	Statement	1	2	3	4	5	6	7	other	pol.	mean	s.d.	cor.
	Control Beliefs												
q32	How likely is it that you have sufficient computing knowledge to engage in successful online learning?		2%	4%	8%	23%	25%	38%		+	5.81	1.24	0.54
q33	How likely is it that it takes a great deal of effort for you to engage in online learning programs?	23%	19%	8%	6%	17%	15%	10%	2%	-	4.38	2.10	0.54
	Perceived Behavioural Control												
35	Engaging with the online PowerPlus Writing Programs gave me a sense of being in control of my learning		2%	2%	12%	10%	38%	37%		+	5.90	1.18	0.43
36	If I want to I can interact successfully with ICT in general at all levels			6%	19%	12%	33%	27%	4%	+	5.52	1.26	0.43

(N=52. 1 = Extremely unlikely; 7 = Extremely likely; other = null response)

Intentions
Table 7 displays the response rates for the behavioural intentions (the respondents' readiness to intent to engage in the online programs). The vast majority of the respondents indicated that they intend to refer back to the online programs that they have already completed (90%) and intend to complete other similar online programs in the future (90%).

Table 7: Response percentages for Intentions items

Item	Statement	1	2	3	4	5	6	7	other	pol.	mean	s.d.	cor.
	Intentions												
38	In the future, I intend to refer back to the online PowerPlus Writing Programs I have completed	2%			6%	21%	21%	48%	2%	+	6.02	1.22	0.77
39	In the future, I intend to complete other similar online PowerPlus Writing Programs				8%	15%	21%	54%	2%	+	6.19	1.02	0.77

(N=52. 1 = Extremely unlikely; 7 = Extremely likely; other = null response)

Quantitative Data Analysis Summary

The participants provided rather encouraging responses to the quantitative items. Nearly all the respondents either agreed or strongly agreed that the content was relevant, pitched at an appropriate level, appropriately presented and led to improvements to their writing skills. This might indicate that the main objective of the online program was achieved; that is, make improvements to the participants' writing skills. For the items relating to the TPB, the respondents' overall responses were rather positive. Their overall attitudes and beliefs about their behaviour when working with the online programs was positive; however, nearly half indicated that online learning programs made them feel apprehensive. The respondents were more influenced by instructors rather than by family or friends to use the online programs; for the majority of the respondents, however, people who are important to them believed that they should demonstrate effective writing skills. While the majority of the respondents perceived that they had control over their learning and had the computing knowledge needed to successfully complete the online programs, nearly half indicated that it took some level of effort to engage in the online programs. Nearly all the participants intend to refer back to the online programs they had already completed and intend to complete similar programs.

Qualitative Data Analysis

The third section of the questionnaire contained seven items that allowed for open-ended responses. The following provides a summary of the responses to these items as they relate to each component of the TPB. To assist with the reading of these findings, the frequencies of the most common responses to each item have been included.

Section Three: Component of the Theory of Planned Behaviour

Behavioural Beliefs and Attitudes
To determine the respondents' behavioural beliefs towards the online programs, they were asked to identify five or six adjectives that would accurately describe how they felt when they were interacting with the online

PowerPlus Writing Programs (q22). The respondents to this question (n=40) put forward 78 adjectives that represented positive experiences with the online PowerPlus Writing Programs, which included ‘intelligent’ (f=14; 14 respondents indicated ‘intelligent’), ‘interested’ (f=7), ‘happy’ (f=7), ‘competent’ (f=6), ‘confident’ (f=5), ‘informed’ (f=4), ‘excited’ (f=4), ‘useful’ (f=3), ‘satisfied’ (f=3), ‘helped’ (f=3), ‘relieved’ (f=3), ‘motivated’ (f=2), ‘learning’ (f=2), and ‘empowered’ (f=2). They also indicated 9 adjectives that represented negative experiences with the program including ‘frustrated’ (f=1), ‘unsure’ (f=1), ‘stressed’ (f=1), and ‘overloaded’ (f=1).

In order to determine the samples attitudes towards the online programs, they were asked to indicate how they felt when they first started the programs and to indicate if and how their attitudes changes as they progressed through each program (q25). A total of 38 students responded to this question; 19 of these respondents indicated that they began the programs feeling ‘anxious’, ‘not sure of its benefits’, thinking that it might be ‘difficult’, ‘boring’ and ‘a waste of time’, but as they progressed through the program they felt that the programs were ‘interesting’, ‘pleasant’, ‘useful’, ‘easy’ and ‘familiar’. Another 16 respondents to this question indicated that they were consistently ‘content’, ‘happy to learn’, ‘encouraged to learn more’, ‘open to new information’ and found that the programs provided ‘good practical application of the knowledge’ and confirmed that they were doing the right thing. Two respondents felt ‘great’ at first, although as they progressed they felt ‘frustrated and ‘overwhelmed with all the information given’; one student experienced technical problems.

Normative Beliefs and Subjective Norms

The sample were asked to describe a situation where a person (or people) important to them had encouraged them to complete the online PowerPlus Writing Programs (q28); 22 students responded to this question. Seven of these respondents indicated that they did not experience a significant other encouraging them to complete the online programs. A least 10 of the respondents were encouraged by their lecturer or tutor through either an on online discussion board, in class, or in their unit outlines. Three respondents were encouraged by friends through either an online discussion board or in class. A further two respondents were encouraged by family members.

The students were asked to describe a situation in which they felt a need to complete the online PowerPlus Writing Programs because that is what people significant to them would want them to do (q31); 20 students provided a response to this question. At least 11 respondents perceived that they needed to improve their writing skills and were not influenced by what significant others wanted from them. Five respondents had family members who wanted to see them improve their writing skills and they desired family members to be proud of them. Four respondents indicated that their lecturer or tutor wanted them to complete the online programs.

Control Beliefs and Perceived Behavioural Control

The participants were asked to describe factors that may facilitate or impede their ability to engage in online learning programs (q32). A total of 30 students responded to this question. At least 10 students indicated factors that would facilitate their ability to engage in online learning including being computer literate and being familiar with the online environment, as well as good design of the online programs in order to facilitate ease of access and to make it easy to follow. At least 22 of the respondents indicated factors that would impede their ability to engage online including unfamiliarity with navigating online, slow computers, restricted access to computers, difficulties with balancing study, work and family commitments, and disabilities which impede reading from the screen or hearing sound from video clips.

The respondents were asked to describe their feelings of control (or not) over what they were doing during their interaction with the online PowerPlus Writing Programs (q37); 21 students responded to this question. While two of these respondents were not able to describe their feelings of control, 18 respondents indicated that they were in control of their learning online, were able to work at their own pace and were excited with learning new writing skills. One respondent felt annoyed with not being able to successfully complete the online activities.

Intentions

The students were asked to describe a situation in which they might refer back to the online PowerPlus Writing Programs, or where they might seek further assistance with their writing through similar programs (q40); 31 students provided a response to this question. A total of 24 of these students indicated that they would refer back to the online programs when writing future essays, assignments or theses. Four respondents indicated that they would refer back to the programs when they have more time or have access to the Internet. Two respondents intend to refer back to the programs for future proof-readings, and one respondent intends to refer back during future employment.

Qualitative Data Analysis Summary

The vast majority of the respondents to these items indicated very positive attitudes towards the online PowerPlus Writing Programs. Many of the students felt apprehensive and anxious before they started, thinking that the programs would be difficult, boring or of no value to them; as they progressed, however, they found the programs to be interesting, useful and easy to use. Only a small number of respondents continued to feel frustrated and overwhelmed. While some respondents were not influenced by significant others to complete the online programs, other respondents were encouragement by significant others including their lecturers/tutors, their peers, and/or their family members; many of these significant others indicated to the students that they would like to see them improve their writing skills. A few of the respondents indicated that they wanted their significant others to feel proud of their successful academic achievements. Some of the respondents indicated that having computer literacy, familiarity with navigating websites and appropriately designed online learning environments facilitated their ability to engage with online learning; other respondents indicated that inadequate computing and Internet access facilities, balancing work, study and family commitments, and hearing and visual disabilities impeded engagement with online learning. Many of the respondents felt that they were in control of their online learning experiences. A large number of the respondents indicated that they would refer back to the online programs when writing future essays or assignments, had more time, better computing access and/or in their future profession.

Discussion

As mentioned earlier, the TPB asserts that people's attitudes towards a particular behaviour, subjective norms, and perceived behavioural control are likely to influence their intention to carry out that particular behaviour. This study examined factors that were likely to influence students' intention to participate in the online PowerPlus Writing Programs; the administered questionnaire, therefore, was designed to elicit information from the participants regarding these factors. Table 8 provides a summary of the findings from the quantitative and qualitative items from the questionnaire.

Table 8: Summary of the findings from the quantitative and qualitative questionnaire items

Behavioural beliefs and attitudes	Normative and subjective beliefs	Control beliefs and perceived behavioural control	Intentions
Many respondents indicated that they felt apprehensive and anxious before starting the online programs, but their attitudes became more positive as they progressed when they realised that the programs were intuitive, interesting and useful to them. However, a small number remained feeling frustrated and overwhelmed with the information presented	A large number of the respondents were influenced by their significant others which included their lecturer/tutor and, to a lesser extent, their peers and family members; many of whom indicated that they would like to see them improve their writing skills. Some respondents wanted their significant others to be proud of their successful academic achievement.	The majority of the respondents believed that they had control over their online learning which was facilitated by adequate computing literacy and appropriately designed online learning environments. Nearly all respondents agreed that the content was relevant, suited to their level of learning, appropriately presented and led to improved writing skills. Impediments to their online learning included inadequate computing access and facilities, balancing work, study and family commitments, and challenges with hearing and seeing particular elements within the online programs.	The vast majority of the respondents indicated that they would refer back to the online programs in the future when needing further help with their academic writing activities during their academic studies and professional careers. The majority also indicated that they would seek out other similar online programs as needed.

While it appears that the online PowerPlus Writing Programs have been beneficial to many of the students who have engaged with this resource, there appears to be a need to further examine ways in which students' anxieties towards getting started and engaging with such online programs may be eased. Students' significant others appear to play an important role in encouraging them to engage with such resources which should also be explored. The factors that can impede online learning and cause feelings of frustration and being overwhelmed need to be further explored and addressed in the ongoing development and revision of these resources.

Conclusion

This paper examined students' perceived attitudes towards the online PowerPlus Writing Programs in order to predict when students are likely to engage in such programs to improving their academic writing skills. The TPB provides a useful framework which highlighted certain conditions in which students are likely to work through resources that will potentially improve their academic writing skills. As the online PowerPlus Writing Program is still a relatively new resource being offered by The Learning Centre, more data will be collect in relation to the effectiveness of this resource and factors that will influence students to engage with these online programs more willingly. This study has provided useful data that will require further investigation which will ultimately be fed back into the ongoing development of the online PowerPlus Writing Programs. The information collected through ongoing investigations into predicting circumstances in which students will engage with online learning programs, particularly when participation with such programs is voluntary, will undoubtedly have benefits for the development and delivery of other online learning programs.

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Start me up! Equity & engagement using e-learning

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In 2010 Unitec launched an institution-wide eLearning strategy as part of a reconceptualised approach to teaching and learning. In response the library embarked on two action research projects investigating the effectiveness of library services.

One project assessed the efficacy of online information literacy tutorials. Embedding online information literacy into Learning Systems such as Moodle are vital in the increasingly blended learning tertiary environment (Adolphus, 2009) (Bongey, Cizadlo, & Kalnbach, 2006). Considerable time and expertise is going into the development of these tutorials, so we want to ensure optimum use is made of them. What we produce must have value for students with differing learning styles and motivation (Berk, Olsen, Atkinson, & Comerford, 2007).

This action research project involved two classes of Diploma in Business students doing a business communications course watched a locally produced online video tutorial showing how to use an academic business journal database. These are typically "web generation" students: unfamiliar with academic texts and the reasons for their use (Godwin, 2009). They are often new to academic study and may not have completed secondary schooling, or there has been a gap since studying. The video demonstrated how to search for and save articles relevant to their current assignment. Subsequent to that, students answered a series of questions, using CPS 'clicker' software about how they would prefer to access and use the video tutorial, their comprehension of it, the language used, its technical quality and its relevance to their needs. Other studies have shown that these factors influence students' opinions and use (Jowitt, 2008). In response to their answers, we modified the tutorial and for the implementation phase of the project we showed the new tutorial to the next cohort of business students and questioned them.

The other project examined distance students' engagement with library services and resources to determine potential barriers to equity of access. Previously, library services to distance students have been minimal. However, the growth of this section of our client base has increased and we want to meet their needs. Informed by the results of a survey, an intervention incorporating eLearning technology was introduced. The group was re-surveyed and individual interview were conducted to obtain verbatim commentary about the efficacy of the intervention for increased engagement.

Our poster will show the results of the action research projects, issues we faced and our future plans.

Keywords: e-learning, distance students, information literacy, engagement, equity

Discussion

Student engagement with online library services and tutorials is most effective when there is collaboration with teaching staff and students. It is important that lecturers are involved so that library staff can develop resources that are tailored to the needs of particular courses or assessments. Information resources and tutorials re most effective when used at point-of-need (Kimok & Heller-Ross, 2008). This way lecturers can encourage and demonstrate to their students how and when to use the online tutorial resources.

Students need to be involved in the creation of the tools so that the style, wording, language, access point, speed and length of resources are appropriate to their needs. It also highlights to students the purpose and value of resources and allows library staff to discover what is needed or if there are any gaps.

This has been a small but valuable project, allowing us to fine-tune a particular resource, more importantly to discover for ourselves that targeted and embedded resources are, as we expected, the best way to go. It has also identified some more effective methods of teaching information literacy in the classroom and sown the seeds for greater collaboration with the teaching staff.

Project two established the engagement of distance students in a small Not-for-profit paper with the library services and resources. Survey results indicated the depth of engagement with library services and resources was non-existent which was disturbing given the prevalence of literature indicating the importance of these to distance students (Ismail, 2010).

Using eLearning technology we sought to increase the engagement of the students with library services and resources. As with the previous project, targeted embedded services and resources in the classroom, both physically and online were the most effective (Bancroft & Lowe, 2006; Bower & Mee, 2010). This has implications for courses that are populated by distance students. Creating relationships with students is key to reaching out to distance learners (Gall, 2010) and this was particularly important for this class. As with other studies, technology difficulties created barriers for many in this cohort of students (Lee, 2008).

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Equity in Group Work Methodologies

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Collaboration is a necessary graduate attribute and is regarded as an effective way to increase learning and understanding. Technologies in education have vastly extended the opportunity for collaborative approaches to learning due to anywhere/anytime accessibility. However, whether in the virtual environment or in person, barriers to collaborative group work persist.

To determine potential group work barriers, this exploratory study investigates student responses within an online environment that utilises a range of collaboration tools, together facilitating a student peer-reviewed group research project in first year human biology. Pre- and post-activity surveys were conducted and revealed persistent perceptions of inequity with regard to group work participation. However, the surveys also indicated that on an individual level there was broad agreement of benefits gained throughout the collaborative process.

The results indicate that a major barrier to student engagement with collaboration relates to perceived performance of others, and not with perceived self-improvements experienced via the collaborative process.

Keywords: Equity, collaboration, group work, peer assessment, large classes.

Introduction

Acquiring a range of graduate attributes that contribute towards life-long learning is a hallmark of the assessment era and a crucial point of departure from the testing era as indicated by Birenbaum (1996). Group work and peer assessment as methods for engendering learning provide a pluralistic approach (Dochy *et al.* 1999) that increases student involvement via collaboration, role adoption, and a greater sense of responsibility.

Collaboration is a necessity within the health industry, an effective way to increase learning opportunities, and provides a realisation of individual strengths and weaknesses. This study explores students' attitudes within a combined group research and peer assessment activity in order to inform the development of strategies to improve group work experiences within a first year foundation Health Sciences course.

Background

Drivers supporting the adoption of group work and collaboration include enabling technologies, large class strategies, student diversity, and evidence of benefits derived from collaborative learning. The range of collaboration methods that have been applied within the first year Human Biology course associated with this exploratory research are briefly described below:

Peer Assisted Learning Strategies

Peer Assisted Learning Strategies (PALS) is a process where higher level students provide cross-year support to assist lower level students during their learning process (Ricci & Peirce, 2010). The benefits of peer assisted learning are related to the non-threatening interaction between students and their peers in that peers are not involved in assessment, may be perceived on a similar level to the students, and provide a cooperative approach to understanding course content. Other notable and similar methodologies are PASS (Peer Assisted Study Sessions) and PAL (Peer Assisted Learning) (Howman *et al*. 2002).

Team Based Learning

Team based learning is a methodology that promotes student interaction within small groups to encourage more active and effective learning (Michaelsen *et al*. 2004). Implementing team based learning requires appropriate course structure design to enable collaborative learning to occur, and adopts a transformative approach leading to several kinds of higher level learning attributes.

Self & Peer Assessment

Self assessment is reflective in that it enables the student to step back from their learning process and consider the effectiveness of their learning strategy. It encourages student independence by accepting a sense of responsibility for their learning process. Peer assessment extends the benefits of self assessment by allowing students to critique and evaluate the work of others. This deepens the potential for reflection during both the peer evaluation process, and in receiving and responding to evaluation from peers. Peer assessment concerns assessment between students of the same or similar educational status and includes individuals and or groups of students within the same course or subject. Topping (1998) indicates that peer assessment of writing and using marks, grades and test have shown positive formative effects on student achievement and attitudes. Topping also suggests that these effects are on par with or more effective than teacher assessment.

Research Skills Development Based Rubrics

The research skills development framework is a conceptual model that locates research skills on a continuum of student autonomy (Willison *et al* 2009). The model encourages students along a pathway beginning with a relatively high degree of structure and guidance, to a relatively high degree of open inquiry and autonomy. The research skills development framework has been incorporated into a structured assessment rubric that encourages student research development and assists in the acquisition of skills and motivations necessary to progress to higher degrees by research. Whilst RSD is not in itself an individual or collaborative learning method, it assists in the goals of collaboration to the extent that it encourages student autonomy.

Methodology

The collaboration and assessment strategies described above have been integrated within a semester long group research project in the course of first year Human Biology. Given the range of learning methodologies and technologies applied, exploratory surveys relating to team based learning, self and group reflection were conducted over the study period with the aim of revealing any barriers to creating a successful group work and peer-assessment learning environment.

Students were randomly allocated to groups (n=49, ~5/group) to undertake the semester-long research project based around scientific research, refinement and presentation of a general human biology topic. Task objectives, guidelines and assessment criteria relating to group collaboration, communication and research were provided to students.

The entire project, including its assessment, was undertaken within an online environment utilising learning management system technologies, wiki's, and a purpose-built group peer assessment application. Methods and strategies utilised in the activity included group work information sessions, peer assisted learning – PALS (Ricci and Peirce 2010), RSD rubrics (Willison and O'Regan, 2007; Peirce and Ricci 2007; Willison *et al.* 2009), and rubric guided feedback via peer assessment prior to final project submission. A range of team-based learning, attitude to group work and reflective surveys were conducted prior to and after the group work period with the aim of revealing any major potential barriers to engagement with group work and peer assessment.

Pre-activity

Prior to the group work activity the students (n~160) completed a Team Based Learning survey in order to determine their attitudes towards group work with respect to content covered, equity, motivation, socialisation and effectiveness. After obtaining initial data on attitudes towards group work, the students were then given a brief presentation on organisational behaviour theories that underpin effective group work, including differing learning styles, motivations, communications, and varying stages throughout a collaborative project.

Activity

The students worked together in groups of approximately five members in creation of a human biology research project. The group work activity represented 30% of the total assessment, the remainder consisting of 10% individual assignment, 15% online activities, and 45% final exam.

The students were assessed on their research content, their group work process, and on their ability to peer-evaluate the work of another group. The peer evaluation was conducted using a purpose built online rubric assessment application that required justification to be provided for selected assessment criteria, and an instructor feedback mechanism. Groups were required to respond to peer evaluation and demonstrate how suggestions were implemented or, if not, then why. On project completion the student groups created research project poster presentations, and prizes were awarded for the best group research poster over a number of categories.

Post-activity

During the final poster presentations and research completion ceremony, and for the purpose of comparison, the students were once again given the same Team Based Learning survey as provided prior to commencing the activity. The students were also asked to complete a brief self-reflection survey inquiring as to the perceived benefits of group work for themselves and for others in their group.

Results

The pre-activity team based learning results indicated overwhelmingly that the students regarded that the more able and motivated students would end up doing most of the work within a collaborative environment. It was also regarded that less content would be covered within a collaborative learning context, and that time would be wasted socialising. However, approximately half of the survey participants felt that knowledge of group work theory would lead to more effective group work practice.

Table 1: Comparison of Pre and Post Activity Results

Group work means that:	less content will be covered	better students do most of the work	less motivated students will "free-ride"	time is wasted socialising	results are ineffective with no group theory.
Pre-Task Survey *(n=160)*	6.6	7.8	7.6	6.0	5.0
Post-Task Survey *(n=160)*	6.9	7.7	7.2	5.3	4.9

Comparison of the pre- and post-activity team based learning surveys indicates that students' attitudes with respect to others within a collaborative environment were largely unchanged. There remained broad agreement that the "better" students end up doing most of the work, and less motivated or less capable students "free-ride" on others.

Table 2: Group Work Self-Reflection Survey

Student self-assessment of performance survey *(n=181)*	T	F	n/a
I am more aware of the skills required for working effectively in a group	95.6	4.4	0
I am more aware of my strengths and weaknesses in interacting with others	85.6	14.4	0
Overall, the group work activity was a positive experience for me	77.3	22.7	0

In the self-evaluation survey, however, students reported a favourable disposition towards group work. Greater than 95% of students reported an increased awareness of the skills required for working effectively as part of a team, 85% were more aware of their individual strengths and weaknesses, and 77% communicated that their group work experience was positive.

Discussion

The pre- and post-activity team based learning surveys relate to a perceived sense of equity with regard to the performance of other students within the group. However, the self-reflective survey relates to the perception of one's own measure of their contribution. A major discrepancy was found between the others-oriented evaluations and the self-oriented evaluations of group work contributions over the collaboration period. While the others-oriented evaluations remained largely unchanged over the period, on individual reflection there was broad agreement that each group member themselves had achieved improvements on a number of group work related dimensions.

Collaboration is shown to be of benefit to student learning and engagement, yet group work continues to be met with either reluctance or resistance from many students. While students overwhelmingly perceive improvements within themselves via the process of collaboration, it appears that they also conversely perceive that their relation to other group members does not improve. Therefore, a major barrier to group work resides not in how the students feel about their own capacity for achievement within this environment, but in how they perceive the achievement of others.

Given the known benefits of collaboration and in order to remove perceptual barriers towards group work, it is recommended that a focus on what others can achieve be communicated, rather than reiterating what the individual can achieve within a group work environment. Communications of this nature will address the current others-oriented barrier with regard to group work acceptance, and also address misperceptions in regard to the wider benefits of a collaborative environment. Put another way, a communication of others-oriented benefits is likely to assist in supporting the collaborative environment by shifting the focus from a "what you can gain from group work" perspective to a "what group members can gain from group work" perspective.

Conclusion and future work

Exploratory research within a technology-enabled group work peer learning environment has been conducted with the aim of revealing potential barriers to group work acceptance. Preliminary results indicate a major discrepancy in the perceived benefits of group work depending upon whether an others-oriented or a self-oriented viewpoint is reported.

The self-oriented reports were found to be congruent with existing literature in that group work is regarded as beneficial in areas of skill building and effectiveness, whereas the others-oriented reports were found to contradict benefits described in existing group work literature. We can conclude that others-oriented perceptions with regard to group work creates a major barrier to group work acceptance, and that this perception is at odds with the known benefits.

Based upon the preliminary findings, it is suggested that barriers to group work may be effectively addressed via communication of others-oriented benefits, rather than via appeals to self-oriented benefits. Further investigations into effective group management and communications may assist in resolving perceived equity issues and in reducing barriers to group work. A reduction in the barriers to group work acceptance will allow for a greater number of collaborative benefits to be realised.

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Beyond the simple codes: QR codes in education

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As mobile technologies become increasingly prominent in our daily lives, mobile tagging with QR (Quick Response) codes in the business sector is prevalently in many parts of the world. However, we believe the movement of using QR codes in education is still in its infancy. Apart from our own research in this area, this paper explores the possibilities beyond the simple use of the codes and offers some suggestions on how the technology can be used to its full potential.

Keywords: QR Codes, m-Learning, Smart Mobile Devices

Introduction

QR codes can literally hold any kind of information up to several thousand bytes. Coupled with a moderate equipped mobile device, it opens up a new horizon for many applications in the commercial world as well as in education. From hospital applications to labels of wine bottles, we can find QR codes everywhere commercially. In education, we believe that the movement of using QR codes is slow and still in its infancy. Many researchers are very excited about the technology and found the use of QR codes in education fun. They felt that the technology is easy to use, easy to implement, and, to a certain extent, low cost. This observation is quite obvious when we search the web and we can find many web links related to the educational use of QR codes in education. Some researchers have gone beyond this initial stage and start questioning the legitimate use of the technology. This paper is in this direction and offers some suggestions on how the technology can be used to its full potential.

Before we go on to discuss the use of this technology, we must first provide what a common decoder such as *i-nigma* (3GVision, 2010) can do with the codes. Figure 1 illustrates the different natures of QR codes that can be very useful for education and personal use. One must be aware that not all readers can handle these different types of codes and not all generators from the web provide the facilities to generate such codes. Interested readers can refer to Law & So (2010) for the process of generating and decoding QR codes.

Text: any textual information can be embedded	*URL*: a link to Youtube (the audio exercise described below)	*Event*: ascilite 2011 (dates and location can be directly inserted to the device's calendar)	*Geo Location*: Wrest Point's coordinates; ascilite 2011 conference location (directly map to Google Map etc.)	*Contact*: can store the information directly into the address book or call the phone number directly	*SMS*: can send the message to the destined phone number directly	*WIFI Setting*: can set the device's wireless connection (e.g. SSID, password, and protocol) if the device can accept it

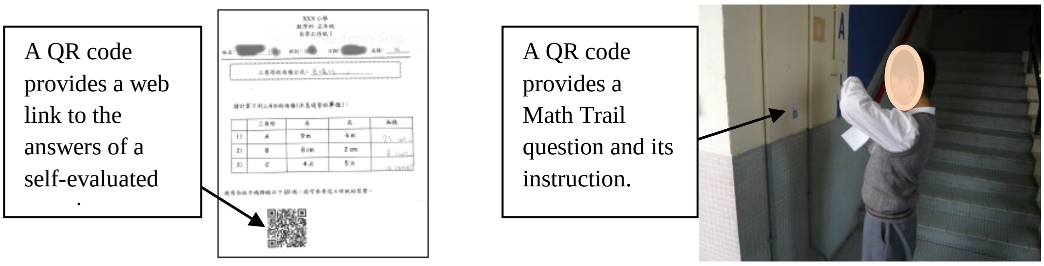
Figure 1: Different natures of QR codes can be processed by a typical decoder

Exemplars of applications

We will also provide some examples of QR code applications in education from our own research (Law & So, 2010) and other examples from the research community. Although these examples certainly cannot represent the whole picture from the literature, these are typical applications and can form the exemplars for our discussion.

Review the information directly

When information is embedded into a QR code, the user can retrieve the content directly through the mobile devices. Answers for self-evaluated exercises can typically be retrieved in this way. Figure 2(a) shows a worksheet for the experiment we tried in two primary schools in Hong Kong. The students can work on the math questions and check the answers for themselves. For straight forward and simple answers, the answers can be stored directly into the code. For more complex answers, the answers can be retrieved from the web. Figure 2(b) shows another example of information embedded into the QR codes. A group of primary students participated in a competition of Math Trail (Shoaf, Pollak & Schneider, 2004). The questions are embedded into the codes and students have to complete the trail as fast as possible by answering the questions from one location to another and write the results and observations onto a worksheet.



(a) (b)

Figure 2: (a) A worksheet for a self-evaluated exercise. (b) A student carried out a Math Trail competition

Access the multimedia resources from the web

This type of applications requires the learner to have a device that can play or display multimedia resources from the web. It can also be web pages to be retrieved by the learner. Figure 3 (a) shows a listening exercise performed by a group of primary students in a primary school. They listened to a Youtube clip referred by the URL on the worksheet. Podcast materials or video clips can be accessed via the QR codes printed on books or notes. Students can also pick up QR codes from slide projectors or computer monitors. Figure 3 (b) shows an outdoor activity of a life science subject. Students can learn different species of trees at a garden by accessing the web pages via the codes.

(a) (b)

Figure 3: (a) A listening exercise. (b) Students can explore a life science subject via QR codes

Other examples are reported by the educational community

Beside learning and teaching applications, there are many reported examples of personal or administrative use of QR codes. Interested readers could refer to the literature listed in the reference section. We can loosely highlight some of them as follows:

- History learning with QR codes (Chen & Choi, 2010)
- A QR code associated with each record on a library catalogue (Bath, 2010)
- Assignment submission sheets bearing the relevant QR code (Bath, n.d.)
- Automatic generation of a QR code to the bottom of Moodle print-outs (Bath, n.d.)
- Posters, flyers and catalog with QR codes indicating the websites (HKIEd, 2011)
- Language learning supported by QR codes (Liu, Tan & Chu, 2007)
- A periodic table with each chemical element represented by a QR code (Stefano & Rizzo, 2009)

Where QR codes can make the difference

Quick access and fun to use are two obvious reasons for people like to use this technology. But why the technology has a slow pick-up in education? Are people aware of the full potential of this technology? One may argue that although smart mobile devices are getting popular, many people like teachers and students do not have the devices. They cannot fully understand the potential of this technology can bring to their daily teaching and learning. In any cases, the following discussion highlights the capability of the technology beyond its typical use. The ideas presented in this section could be of interest to some of the researchers in the area.

Extend learning to outdoor activities

The ubiquitous nature of accessing information through mobile handheld devices creates a so-called *u-space* for learners. Rather than carrying a laptop or other bulky devices to a location outside the classroom for learning, a learner can immerse into the learning process through a pocket-sized device. For example, our Math Trail activity or any treasure and scavenger hunt allows the learner to access questions and information at a spot outside the classroom. The code can also review the next location as we did in our activity. In fact, QR codes can also provide delayed information to the learners or players (see explanation below). This allows the process of carrying out the outdoor activities more sophisticated and interesting.

For outdoor exploration of subjects like Life Science described in the previous section, QR codes can really shine. The codes provide the required anchors to retrieve the additional resources. Extended learning can therefore be quickly established. Furthermore, this approach can give the learner a bookmark she or he can retrieve later. A trace of visited websites or information can be valuable to the learner for revision. We can facilitate social interaction through blogs, wikis and any social networking software via QR codes as well.

Location-based activities or activities related to geographic location can also be provided through QR codes. As shown in the introduction section, geographic positioning coordinates can be embedded into a QR code. By reading the code, the device can directly invoke a map to pinpoint the location. Many activities can be established by making use of this possibility.

Provide interaction among learners and tutors

Beside the social interaction we described above, there are many opportunities for making use of QR codes in classroom. For example, a voting system can be created with QR codes and handheld devices to accept responses from the learners during lecture. In other words, we can establish a personal response system (PRS) to allow interaction among learners and tutors. The tutor can display various QR codes onto the projector and the learners can choose different codes according to their choices. Different codes with printed responses can also be made available on a piece of paper. Once the selections are made, the responses can be stored at the server. The tutor can activate another piece of software to review the statistics and individual responses. We believe this is an effective instructional strategy (So, 2009).

Assessment is an integral part of any learning and teaching activities. Imagine that learners can participate in a test that QR codes not only can provide the questions and self-evaluated answers like the worksheet described above. The teacher can monitor the progress by observing the flow of answers, interaction and timing. This kind of dynamic information is valuable and reflective to the teacher.

Require an extra step to get the information

Paradoxically, the extra step to get the information through the scanning of the code is sometimes advantageous. There are several reasons to this. Firstly, the content can be changed dynamically. Using the listening test as an example, we can replace the content at the last minute for different learners if the content is just a file at the server. Furthermore, question banks can be adopted for various tests. After all, the QR code can just be a label to a piece of information at the server. We can override the information easily. Secondly, the delayed information prevents the learner to look at the information directly. The periodic table of elements in Chemistry is a good example on this. Normally, whether we like it or not, we have to remember the positions and properties of some elements in the periodic table when we study Chemistry in high school. If the periodic table is made out of tiles of QR codes, we can turn it into a fun memory game for students. This kind of challenge should be less boring than dry memorization!

Trace the time stamps of scanning QR codes

Most readers provide the history of reading the codes. Some readers provide the time stamp when the code was scanned as well. If this is the case, this level of information can be used for analysis and for record keeping. The timing on when the learners respond to the questions is important for some activities. Therefore, if we can collect this piece of information, we have a dynamic picture of the learning process. Furthermore, we can verify the activity has been performed at the appropriate time.

Exchange encrypted information

As mentioned before, any kind of information can be embedded into the codes. It is entirely possible that the information may be encrypted for those who have the keys to read the content while the code can be read by anyone. We can explore the XML technologies to encrypt information or just to use the public key infrastructure to carry out the encryption. After all, QR codes can handle plain text or binary characters.

Summary

QR codes can be very versatile to use. The growing use of QR codes in business sector does not equate to more use in education. In fact, they have been slow to catch on. From our previous research, we provided examples on how the technology can be used. In this paper, we explore beyond the simple use of the codes and offer some suggestions on how the technology can be used to its full potential. Some ideas are directly extended from our previous research. They can inspire other researchers in the area to explore.

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Why should I use this?
Adopting a social network site in tertiary education

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This paper reports an ethnographic study in which I investigated how students made sense of, and in their turn shaped, a social network site in intensive courses in film and media production. Broadly based on a sensemaking approach, the study aimed to reveal how students' expectations, strategies, 'knowledge gaps' and other perceptions of the situation and digital affordances shaped the use of a social networking space. Results showed that students brought expectations that were sometimes met and sometimes not. The paper suggests that while preserving students' freedom of choice, the institution should aim to clarify how online tools fit into the larger environment of learning and offer strategies in their use. Learning design should an ongoing process of students' and online designers' collaborative sensemaking.

Keywords: social network site, sensemaking, affordances, film, media.

Background

When confronted by a new online environment for learning, students are asked to make sense of it and fit it into their existing online life and study routines. How we expect or hope students will act in that environment does not always line up with what they do in reality (Goodyear & Retalis, 2010)—especially if the environment is informal. As Halverson (2011) suggests, there is a trade-off between freedom of choice in a site and promoting its use for achieving specific learning goals; this may be addressed by 'attending to which features users already see as interesting and important' (p.65) and co-opting them to serve learning goals. It will take less persuasion to encourage students along a path they are predisposed to follow. Understanding how students make sense of their learning situations and affordances could inform the design of better learning spaces and support.

In this ethnographic study, I researched a social network site that I as an online learning designer set up for all award course students at an Australian media school (Spence, 2011). The site used Ning software and services that provide user profiles, media sharing, events, blogs, forums and groups. Several teachers used the site for informal information sharing, but overall the site was not formally integrated into curriculum and students were free to use it or not. The reliance on often numerous crew members requires media production students to network for projects; and it was hoped that students would use the site, with a membership of over 400, to share information and communicate within and between disciplines and courses. My study aimed to investigate students' actions, experiences and perspectives with an aim to inform further development of the learning environment.

Conceptual Framework

This research employed the concepts of sensemaking and affordances. These concepts share a common foundation in the interdependence of the human (perceptions, experience, actions, goals, etc.) and the environment (tools, design, structure, etc.). While sensemaking is more associated with deliberately working out action, the notion of affordances assumes a more natural or spontaneous recognition of possibilities.

'Sensemaking' comes into play when organisations and individuals have to work out ways of operating and communicating in unclear or novel situations; such as the adaptation of new collaborative software to local circumstances (Weick, 1995; Bansler & Havn, 2005). Sensemaking is characterised by 'extracting' cues from the familiar in a novel situation, focused on doing only what is needed to get the job done and is realised through action (Weick, 1995). Sensemaking is highly contextual and ongoing and changes with time and circumstances (Dervin, Foreman-Wernet & Lauterbach, 2003). For example, a student who avoids Facebook in their private life may happily post on an online class wall, recognising its unique affordances, and vice versa.

Technology does not provide an affordance independently of the person perceiving it: 'An affordance points both ways, to the environment and to the observer.' (Gibson, 1986, p. 129). An affordance arises out of the needs of the person, their experiences and history acting within the environment to recognise a useful function or benefit. Observing sensemaking in action offers a way to understand student experiences and practices for design of better, more 'visible', learning affordances.

In my research I observed and investigated how students made sense of the new site, the cues they took from the environment and how they applied their own experiences and goals to their actions.

Methodology

My study broadly followed an ethnographic approach and combined a range of ethnographic data collection techniques: observation, interviewing and analysis of digital artefacts and student online interactions. My notes consisted of observations of unfolding activities, the level, type and tenor of participation across the site. These notes then formed the basis for selecting some individual students and one group's online interaction records for detailed analysis. The selected group was particularly active. Their communication was analysed broadly using the categories of 'social', 'procedural', 'expository' and 'cognitive' interaction (Oliver, Omari, Herrington, 1998). The ten students selected for interviews included two members of the target group and eight students who engaged at different levels in the site from a number of disciplines. Interview questions were based on the sense-making methodology (Dervin, Foreman-Wernet & Lauterbach, 2003). I started interviews with questions about current concepts of and actions on the site, such as 'How would you describe the site to someone who is new to it?' I then moved to questions that were retrospective and attuned to Dervin's area of helps and hindrances, gaps in understanding and sensemaking processes. For example, 'When you started, what did you think the site would be useful for?' and 'What was an obstacle to you doing what you wanted to?'

Results

Results showed that while the site was student-led, it was used for course-related information and activities rather than for social interaction. The lack of 'off-topic' content pleasantly surprised some students: 'people would just add information rather than people commenting about friends' (Student 8). Many students were only marginally active, but others found a variety of ways of using the site to serve individual and group needs. Summarised below are some insights into how students made sense of the site and its affordances in their learning.

The selected study group of students shared quick snippets of information, support and affirmations on their common wall; 'we didn't want to use [the site] as a learning tool outside of very short, sharp bits and pieces' (Student 10). The way the group wall was used echoed a wall on Facebook, in the brevity and sociability of the messages and visibility of the conversation. The group mainly helped its part-time students connect to each other: it 'allowed me to relax a lot quicker and ... disclose my passions' (Student 2). Students often compared Ning—'I thought it might have been more active' (Student 5)—to the familiar busy Facebook, but also noted positive differences, such as: focus on subject, ‘Facebook is for friends but [the site] is more professional’ (Student 5); the implied permission to contact teachers informally; access to trusted members with common interests; and a private publishing space—‘a safer place to put [video]’ that YouTube or Facebook (Student 4).

The study group chose to use Ning over a space set up in the learning management system (LMS). Students noted differences between social interaction and activity in the LMS (Moodle) and the social network site (Ning): the LMS ‘just feels more lonely. It’s just you in there’ (Student 10). Being able to see what others in the site were doing ‘made us feel part of the wider [School] community’ (Student 11). Within the wider community, however, the smaller group was valued for its trusted, known membership. This was brought into focus in the course of the interviews when the two group members were surprised, if not shocked, to be told that the group was not actually private as they had assumed. Lack of clear instructions for setting up groups and lack of visual clues in Ning led the group to assume you needed to be a member to see group content. The conversations within the group were candid and occasionally personally revealing, so this was a case of a sort of ‘false affordance’ inspiring communications that would have differed if the actuality was known.

Gaining help on projects was the most strongly chased affordance, through networking with likely collaborators. Profiles and public discussions were generally not seen as particularly relevant in creating connections and collaboration; ‘You establish yourself [in the site] and it is more of a forum to lead to interaction, rather than a place for interaction itself’ (Student 5). The degree to which this applied, and the mix of activities, differed between individuals. For example, Student 9 networked extensively, participating in online discussions and privately messaging other members before arriving in semester two. On arrival, he met those people in person and worked on an astonishing 32 productions, generated from initial online contacts. He had not used a social network site before.

Students’ had differing expectations of how Ning could be used in their learning. For example, many especially full-time students, after joining and setting up a profile did not see the point of ‘coming to’ Ning, seeing it as yet one more password to remember for little payback. Comments included: ‘it doesn’t have a mission statement’ (Student 6) and ‘I didn’t see the point of it at first… because they go home and they have to get onto Facebook and onto [the Ning site]’ (Student 8, who did end up seeing a point in it).

The site was new and took some time to build up content and activity. By the time a group of part-time students had started in second semester, many of the full-time students were no longer visiting the site. Part-timers, less plugged in to the network on campus, were eager to find collaborators for their projects and were responsible for close to 90% of the 91 project callouts posted in second semester. However, ‘the problem is that people didn’t use it early in term, and so now when people are trying to conduct crew callouts on it, there isn’t an attentive audience’ (Student A).

Other students had expectations that were not met, noting unexploited opportunities for professional collaboration and learning. For example, one interviewed student expected that ‘there would be a great deal of film discussion, across all areas’ (Student 1). Another student suggested that there is potential for peer review and critique of student projects. She noted ‘there was a big leap from what we initially presented… to what we presented at the end’, and the opportunity, rather than be unaware of what each other was doing, to ‘offer each other feedback during the process’ (Student 10). One example showed the link between course design and students’ use of the learning affordances. After this study was completed, the full-time courses introduced an assessment task that used the Ning site to blog about film-related subjects. The number of posts tripled from the previous year’s total within two months, providing some of the hoped-for deeper exploration and film discussion.

Discussion

Questions around students’ expectations and obstacles led to interesting descriptions of what social learning space *should* be in an institutionalised learning space. By asking what they expected to be able to do or expected to see happen, students’ predispositions and preferences became evident. The questions elicited ‘aspirational narratives’ (Wenger et al., 2011). While students had some ideas at the beginning of the course of what the site might afford them, it was after using the site that much of the considered ideas were formed: sensemaking is clear only in retrospect.

What the interviews revealed were the ‘hidden paths’ (hidden at least from me as an administrator of this site) that the students trekked in their daily lives, both within and beyond the target site. Student preferences and predilections such as those in the findings might be incorporated into the design of a learning environment. For example, by considering ways that a course or unit could be located within a visible wider online community or publishing a wall of student contributions on unit home pages. There should be sweet places where students are predisposed to an activity, but need the ‘sanction’ of instructions or assessment to inspire action. There will also be instances of limited experience and stretched sensemaking skills, where guidance in the affordances for learning is needed before students are prepared to jump into online activities. There is striking tension between the needs of particular learning situations, affordances and institutionalised eLearning infrastructures. An approach that focuses on the specifics of a particular situation and group of students poses the question of how to balance ease of administration with targeted design and agency. The sense-making methodology offers a way of incorporating students as co-designers (Collis & Moonen, 2008) of the learning environment, particularly after they have had some time using the online tools for their purposes. Further research could consider how the sense-making methodology could incorporate student perspectives into an ongoing design plan for learning environments.

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Engaging the online learner: Student reactions to the use of audio podcasts in off campus courses

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Abstract

The topic of high attrition rates in distance courses is well documented (Holder, 2007; Patterson & McFadden, 2009) and a lack of personal interaction and support are cited as contributing factors for student drop out (Carr, 2000; Street, 2010). New technologies provide opportunities to personalise the experience for students studying at a distance (Lee, Tan & Goh, 2004) and there is a growing body of research on the use and effectiveness of audio and video podcasts in higher education (Bolliger, Supanakorn & Boggs, 2010; Taylor & Clark, 2010). This study explores the effectiveness of audio podcasting as a tool to engage students studying by flexible delivery at a dual sector tertiary institution in Australia. Surveyed students reported that educators used the audio podcasts to announce weekly requirements, explain complex concepts, provide guidance about assessment and to add information related to the unit content. The study suggests that the use of audio podcasts may be effective as a way of personalising the learning experience for students studying off campus. Students reported that they felt more connected to the educator through listening to the podcasts and appreciated the variation in technology as a way of keeping their attention. The low cost and technical simplicity of recording and listening to audio podcasts suggests that it may be an accessible and cost effective method of engaging students studying at a distance.

Keywords: audio; distance education; engagement; personalisation; podcasts; retention

Introduction

Online education in Australia is growing at a rapid pace with an estimated growth rate of 20% per annum over the next five years (Kidson, 2010). However, attrition in online courses far outstrips that of its on campus counterpart (Carr, 2000; DiRamio & Wolverton, 2006) and the issue of retention in online courses is the subject of many studies (Berge & Huang, 2004; Betts, 2008; Tyler-Smith 2006). The use of podcasts as a tool for delivering educational content, guidance and feedback has become popular in recent years (McGarr, 2009) and there is a growing body of research on the use and effectiveness of audio and video podcasts in higher education (Bolliger, Supanakorn & Boggs, 2010; Taylor & Clark, 2010).

The College, a dual sector tertiary education provider, offers both on and off campus delivery to approximately 3,500 students. Consistent with findings reported in the literature, the College has been facing high drop-out rates of students studying off campus. In an attempt to better engage students studying off campus, an audio podcasting pilot was launched early in 2011. This paper reports on the findings of the pilot study with the first section presenting an overview of the relevant literature and more information on the context of the study. The paper then provides details about the methods employed to collect data, discusses the findings and suggests ideas for further research.

Literature Review

There have been a large number of studies focusing on the topic of student attrition in higher education, with Tinto's (1975, 1993) findings being drawn upon heavily in the literature. Tinto suggests that, among other factors, social interaction and integration into the institutions academic culture contribute to student retention. In higher education, the term 'engagement' is used to describe students' involvement in activities that lead to positive outcomes, including retention (Krause, 2005). Such activities may encompass academic, non-academic and social elements of the student experience (Coates, 2006).

Student engagement and integration

Engagement and integration is an important concept in the literature on retention and it is well recognised that the development of relationships, with other students and with teaching faculty, is one key factor in the engagement, integration and retention of students (Betts, 2008; Rovai, 2002; Tinto, 1993). Specifically, the role of faculty contact has been identified in a number of studies as a key factor in student retention (Betts, 2008; Chickering and Gamson, 1987; Miller, 2007; Sweet, 1986; Terenzini and Pascarella, 1980).

Integrating and engaging distance and online students is especially important as dropout among this group is frequently attributed to feelings of isolation, a lack of engagement and personal contact (Angelino, Williams & Natvig, 2007; Carr, 2000; Pugliese, 1994; Sweet, 1986; Wojciechowski & Palmer, 2005). Engaging and integrating distance and online learners has traditionally been more difficult to achieve (Rovai, 2002) given the physical separation of students from the institution, teachers and other students.

However, strategies and interventions to engage, and possibly retain, the distance and online learner abound. Early and frequent faculty-initiated contact has been identified as having a positive impact on student persistence (Angelino, Williams & Natvig, 2007; Nash, 2005; Rovai, 2002; Sweet, 1986). Methods such as emails, phone calls and bulletin board posts are common suggestions (Angelino & Natvig, 2009; Sweet, 1986) with some advising quite specific formulas for student contact (Ali & Leeds, 2009). Such strategies however, can prove difficult to sustain with large numbers of students (Nash, 2005).

Attendance at an orientation session has been reported as a factor in the retention of students studying at a distance (Ali & Leeds, 2009; Wojciechowski & Palmer 2005). Such sessions can assist students to prepare for study, provide technical advice and skills (Ali & Leeds, 2009; Carr, 2000) as well as providing an opportunity for the early formation of relationships (Ali & Leeds, 2009; Rovai, 2002). Supplemental tutoring and the provision of online support services have been identified as a strategy to address attrition in distance and online courses (Angelino, Williams & Natvig, 2007) and Nash (2005) argues that extra tutoring, whether provide by peer students or paid faculty, can assist in providing much needed guidance and support to those studying online or at a distance.

While these strategies may assist in retention, the literature highlights the difficulty of engaging students in these activities. Distance and online learners are often characterised by their independence, autonomy and lack of available time, and therefore may not desire or be able to engage in a high level of interaction with fellow students and educators (Nash, 2005; Rovai, 2002). Nonetheless, making meaningful contact with others, the development of relationships and building of social connections and communities is clearly a critical element in efforts to engage and retain students in online and distance courses (Ali & Leeds, 2009; Betts, 2008; Miller, 2007; Rovai, 2002). Within this, and perhaps most critical of all is the 'presence' of the teacher and the impact of their interactions with students (Miller, 2007; Rovai, 2002; Savery, 2005).

Changing technology and changing demands

Recent advances in connection speeds, reduced technology costs and greater access to personal computers, laptops and mobile devices mean that more people than ever are 'connected' and able to access information and education via the internet. Technology is now integrated into everyday lives with eight out of ten Australian households having an internet connection, broadband comprising ninety-five percent of this group (Ewing & Thomas, 2010) and this trend is set to continue with the future rollout of the national broadband network (Australian Government, 2011). In Australia, online education has grown twenty-five percent each year over the past five years (Kidson, 2010).

Technology, in one form or another, has always featured in distance education (Taylor 1995, 2001) and the advent of, and access to new technologies has provided greater opportunities and possibilities for personalised contact, interaction and integration for students in distance and online programs (Park & Bonk, 2007). Web 2.0 technologies, which support co-creation, collaboration and connectedness (Lee et al., 2004; McLoughlan & Lee, 2010) can allow for the student to play a more active role in the learning process (Brown & Adler, 2008).

Echoing a broader societal trend in the use of technology (Collis & Moonan, 2008), students are also seeking more personalised and customised online learning experience with options and choices that are relevant and meaningful to them (Ausburn, 2004; Bollinger, Supanakorn & Boggs, 2010; McLoughlin & Lee, 2010). While this poses a challenge to current models of teaching and learning (McLaughlan & Lee, 2008), it also offers many opportunities for the sought after development of engaged, participating students in online communities of learning (Rovai, 2002).

Supported by improved connection speeds and reduced technology costs, recent developments in digital media production mean that making, watching, downloading or sharing digital video and audio is now a commonplace activity, with almost half of Australian internet users downloading video (Neilson, 2010) and thirty-five hours of video being uploaded onto YouTube every minute (YouTube, 2011). As this trend continues, demand for the use of such technologies in education is also likely to increase (McKee, 2010).

Podcasting as a strategy to address student engagement

Recent mainstream adoption of multimedia also provides alternatives to text-based communication, which has been widely used in distance and online learning (Betts, 2008). Video and audio technologies in particular can assist facilitating social connections and the availability of different mediums of instruction accommodates different learner styles and preferences (Ausburn, 2004) and can lead to enhanced student performance (Balaji & Chakrabarti, 2010).

According to Salmon and Nie (2008), the use of audio in distance learning is undergoing somewhat of a 'renaissance'. Employed as a learning tool in distance learning for many years via cassette tapes and CD Rom, the learning, engagement and motivational benefits of audio are well documented (Betts, 2008; Bolliger et al., 2010; Durbridge, 1984). The role of the human voice in personalising, creating a sense of belonging and a 'social presence' for the lecturer (Salmon & Nie, 2008; Taylor & Clark, 2010) can have specific benefits for students studying at a distance by facilitating connectedness between members of the learning group and developing a sense of community.

Podcasting is the term used to describe digital files (usually audio and/or video) that are available for users to download and 'consume' at a later time, either from a computer or a portable device. Since the advent of digital audio files and portable MP3 players early this century the uptake of this technology in society has been remarkable, with an estimated one third of UK adults owning an MP3 player, a figure likely to be mirrored in other countries such as Australia and the USA. There is also growing interest in, and use of podcasting in education (McGarr, 2009; Salmon & Nie, 2008; Scutter et al., 2010; Taylor & Clark, 2010).

Podcasting offers a number of possible benefits to student learning experiences and outcomes, including flexibility and learner control, learner motivation and engagement, and enhanced cognition (Salmon & Nie, 2008; Taylor & Clark, 2010). There are a variety of ways in which podcasting is being used in educational settings, with Taylor and Clark (2010) identifying twenty different podcast types. The capture and podcasting of on-campus lectures (audio, video, presentation or a combination of all three) has been well documented (McGarr, 2009; Scutter et al., 2010) and other strategies identified include podcasts to summarise content, provide feedback, give instructions or to conduct interviews (Nathan & Chan, 2007; Taylor & Clark, 2010).

The benefits of podcasts have been documented in terms of flexibility and accessibility (McGarr, 2009; Nathan & Chan, 2007). Enhancement to learning and the student experience has also been identified, especially for students who wish to revise the content at a later date, who prefer listening to reading or, simply in order to feel more 'connected' by hearing the lecturers voice (Bolliger et al., 2010; Salmon & Lie, 2008; Scutter et al., 2010; Taylor & Clark, 2010). However, as pointed out in many studies, it is not the technology itself that provides benefits to learning or the student experience, but the appropriate use of that technology driven by the educational need, within a specific learning context (Anderson & Dron, 2011; McGarr, 2009; Scutter et al., 2010; Taylor & Clark, 2010).

Local Context

The College, an Australian dual sector tertiary institution, offers both on and off campus delivery to approximately 3,500 students in the areas of counselling, management, coaching and psychology. A large proportion of students in undergraduate and postgraduate social science programs study by flexible delivery, which combines elements of traditional distance education, such as hard copy written materials and on line activities, such as access to resources, interaction with the educator and classmates, as well as assessment submission and feedback.

To date, the course content and tools for interaction have been predominantly text-based, utilising threaded discussion boards, live chat facilities, written content and self managed activities. While instructional videos, telephone conferences and individual phone conversations with educators offer opportunities to access multiple forms of media, both the curriculum resources and class interaction is dominated by text.

Consistent with the experience of other tertiary institutions, the College has been facing higher drop-out rates of students studying by flexible delivery when compared with on campus students and a number of initiatives have been put into place in an attempt to improve the retention of students. Previous internal surveys of educators and students have identified the need for more interactivity and 'connection' in the online classroom including the incorporation of a greater range of multimedia technologies.

Given the possible benefits of audio podcasting and the student/educator requests for enhanced media choices, an audio podcasting pilot was launched in Trimester 1, 2011 (February-May). In selecting this technology, the ease of use (for educator and student), widespread access to the technology and suitability for asynchronous delivery was considered. Important in the context of these courses, given that students study wholly at a distance, was the possible benefits of audio podcasting in personalising learner experience. Specifically, it was hoped that hearing the voice of the educator might diminish students' feelings of isolation and enhance their connection with the educator and the College. The benefits of mobility associated with podcasting were less important in the decision to pilot the technology.

The primary aim of this study was, therefore to explore the effectiveness of audio podcasting as a tool to engage students studying by flexible delivery. More specifically, the research sought to examine:

- How podcasts were used by educators and which strategies students found the most useful
- Which characteristics of audio podcasts were important to students – for example *social aspects* such as personalisation, connectedness and belonging and *media aspects* such as media choice or learning by listening

Method

In early 2011, prior to the commencement of Trimester 1, educators teaching in undergraduate and postgraduate social science programs were invited to participate in the audio podcasting trial. Using the college's learning management system, Moodle, an online space for educators, the 'Podcasting Sandbox' was created to provide information, resources and guidance for educators. Step by step instructions on how to download 'Audacity', the freely available software program selected to create digital audio files, was included in the Sandbox site. Literature on the use of audio podcasts was made available and suggestions and ideas about how to incorporate podcasts into teaching were provided. Educator questions and sharing of ideas were managed through discussion forums in the Sandbox site.

The nine educators who participated in the pilot taught across 35 classes with a total enrolment of 620 students. Throughout the Trimester, participating educators used the Audacity program and a headset microphone to record audio podcasts and make them available in their online class spaces. There were no specific requirements placed on the educators in terms of the way in which they could use podcasting in their teaching, however guidance, examples and suggestions were made available in the Sandbox site.

Toward the end of the Trimester, a link to an online survey was placed in the announcements section of each of the classes where podcasts had been used. Students were offered the opportunity to provide anonymous feedback on their experiences of the audio podcasts by following the link to the survey. The survey was made available through the College's subscription to the commercial online survey tool 'SurveyMonkey'. Students gained access to the survey by following the link to the external site. The first page included a statement about the purpose of the survey and information that the survey was anonymous and voluntary. Students could then opt to proceed to the questions or exit without completing the survey.

The survey included sixteen questions with 5-point Likert scale items, one yes/no question and four multiple choice questions. The development of the instrument was informed by the work of Bolliger et al. (2010) and adapted to suit the focus of this study.

The multiple choice and yes/no questions in the survey asked about the way in which the educator used audio podcasts, how often they were used throughout the trimester and whether or not the student experienced any technical difficulty listening to the podcast. The remaining sixteen Likert scale items were divided into two sections. The first, consisting of eight items, gathered information related to 'task orientation' and 'social orientation', which were two major themes arising from Bolliger et al. (2010) study. Task orientation pertains to podcasts being used as an alternative media choice in learning activities and the usefulness of the media for the task. Social orientation relates to the way in which audio podcasts can impact the students' sense of connection and speaks to the personalisation of the students learning environment.

The final eight Likert scale items relate to student motivation and were adapted from Keller's (1987) ARCS Model, which measures individuals' levels of motivation. The ARCS Model consists of four factors - Attention, Relevance, Confidence and Learner Satisfaction. Student motivation was seen to be relevant in the context of this study as lack of motivation and engagement could contribute to student attrition. The eight items in this section of the survey relate to each of the ARCS Model factors. Three items related to Attention, two items each related to Relevance and Confidence, with one item related to Learner Satisfaction.

The data was analysed using the online survey tool's in-built summary and analysis functions including filtering and cross-tabulation. Data was also entered into excel for analysis and reporting. Given the small sample, it was not possible to undertake more detailed interpretive analysis.

Results

A majority of educators expressed an interest in audio podcasting and were provided with access to the podcasting sandbox resources and nine educators proceeded to use podcasts in their teaching. These nine educators taught across thirty-five class groups. Of the 620 students enrolled into those class groups, 73 students (12%) responded to the questionnaire. Two students (2.7%) reported technical difficulties in downloading or listening to the podcasts and of these, one was able to access the podcasts. The other student indicated that they could not access the podcasts. This respondent was excluded from the analysis, leaving a total of 72 useable questionnaires for analysis.

Students were asked about the frequency of podcasts provided by their educator and, as shown in Table 1, just over half (54%) experienced one or two podcasts in the trimester, while 31 students (43%) reported weekly podcasts. Two students (3%) indicated that their educator produced podcasts several times per week.

Table 1: Frequency of Podcasts

Generally, how often are audio podcasts used in your class?	Response Count	Response %
Once or twice in the term so far	39	54%
Weekly	31	43%
Several times a week	2	3%

Students were asked about how their educator used podcasts, which strategy they found most useful and how they would like podcasts to be used in the future. As shown in Table 2, podcasts were categorised into four types: 1) to announce weekly requirements; 2) to explain complex concepts; 3) to provide guidance about assessment; and 4) to add information related to the content. Students were able to choose more than one podcast category.

Table 2: Podcast types

	To announce weekly requirements	To explain complex concepts	To provide guidance about assessment	To add information related to the content	Response Count
How has your educator used audio podcasts?	34 (48%)	32 (45%)	56 (79%)	41 (58%)	71
What did you find most useful?	24 (38%)	30 (48%)	51 (81%)	32 (51%)	63
How would like podcasts to be used in the future?	40 (62%)	52 (80%)	54 (83%)	53 (82%)	65

A high proportion of students (79%) reported that educators used podcasts to provide guidance about assessment, however, educators employed a variety of uses for podcasts, with just under half (48%) indicating that their educator used podcasts to announce weekly requirements and to explain complex concepts (45%), while 41 students (58%) reporting that their educator used podcasts to add information to the content.

Despite reporting variance in the use and usefulness of podcasts types as shown in Table 1, the majority of students indicated that they would like podcasts to be used to explain complex concepts (80%), provide guidance around assessment (83%) and to add information related to the content (82%). Less, but still over half (62%) indicated that would like to see 'announcing weekly requirements' as a podcast strategy in the future.

Table 3 provides a summary of student responses to statements relating to the way in which audio podcasts might assist students in their learning processes (task oriented items a – f) and the social/personal benefits that podcasts may provide (socially oriented items g –h). For ease of reporting the 5-point Likert scale was collapsed into three categories: 1) Strongly Agree and Agree (SA/A); 2) Not Sure; and 3) Strongly Disagree and Disagree (SD/D).

Table 3 shows that 66 students (93%) agreed or strongly agreed that they felt more connected to their educator through the provision of audio podcasts and 68 students (96%) indicated that audio podcasts made their learning experience more personal. Using the online survey tool's in-built analysis function, the frequency of podcasts was cross-tabulated with responses to the socially oriented questions (items g-h in Table 3). The results indicate that of students who experienced podcasts weekly or more often, 27 felt more strongly connected (82% strongly agree) to their educator than those who experienced podcasts less often where 24 (63%) strongly agreed. A similar effect could be seen in item h, whereby 27 students (69%) who experienced podcasts once or twice in the term strongly agreed that the podcasts personalised their learning experience, compared with 26 students (79%) who experienced podcasts weekly or more often.

Task oriented items identify the way in which the podcasting medium can assist student in their learning processes. Two items (e-f) related to the medium of audio and listening as a method of learning. Almost all students (68) agreed or strongly agreed that they like to learning by listening (95%) or enjoy listening as an additional way of learning (96%). Items a-d in Table 3 related to the way in which podcasts may assist students in their learning processes and organisation. Item c rated less favourably than other items with 11 students (16%) indicating they either disagreed or were not sure whether podcasts helped them to know what was expected each week. Further analysis shows that of the 33 students (46%) who experienced podcasts on a weekly basis, 31 (94%) either agreed or strongly agreed that podcasts helped them to know what was expected each week.

Table 3: Task Orientation, Social Orientation

	SD / D	Not Sure	SA / A	Count
a. Podcasts help me to better understand some of the concepts in my course	3 (4%)	3 (4%)	63 (91%)	69
b. Podcasts add depth to my learning	4 (6%)	5 (7%)	60 (87%)	69
c. The podcasts help me to know what is expected each week	3 (4%)	8 (12%)	57 (84%)	68
d. The podcasts help me to focus on what is important	3 (4%)	2 (3%)	65 (93%)	70
e. I enjoy listening as an additional way of learning	0 (0%)	3 (4%)	69 (96%)	72
f. I like to learn via listening	1 (1%)	3 (4%)	68 (95%)	72
g. I feel more connected to my educator through the podcasts	2 (3%)	3 (4%)	66 (93%)	71
h. Podcasts make the learning experience more personal	1 (1%)	2 (3%)	68 (96%)	71

Items in Table 4 relate to the four factors in the ARCS Model (Keller, 1987). Items i-k., relating to 'attention', indicate that podcasts do generally assist in keeping students' attention (94% agreement), make the topic more interesting (88% agreement) and include information that stimulates curiosity (80% agreement). Of the 19 students who disagreed or strongly disagreed with these statements, fifteen (79%) experienced podcasts once or twice during the term and three experienced podcasts on a weekly basis or multiple times per week, indicating that frequency of podcasts may impact motivation.

Results from the 'confidence' factor (items n & o) show that the podcasts reassured 64 students (92%) that they were on the right track and 61 students (87%) felt more confident about what they were supposed to learn. The final item in Table 4 relates to learner satisfaction, where 65 students (93%) reported that they agreed or strongly agreed to enjoyment of learning by use of podcasts. Of these students, 25 (38%) agreed and 40 (62%) strongly agreed to this item.

All items in Table 4 were cross-tabulated with frequency of podcasts (weekly/several times a week and once or twice in the term). The results indicate that the more frequently students experience podcasts, the more likely they are to strongly agree with statements representing motivational factors.

Table 4: Motivational factors

	SD / D	Not Sure	SA / A	Count
i. The podcasts include information that stimulates my curiosity	8 (11%)	6 (9%)	56 (80%)	70
j. Podcasts make the topic more interesting	8 (11%)	1 (1%)	61 (88%)	70
k. Podcasts make my learning more varied and help keep my attention	3 (4%)	1 (2%)	66 (94%)	70
l. There are stories or examples in the podcasts that make the material more relevant to me	8 (11%)	3 (4%)	59 (85%)	70
m. The content in the podcasts is not relevant as I already know most of it (recoded)	13 (18%)	3 (4%)	54 (78%)	70
n. After hearing the podcasts, I feel confident that I know what I was supposed to learn	4 (6%)	5 (7%)	61 (87%)	70
o. The podcasts reassure me that I am on the right track	5 (7%)	1 (1%)	64 (92%)	70
p. I really enjoy learning this way	2 (3%)	3 (4%)	65 (93%)	70

Discussion

The purpose of this study was to explore the different ways podcasting was used (Taylor & Clark, 2010) and the extent to which audio podcasting assisted students' learning processes (Balaji & Chakrabarti, 2010; Daft & Lengel, 1986), engaged students (Bolliger et al., 2010; Keller, 1987) and personalised their learning experience (Betts, 2008; Miller, 2007; Sweet, 1986).

Mirroring findings in the literature (Bolliger et al., 2010; McGarr, 2009; Taylor & Clark, 2010), the results from this study indicate that a majority of students are positive about the use of audio podcasts. Of the students who provided feedback on podcasts, only two (2.7%) indicated that they had technical difficulties. As there were no technical instructions or guidelines provided to students about how to open or listen to the audio podcasts it would appear that technology was not a barrier for most students. This supports findings in the literature regarding the accessibility of audio podcasts (McGarr, 2009; Salmon & Nie, 2008), however, the questionnaire did not ask students to rate their technical skills and, given the low response rate, the issue of technical barriers would need to be explored further.

Students reported that educators used podcasts for a number of different purposes – to announce weekly requirements, to explain complex concepts, to provide guidance about assessment and to add information related to the content. Guidance about assessment was the most utilised by educators and most desired by students. This result may be due to the high priority ascribed to assessment rather than any specific benefit of podcast media. While students reported all four strategies to be useful, it should be noted that nine students (12%) did not respond to the question related to usefulness of podcasts. The lack of response to this question might indicate that students did not have an opinion on the usefulness of the strategies listed, they did not find any of the strategies useful, or their educator did not employ any of the strategies listed. An open-ended question in this section of the survey would be important for any future research so as to better capture students' views on podcast strategies. As student characteristics such as class standing or prior technology experience may also affect results (Bolliger et al., 2010), this data could also be captured in future research.

Student feedback from this study indicates that the vast majority of respondents (96%) 'enjoy listening as an additional way of learning' and 95% 'like to learning by listening'. Additionally, students indicated that they would like to see each of the four strategies utilised in future podcasts, with assessment, explanation of complex concepts and adding information being favoured by over 80% of respondents. While this may well indicate that students want to see more of these specific strategies, it may also be an indicator that students are generally keen to experience a more diverse range of media during their learning activity. Balaji and Chakrabarti (2010) propose that the use of a variety of media, each matched to the purpose of the task, could enrich the communication context and lead to enhanced student learning. The use of audio as a medium for instruction, almost regardless of which podcast strategy was used, may have 'struck a chord' with the students who responded to the survey, especially given that the majority of their learning content was, up until that time, in text-based formats. Alternatively, the purposes for which audio podcasts were used by educators in this study may have just 'worked' better than in traditional text formats (Salmon & Nie, 2008). Either way, a deeper exploration of student views about the use of podcast as an additional media and the way in which the media was used to enhance learning could be incorporated into future research.

One of the objectives of this study was to explore the extent to which audio podcasts assist in connecting and engaging students studying at a distance. Previous studies have shown that the voice of the lecturer can humanise and personalise the learning experience, and diminish feelings of isolation for distance students (Salmon & Nie, 2008; Taylor & Clark, 2010). Responses to the survey indicate that students do feel a sense of connection through the audio podcasts, with 75% of students strongly agreeing and a further 21% agreeing that 'podcasts make the learning experience more personal'. A similar result can be seen for the item 'I feel more connected to my educator through the podcasts' with 72% strongly agreeing and 21% agreeing to the statement. Responses to these items indicate that audio podcasting personalises learning experience for students and enhances feelings of connection to the educator.

Terenzini and Pascarella (1980) and Sweet (1986) found that frequency of contact with faculty was the most significant factor in student persistence. In this study, the results show that students who experienced more frequent 'contact' with the educator through audio podcasts responded more positively to social, task and motivational factors. While an audio recording of the educators voice is not strictly 'contact' with the educator as defined in this previous research, a number of more recent studies indicate that audio podcasts of the lecturers voice, when delivered in a normal, relaxed tone, can make the students feel like they are there with the lecturer, having a private consultation (Salmon & Nie, 2008; Taylor & Clark 2010). In this way, aspects of audio podcasting may simulate personal contact with the lecturer thereby enhancing a distance learner's feeling of personal and social connection. Further examination of which characteristics of audio podcasting best enhance students' feelings of connectedness could be a focus of future research.

Motivation is an important element in engaging students (Bolliger et al., 2010), especially those studying at a distance (Holder, 2007). The results from the eight items relating to motivation indicate that audio podcasts may have a positive effect on student motivation. Keller's (1987) ARCS model of motivation was used in this study and the first factor, 'attention' received positive responses from students, with between 80% and 94% of students reporting that the information contained in podcasts stimulated their curiosity, made the topic more interesting and helped to keep their attention. The second factor relates to 'relevance', or how well the instruction meets the needs of the learner and connects with their previous experiences (Bolliger et al., 2010). Again, students responded positively to the questions representing relevance, with 78% indicating that the content was relevant and 85% indicating that the podcasts contained relevant stories or examples.

Durbridge (1984) found that students liked the encouragement they received from the voice of their lecturer through the medium of audio. In keeping with these findings, podcasts in this study seemed to have a positive impact on student confidence, the third factor in the Keller's (1987) ARCS model, with 87% of respondents indicating that, after hearing the podcasts, they felt more confident about what they were supposed to learn, and 92% indicating that the podcasts reassured them that they were on the right track. The sound of the educator's voice and their words of instruction and guidance provided students with confidence and reassurance, a key aspect of engaging students who are learning at a distance (Rovai, 2002).

Almost all (93%) students who responded to the survey reported that they 'enjoyed learning this way' using podcasts. The 'satisfaction' element of learner motivation is an important consideration for students, especially those studying at a distance. Distance students are often difficult to engage due to their physical separation from the institution (Nash, 2005; Rovai, 2002) and the incorporation of activities, resources or other curriculum elements that students find enjoyable is more likely to better involve them in the learning activity.

The study was not able to control for podcast type or educator experience in podcasting, and given the small sample size and other limitations of the study, it is not possible to draw strong conclusions. However, it is interesting to note that the responses from students who experienced podcasts weekly or several times per week were more strongly motivated than those who experience podcasts only once or twice in the trimester.

Conclusion

Developing relationships and building social connections are important elements in engaging and retaining students studying at a distance (Ali & Leeds, 2009) and audio podcasts can enhance the social aspects of learning (Salmon and Nie, 2008). In this study, distance students who listened to audio podcasts reported feeling more connected to their educator and indicated that podcasts made the learning experience more personal. The study suggests that audio podcasts in distance and online courses could have a positive effect on student motivation in terms of attention, relevance, confidence and learner satisfaction.

The findings show a strong positive response to the use of audio as a medium for learning and indicate that audio podcasts have the potential to improve engagement for students studying at a distance. Students indicated that they like to learning by listening and, as reported elsewhere (Durbridge, 1984; Salmon & Nie, 2008), audio can provide an effective addition to text-based communication and content. The results of this study will provide educators with a better sense of the podcast strategies that were used across different classes and the podcast types that students found useful. This initial result provides impetus for further use of podcasting within the College and more detailed exploration of its impact on student learning, motivation and retention.

The low response rate and small sample size need to be taken into account when drawing conclusions from this study. Bias may have been introduced to the results as both students and educators were self-selecting due to the voluntary nature of participation. Student characteristics, such as experience with technology, prior use of podcasts and class standing was not taken into account and the study was not able to control for the types of podcasts used by educators. Further research could take student and educator characteristics into account and include additional classification of podcast types such as length, presentation style, topic and frequency. Information from educators about their use of audio podcasts could add depth to future research and open-ended responses may add richness and provide insights to quantitative findings.

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A portrait of evaluation studies of learning technology innovations 2005-2010: Addressing the elephant in the room

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Much effort has gone into the development of evaluation methods for learning technology. Yet the mantra remains the same; that studies fail to produce reliable evidence to answer important questions about the impact of technology on student learning and behaviour. The authors conducted a meta-analysis of 100 evaluation studies published in two leading learning technology journals from 2005 – 2010. A set of thirteen criteria to critique the articles was derived from the principles of educational design research. This paper discusses findings concerned with the extent to which studies are a) theoretically grounded, b) show evidence of impact on student learning and behaviour and c) potentially transferable to other higher education contexts. The findings resonate with comments in a recent report on Learning with Technology (ALT 2010) that 'research typically doesn't address the problem of building an ecology of learning, or treat integration of the innovation as a research issue' (p.5). The authors are keen to discuss ways to improve the quality of evaluation studies in learning technology for the future. Some recommendations are proposed to stimulate discussion and feedback.

Keywords: Evaluation studies, research design, evidence, impact, meta-analysis

Introduction

This paper identifies some of the limitations of common approaches to evaluative research in learning technologies in higher education over the past five years. Prompted by ALT's response (ALT 2010) to questions about how, and in what circumstances, elearning is effective and particularly what evidence demonstrates this, the authors reviewed 100 articles published between 2005 and 2010 in two leading learning technology journals. We used educational design research (also known as design based research) principles to define a set of criteria to critique the selected articles. The focus of this short paper is on three criteria that explore the extent to which published studies are theoretically grounded, show acceptable evidence of impact and produce findings that are informative and possibly applicable in other educational contexts.

The ALT (2010) report notes that, despite a reasonably large body of knowledge built up over the past decades, and the acknowledged importance of doing so (Bannan-Ritland, 2003), research typically doesn't address the need to build an ecology of learning or consider integration factors. It also notes the impossibility of separating theory from evidence, implying that a body of evidence from research into practice offers an ideal basis for theory generation. However, for some decades researchers in the field of learning technologies have noted the lack of appropriate research design as a problem, (Dick & Dick 1989; Brown 1992; Kelly 2003). While solutions to this issue have been proposed they have not been widely adopted (Barab & Squire 2004).

Methodology

Two journals were selected to review evaluation studies in the field of learning technologies over the past 5 years - AJET (The Australasian Journal of Educational Technology) and ALT-J (Research in Learning Technology). These two leading educational technology journals are representative of the higher education communities in Australasia and the UK respectively, and include the work of a range of international authors. Both are owned by high profile professional societies (Ascilite and ALT) and include top ranked papers from the organisations' competitive annual conferences, and themed special editions as well as unsolicited articles submitted through the normal editorial process. A process was applied to select evaluation studies that were relevant to this review and criteria were applied to gain a portrait of these studies over the past 5 years or so.

Identifying relevant articles

An initial selection process was applied to a total of 318 articles published across the two journals between 2005 and 2010. Articles were selected for review based on positive responses to the following questions:

- Is the research conducted to evaluate technology-related educational resources, learning designs or the use of technology to solve an educational problem?
- Does the research involve the collection and analysis of data?
- Is the research conducted in a higher education context?

One hundred articles were selected and then subjected to a more in depth review. Criteria for review were drafted and refined following a trial run and cross checking for consistency of application by both researchers. Our preliminary discussion also focused on alignment with the literature describing features of educational design-based research. The final set of criteria reflects the principles of this methodology, which is used as a good practice model for evaluation studies of learning with technology. Thirteen criteria were developed and then applied to the sample. The findings discussed in this paper are based on three criteria as follows:

1. Is theoretical grounding of the educational design concept described?
2. Did the evidence clearly show the impact of the initiative on student learning and teacher behaviours?
3. Were the findings informative for the study and possibly for other [higher education] contexts?

Findings

The analysis of the 100 articles revealed that the majority featured case studies of research into practice. Less than two thirds described the theoretical grounding of the learning design, and few made any serious attempt to reflect on, or extend theories through the study findings. Claims made around the impact of the technology-related educational resources, learning designs technology solution were sometimes tenuous and as such their generalisation to other higher education contexts was also variable. Results are presented in the sections below.

Theoretical grounding

According to advocates of educational design based research, such as Collins, Joseph and Bielaczyc (2004), evaluation research should not only aim to refine practice but also to address theoretical questions and issues (p.19). This requires research to be grounded theoretically with a view to testing or extending theory. Our analysis found that 64% of articles fully described a theoretical basis for the innovation, 19% provided a partial description and 16% of articles across the two journals provided minimal or no description at all (see Figure 1).

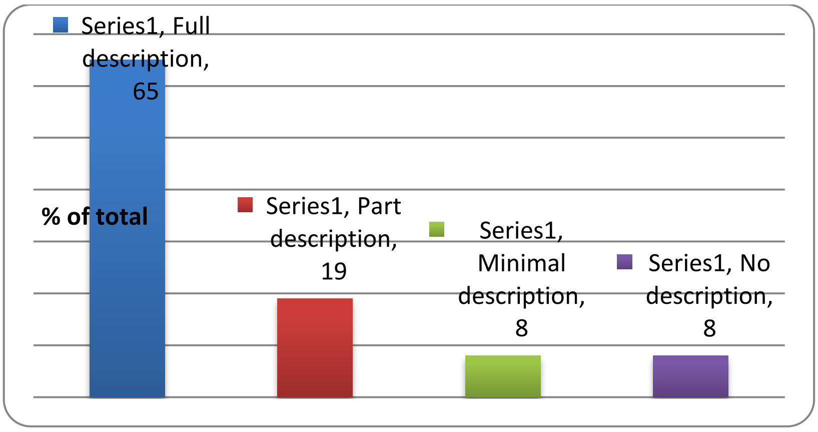

Figure 1: Is theoretical grounding of the educational design concept described?

Evidence of impact

Over the decades, a significant criticism leveled at research into the use of learning technologies is that there is little evidence that the use of technologies has actually had any significant impact on learning, learner experiences and learning and teaching approaches (e.g., Cuban, 2001; Zemsky & Massy, 2004). The ALT (2010) report points out that 'a problem with many studies is that they are inevitably conducted in situations where novelty, researcher attention, teacher enthusiasm and special funding may all have a role to play in the enhanced performance or experience of learners and so a significant placebo effect can be present for which a correction is rarely made' (p.5). Our analysis supports this contention. Only 34% of articles showed a clear impact of the initiative on student learning and teacher behaviours (Figure 3). While 13% presented some evidence, the remaining 53% of articles reported on evaluations where it was too early to show impact, the impact was unclear or based perceptions only or no systematic data collection was described in the study.

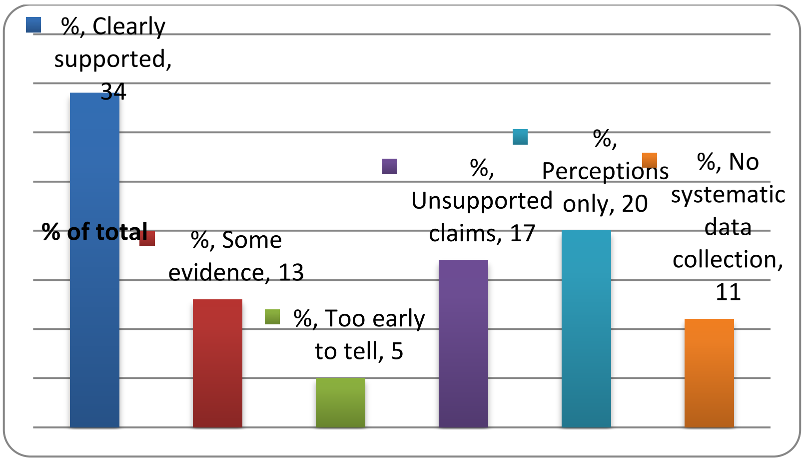

Figure 3: Did the evidence clearly show the impact of the initiative on student learning and teacher behaviours?

Potential to generalize findings

Educational design researchers are cognisant of the role that context plays in the evaluation of technology supported learning designs. However, at the core of this kind of research is the goal that design principles and guidelines will eventually be produced to form research outcomes that can be generalised to other contexts (Reeves, Herrington & Oliver, 2005). In our analysis, potential for broader application of outcomes could be identified in 64% studies (Figure 4). However, findings were context-specific in 7% of studies and low impact in a further 5%. In 24% of cases, we identified claims that were tenuous or unsupported or otherwise inconclusive.

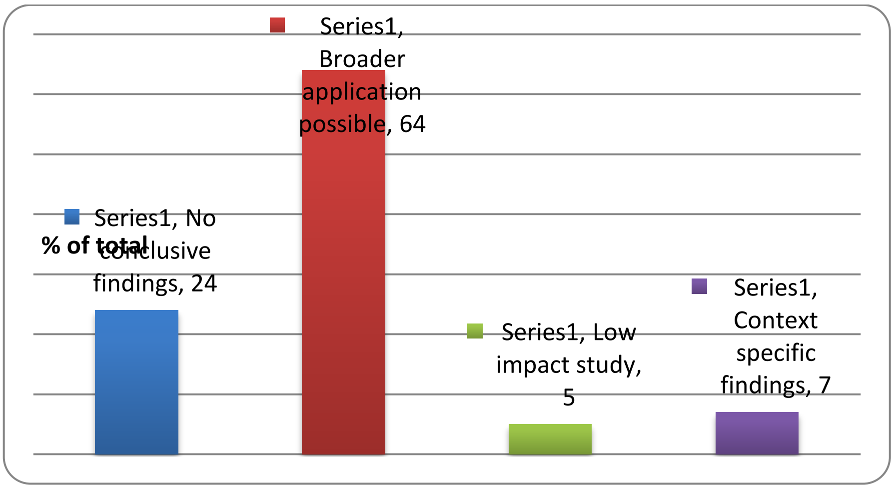

Figure 4: Were the findings informative for the study and possibly for other [higher education] contexts?

Discussion

From a total of 100 articles, 65 included a description of the theoretical grounding of the learning design, while the remainder provided minimal detail or none at all. Equally concerning was the actual impact on student learning and teacher behaviours. While 34 presented evidence that clearly showed impact, for over 50 it was either too early to tell, based on perceptions only or unsupported through the data collected. Although 64 of studies could apparently be applied to other contexts one would have to question what was worthy of transference? How also do such findings legitimately inform evidence-based practices?

While the results of many studies may be of interest in context, they add little to theoretical understanding or the body of knowledge of learning with technology. Together, these factors highlight a disconnection in the ecology of learning with technology that threatens sustainability of the discipline. The findings reported here concurred with previous studies on this topic (e.g., Brown, 1992; Kelly, 2003; Reeves & McKenney et al., 2010). They also resonate with comments in a recent report on Learning with Technology (ALT 2010) that ‘research typically doesn’t address the problem of building an ecology of learning, and doesn’t take the integration of the innovation into account as a research issue’ (p.5). Factors such as the novelty affect, teacher enthusiasm and enhanced performance need to be taken into account as these dissipate in mainstream application to practice.

Recommendations: Addressing the elephant in the room

Our findings give cause for concern. This portrait of the state of evaluation studies of technology innovations from 2005 – 2010 clearly shows that there is an elephant in the room in need of address. Further, our elephant has been present in our field for near half century. Since the 70's the issue that evaluation studies fail to produce reliable evidence about the impact of technology on student learning and teacher behaviour has remained the same. However, in an increasingly mobile and connected society (Andrews and Steel, 2011), the need to understand the impact of learning supported by technologies has never been more critical. A rapidly expanding range of technologies and the pedagogical affordances they offer are influencing university learning and teaching practices more than ever before. Thus, we believe that there is a need to engage our communities in crucial discussion about how we can improve the quality of evaluation studies in learning technology in higher education. We offer, as a starting point, a set of proposed recommendations for discussion and feedback:

Recommendation 1: Expectations of high quality evaluation research could be more clearly conveyed to authors through journal submission guidelines and review criteria. These could be explicit enough to ensure that studies situate their inquiry theoretically, collect evidence systematically over time and build on related studies. They might also highlight the need for clear and transparent evidence of impact on learners and teachers and, while acknowledging the contextual aspects of the study, distill the elements that can be generalized to other contexts. At the same time, submission guidelines and review criteria could be carefully crafted so that they are inclusive of different methodological perspectives.

Recommendation 2: Reviewers of such articles could be more clearly guided as to what comprises high quality evaluation research and how to give constructive and supportive comments to authors that help them to strengthen their conceptualization of good research design and reporting. This could be achieved by clearer review guidelines and perhaps self-paced reviewer training that helps reviewers benchmark their feedback against exemplar reviewer practices.

Recommendation 3:
Societies such as ascilite and ALT could offer a range of flexible professional development activities for researchers and reviewers alike. Such activities could promote benchmarking, explicitly address the elements of research design and reporting that contribute to quality evaluation research, and promote engagement and discussion across our communities around the urgent need to produce reliable evidence to answer to the important questions about the impact of technology on student learning and teacher behaviour.

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Working together – the benefits of student-staff partnerships in supporting moves towards personal learning

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Personal learning is a complex terrain for students to navigate, and one that transcends discipline and cohort boundaries. This paper reflects on the introduction of a forum to promote, encourage and support student engagement with PebblePad, an ePortfolio / personal learning system. The forum provides students with an informal network beyond their course/subject cohorts in which they can ask questions and discuss issues as they traverse the technical and conceptual complexities in what is for many a transformational learning approach. It has developed as a partnership between students and staff, emerging from a student suggestion, establishing itself under the leadership of staff with student support, but gradually undergoing a role reversal so that students now take the lead. Now nearing the end of its second year, the forum demonstrates how staff-student partnerships can benefit a range of stakeholders in the university community – from students to academics, and particularly to the mentors themselves.

Keywords: ePortfolio, personal learning, PebblePad, networks, forums, student engagement

Background

Since the inception of the Australian ePortfolio Project less than five years ago, an increasing number of Australian universities have incorporated ePortfolios into their suite of technologies to support more learner-centered (So, Bonk, & Wisher, 2009), authentic (Herrington, Reeves & Oliver, 2009), reflective (Schön, 1983; Kolb, 1984) teaching approaches and the development of lifelong learning skills (Barrett, 2000), such as goal-setting, monitoring of progress and self-evaluation. The work of Queensland University of Technology and the University of New England has paved the way for more recent adoptees, such as Royal Melbourne Institute of Technology, University of South Australia and Charles Sturt University.

EPortfolios have alternatively been defined as *product* (Challis, 2005) and *process* (Joyes & Gray, 2009). Indeed they are both, but it is the process that has gained more attention in recent years. This idea of portfolio as process is strongly linked to personal learning approaches, and the concepts of ownership and self-management of learning, both formal and informal. It's based on the premise that 'to learn is not to acquire or to accumulate, but rather, to develop or to grow. The process of learning is a process of *becoming*, a process of developing one's own self' (Downes, 2009, p.29). In terms of ePortfolios, this process typically involves planning, collecting and reflecting, synthesizing, constructing, collaborating and sharing, as well as giving, receiving and responding to feedback. During this process, the ePortfolio becomes 'a place to develop one's professional identity' (Hunter & Stewart, 2010), and provides an opportunity to shift the balance of power between academics and students, giving students more responsibility and control over their learning and professional development (Kimball, 2005 in Butler, 2006).

PebblePad differs from many current ePortfolio systems in that it focuses mostly on the personal learning process, rather than the final product. Indeed, PebbleLearning describes their system as 'more than just an ePortfolio', but a learner-centred personal learning system that 'provides scaffolding to help users create records of learning, achievement and aspiration (with) a reflective structure underpinning all of its core elements' (PebblePad, 2011). While, as an institutional system, it may not offer some of the freedoms of a Personal Learning Environment (PLE) created with social media tools, this is outweighed by the provision of scaffolding, the greater ease of sharing control and levels of privacy for those just starting to explore their professional identity.

One of the great advantages of using a personal learning system like PebblePad is that it is designed for maximum flexibility to suit a wide variety of contexts and learning preferences, and to allow students freedom to manage their learning in a variety of ways; however, this can also lead to conceptual and technical complexity with which some students struggle (Hunter, *et al*, 2010). This is particularly true for those who still believe that their learning consists of 'acquiring or accumulating knowledge', rather than seeing themselves as creators of 'personal knowledge' (Gamache, 2002). Similarly, those who start exploring the system for personal use, rather than through an embedded course experience which guides students through these changes, may also struggle. These kinds of experiences will likely occur with any new technology that forces students through such a mindshift.

In February 2010, a university-wide online forum was set up to support students who were using PebblePad, both within their courses and for personal use. It was designed to help students tackle the conceptual and technical difficulties associated with the move to personal learning in a staff- and peer-supported environment outside of their usual discipline area. The forum was initiated following a student request, and established with staff guidance and the support of student mentors. By incorporating the mentoring aspect, the forum offered the opportunity for more experienced students to transition from learner to teacher. In discussing Student Peer Assisted Mentoring (SPAM), Whitman and Fife (1998, in Kirkham & Ringlestein, 2008) state that 'to teach is to learn twice' and explain that, through teaching, peer mentors attain an improved understanding of the mentoring subject area through being involved in the teaching process. However, it's not just their professional understanding that improves; there are also significant gains for the mentor in terms of their own personal development as teachers and leaders (Hill & Reddy, 2007).

This concise paper reports on a work in progress, and presents a reflective 'story' of these benefits, drawing upon autoethnographic methodology to do so (Chang, 2008). Autoethnography allows the researcher to be the subject of the research by using their personal experiences as primary data. In this study, the researchers are the leading student mentor (SM) and the staff member who partnered her in establishing the forum (S). The data was collected over 18 months, and includes a reflective analysis of forum observations that had been recorded in the researchers' personal PebblePad blogs. It takes note of our findings and how we understand the interactions and potential benefits of stakeholders in the forum, including academics, student users and the staff who so diligently support its existence. While offering our own perspectives, it interprets our connection to others and the culture of the forum.

> The PebblePad forum experience is only in part, my story, that of a student who embraced and shared my learning through a mentoring process. It is also the story of staff members at a university who support the student voice by encouraging and implementing student ideas, students who enter the forum to ask questions and have a sense of achievement when they have completed an ePortfolio task.(SM)

A story of partnership

Since its inception, the forum has emerged as an excellent example of how a partnership between staff and students can evolve through shared need to benefit a wide range of stakeholders. During the first year of its implementation, staff and student support resources were still ‘developmental’. PebblePad itself provides a comprehensive help system, and local support included general orientation information, technical ‘how to’ worksheets, information on the potential for personal and self-directed student learning and general IT service desk. However, despite this, a common theme emerged of students initially struggling to make sense of how the ePortfolio should be used.

> With no experience of the ePortfolio process or the PebblePad tool, I accessed the support of a member of the ePortfolio Project team, who using screen share technology spent time demonstrating and explaining its use. As she used PebblePad both professionally and personally, there was a genuine understanding of my confusion, and willingness to assist. The ongoing level of support and encouragement took my knowledge of PebblePad from a task that was overwhelming to one I embraced with great enthusiasm by diving into practice with the PebblePad tools as if I had been given extensive training in their use. My desire to further direct and support my own learning led me to further experiment and find uses that were not restricted to my course work. I wondered what other forms of support may have benefited me as a learner. (SM)

Clearly, in this case help sites weren’t enough. There was a need for a ‘personal’ connection with other more experienced users to overcome those ‘hurdles’ and uncover the essence of personal learning.

> We are such social beings. It doesn’t matter how many help pages are created, how many clear worksheets, how many explanatory videos…nothing beats human contact, and the reassurance that comes from being able to ask your own questions, and knowing that someone is there who is able and willing to answer, or at least to find others who can answer. (S)

At the same time, the student was using the university’s discussion forums successfully for peer support and interaction, both within courses and subjects, as well as at a wider, university level.

> As a distance education learner, forums were providing an important part of both my PLE and social support within the university context. I was impressed by the level of communication, collaboration and support by students on the university’s Mature Age Forum, a living university-wide community which embraced all delivery modes, age, courses and levels of study. Was it possible to have a PebblePad forum to support students in their learning of and development with PebblePad? My motive was self-interest. I wanted a place to have my questions about PebblePad supported. I also believed that what I now saw as my successful student experience had the potential for empowering other students in their use of PebblePad. (SM)

With a plan in mind, the student approached the same member of the ePortfolio Project team about the possibility of setting up a PebblePad forum as an online place to ask and receive answers from staff about PebblePad and its use. This idea was embraced by the team and within days the PebblePad forum was open for use.

Gamache (2002, p.281) notes that some students require ‘personalised, individualised learning strategies’ for support; the forum was providing this for those who participated. While it was still encased within an institutional setting, already the forum was emerging as a useful network for users. The first question appeared within 24 hours., and during the first eight months there were almost 500 posts and 70,000 views.

> The forum is really taking off. It’s had some significant impacts on students already. Over the past week alone, these comments have been posted: “I also worked on my portfolio and linked files and pages - it was so easy. I just love it!” ; “Do you realise what an amazing journey you are leading me on? I am going places that I never thought possible” ; and “Thanks again for your help, your quick responses have made a great difference to people like me who have no idea!!!!!!!” (S)

During this time, some students started to take on a much stronger role in mentoring other students, as they themselves started to learn more technically and conceptually about the tools. In fact, some of the students were evolving from being learners and were taking on the role of teaching other students how to become more confident users of PebblePad.

> Due to my newly discovered enthusiasm, I was a prolific forum poster, initially for questions that I required answers to, but later for the questions that I would have liked answered when I had first started using PebblePad. When a question was posted by another student that I could answer I became quite excited and as I would on any student forum, I responded. My answered guided them to the resources that could provide further support. (SM)

> There's something great going on in this forum. I'm no longer answering all the questions. (The student mentors) are responding quick and fast, empathising with other students who aren't quite sure of the personal learning journey, championing those who are achieving great success. And there's a qualitatively different feel to the conversation. There's such an interweaving of help, support, and personal story…everything from wine to wombats is popping up as they discuss how they approach personal learning. (S)

Siemen's (2007) states that 'the network is the learning'. While he is referring to open social networks using Web2.0 technologies, the statement is no less applicable to institutional networks. In this situation, students had found a network in which they were familiar and secure, suggested its use to staff, who were responsive to their needs, and students have felt safe enough to gradually take on a leadership role in that network. Today, student mentors are leading the forum, and while staff still monitor posts, they are only required to respond to more 'tricky' questions.

Impacts for stakeholders

Since the beginning of the forum in late February 2010, there have been almost 1000 postings and 200 000 distinct reads on the forum. For students, the sheer volume of postings and reads suggests that they are gaining something more from the PebblePad forum mentoring than the traditional support options provided.

> I'm still amazed by the thanks that some students are expressing on the forum. This one came in yesterday: "Thank you (to staff and student mentors) from me, one who hardly knows how to turn a computer on, NOW HAS A SPECIAL PAGE in her portfolio! Thank you for your kind, scaffolded instructions." And this one: "I forgot to just say how appreciative I am and everyone else is of the responsiveness of those monitoring the Pebblepad forum...It really should be acknowledged." And again this: "Thanks again for your help. I'm just completely blown away that you are giving me technical advice on the weekend!!!" (S)

The reflections in both the staff and student blogs noted that the forum was being used by students who were not using PebblePad as part of their course, possibly because it was grouped with other university forums focused on personal and academic support, and so students would just 'drop-in' to see if the discussions were of interest.

> I am often surprised by students who just find their way to the forum and ask what is PebblePad and what is it all about? On 7 February 2011, "OK I knew this pebble pad thing existed but have not a clue where to begin." If PebblePad is not being used as part of their course they may not know about it. By finding the forum, reading and asking questions they are able to add a new tool to their PLE. Many of these students return to the forum as they start to explore more tools in PebblePad. (SM)

In instances where academics are using PebblePad for the first time, often students feel more empowered to learn together with the academic as they have previously gained support outside the course from the forum.

> In chatting to academics, I'm finding that they are really happy that they have a backup for student support when they themselves are quite new to using this system. It's a relief to be able to provide a link to the forum, and know that this is being monitored regularly by both staff and students. It's taking the pressure off them as they learn together. (S)

However, despite the aforementioned benefits, arguably the greatest benefit has been for the student mentors themselves. Another common theme was emerging: the forum had provided them with a vehicle to develop self-confidence as well as expand and share their skills within the institution and beyond. Indeed, two of the mentors have presented their work with ePortfolios at local, national and international conferences.

> Sometimes I am struck by the frustration that a student portrays in a forum post. I originally only answered questions that I knew the answers for but … (now) even if I do not know the answer I can

reply and truly empathise with how they feel and let them know that an answer is being sought. I cannot always find the answers and there are those that need university IT support, this is where the PebblePad support team give of their expertise. They monitor the forum and still provide answers, including different solutions to an answer given by me, this is accompanied by a positive comment or thank you for my efforts. I read, I practice, I learn and feel that my role is appreciated by staff. I value highly their knowledge and support for my learning as well as their ready availability to provide help via phone or email. (SM)

My personal reflections in my PebblePad blog showed me the positive impact from being able to help a peer with a task that I had once had difficulty with. After answering posts for a few months, she said "I finally pulled together a rather fancy webfolio. I can't believe I managed to learn yet another technological tool... Just want to say thanks for all your support and e-portfolio emails, they really helped." I started out with very little confidence and low self-esteem, but now feel empowered as a learner. I have started a Masters in Education with a view to research and co-written a conference paper for ASCILITE. During the time participating in the forum I have improved my understanding and knowledge about the PebblePad tool and taken active responsibility for my own learning by seeking articles and practitioners of e-portfolios and personal learning to become better informed about the practical and educational implications of e-portfolios as personal learning spaces. (SM)

This is only the beginning...

Student engagement involves 'active and collaborative learning, participation in challenging academic activities, formative communication with academic staff, involvement in enriching educational experiences, and feeling legitimated and supported by university learning communities' (Coates, 2007, p.122). This paper provides an example of how a staff-student partnership can enable this kind of student engagement to occur. While in this case online forums were used, the technology is not the important feature. The partnership has resulted in the development of an emerging community, where both students and staff can explore personal learning, and share experiences and technical know-how in relation to an institutional system. Weller (2009) describes this drawing together of students with a common interest as part of a university's function. At this stage alone, the forum has drawn together not only students but staff in a creative and committed partnership through using technology in a way that is both vital and relevant in today's digital society. However, this is just the beginning. The university is embarking on a new initiative to provide more structured support to student mentors, and to ensure the sustainability of the mentoring that has emerged organically through the forum. We look forward to watching future developments.

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Facilitating the ability of graduates to articulate their employability skills through the use of a 3D virtual learning environment

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‘Readiness’ for employment is having the appropriate knowledge and practical skills for a particular job, as well as possession of the ‘right’ attributes for that job. A recent report on the recruiting preferences of Australian graduate employers (AAGE, 2011) revealed that the three most desired attributes in graduates are communication, team work and problem solving. This paper reports on the first stage of a three stage study exploring the potential of a 3D virtual learning environment (3DVLE) to aid graduates identify and articulate these ‘employability skills’ (Precision Consulting 2007). Using a qualitative approach, the purpose this stage was to seek primary stakeholder (students and university staff) feedback and input into the early design of three proposed learning scenarios in a 3DVLE. Student acceptance of the 3DVLE was positive, staff acceptance less so. Both students and staff provided valuable input into improving the look and use of the proposed scenarios.

Key words: 3D virtual learning environment, employability skills, virtual world research.

Introduction

The internet revolution witnessed over the past two decades has precipitated significant cultural change in how organisations, businesses, production processes, governments, news media, communities and individuals communicate, interact and operate (Benkler, 2006; Rheingold, 1993). These new practices, combined with the increasing ease of use new software and technologies, provide the opportunity for individuals to be more participatory in and critical of things that affect them (Benkler, 2006) such as the activities of government, their interaction with the world of work, the economy and the environment. The changing demands of the participatory culture in a networked information economy (Benkler, 2006; Wood et al, 2011) highlight the critical role that higher education needs to play in not only positioning graduates for integration into a knowledge community (Hodge & Collins, 2010), but also in facilitating learners' employability skills. At the same time, we also need to leverage off the digital literacy of our changing student demographic.

Key to successful job acquisition is the ability of the applicant to demonstrate to the recruiter one's possession of the appropriate knowledge, skills and attributes for a given position (Allen Consulting Group, 2010). For the graduate, knowledge and skills are easily identified and conveyed (predominantly in written form via a cover letter and rėsumė and academic transcript) as these are generally part of the curriculum and are overtly assessed. The applicant's possession of appropriate attributes for the position, however, is equally if not more important than knowledge and skills (Yorke, 2006). These are not as easily identifiable, nor elucidated as these 'employability skills' (Precision Consulting, 2007) appear in general to be neither formally taught, nor assessed in Australian higher education institutions (Bridgstock, 2009; Kavanagh & Drennan, 2008; Smith *et al*, 2009). This is in sharp contrast to active employability skills education and assessment in the United Kingdom (Shepherd, Braham & Elston, 2010), or indeed in Australian vocational tertiary institutions (see Denton, 2005 as an example).

Many educators are turning to 3DVLEs in response to the needs of the changing student demographic and the related demands for increased flexibility and more engaging collaborative activities facilitated through simulated learning environments (Wood, 2009). Such environments have been found to be an effective medium for a range of activities including presentations, discussions, role plays and simulations, historical re-enactments, games design, dramatic performances, creative arts and business modelling (Wood, 2010). Not surprisingly, therefore, 3DVLEs are increasingly utilised in higher education institutions as part of their pedagogical approach to knowledge and skill acquisition (Armstrong & Franklin, 2008; Gregory *et al*, 2010; Kirriemuir, 2010).

Importance of the study

'Readiness' for employment is not just about having the appropriate knowledge and practical skills associated with a particular job; it also includes possession and internalisation of the 'right' attributes and attitude(s) for that job. It is not unusual for graduates to think that employers are chiefly seeking candidates who have an ability to carry out tasks associated with a position and possession of knowledge underpinning those tasks. However, it is argued that the most important skills employers require of candidates is the possession of relevant attributes associated with the job (Maiden & Kerr, 2006; Ostrom, 2007; Scott and Fuller, 2009; Yorke, 2006). These attributes include sound written and verbal communication skills, the ability to work in teams and solve problems, and initiative. Enterprises call these the 'employability skills', the careers industry terms them the 'soft skills', and centres of higher education (HE) infers them under a variety of banners including 'graduate qualities' (UniSA, 2010) and 'graduate attributes' (Barrie, 2006).

Whatever the terminology used, it is evident from the literature that HE careers services units promote them, employers expect graduates to possess them and universities use them in their marketing. However, whether or not students have gained the attributes as a result of their studies, many graduates appear to minimise the importance of job related attributes (AAGE 2010), let alone promote them to employers. As a result, graduates may well be underachieving when it comes to providing employers with evidence of their suitability for a particular position during the job search process. This can lead to: a) dissatisfaction of employers with the quality of job applicants; b) a greater time gap between graduation and employment for students, and: c) poorer employment outcomes for universities.

As with all similar graduate career related units in Australian HE institutions (Smith et al, 2009; Yorke, 2006), the University of South Australia's (UniSA) Career Services unit provides students with a wide variety of career management skills education, employment market information and practical job search and application resources to better position students for the world of work. The job application resources available to students include web based written materials, weekly resume writing workshops, one-on-one career guidance and in-curriculum lectures on job application techniques. However, unlike some other Australian HE career service units (Stokes-Thompson, 2009), UniSA's Career Services is yet to embrace the wide range of technologies now available, and more specifically, 3DVLE and social networking platforms such as Wikis, blogs and Facebook, in the delivery of its services. This is set to change.

In the last two years UniSA has transitioned to *Moodle* as its learning management system platform. The adoption of *Moodle* now enables teaching staff greater flexibility and a variety of tools for incorporating different pedagogical approaches and the diverse suite of synchronous and asynchronous Web 2.0 based communications platforms (Benkler 2006) such as blogs, wikis, eportfolios, vidcasts and RSS feeds. The Career Services unit is keen to exploit this opportunity to expand its range of career information and teaching aids delivery much like a number of other Australian university career services units have done in recent times (Stokes-Thompson, 2009). Of particular interest is the potential of the 3DVLE (Gamage, Tretiakov & Crump 2009; Kluge & Riley, 2008), with the support of the Web 2.0 technologies, in assisting graduates to recognise and articulate their employability skills.

Approach - development of a series of 3DVLE based learning scenarios

Stages

The value of use of the 3DVLE in HE learning for offering a wide range of unique, timely, purposeful, mistake-forgiving, student centred scenarios for interaction and learning, which are not possible in the real world (Savi-Baden, et al 2010) is now well recognised. Development of employability related attributes in the 3DVLE environment at the HE level (for example, communication skills: (Sweigart et al 2010); team skills (Maxwell, 2007; Minocha & Morse, 2010; Rudra et al, 2011); problem solving (Tanti & Kennedy-Clark, 2010) is not new. However, in many of these documented applications, graduate attribute development appears to be secondary if not incidental to other learning for which the activity was designed. There is an apparent lack of curricula that address the underlying principles which constitute effective communication, constructive team work or successful problem solving. For example: What are the finer nuances of verbal and non verbal communication? What are the various roles people take on during team meetings and what contribution can or does each member make towards goal achievement and team maintenance? What are the recognised steps in problem solving and how can each person involved positively contribute to each of those stages?

Proposed Learning Scenarios

Towards the end of 2010 the Australian Association of Graduate Employers (AAGE) commissioned a survey of member organisations to determine, among other things, those attributes they deemed most needed in graduates to make them employable. The final report (AAGE, 2011) showed that the three most valued attributes, in order of importance, were communication, team work and problem solving skills. This section reports the first stage of a study undertaken at UniSA in which scenarios addressing these identified attributes were developed within a 3DVLE; each of which has been designed to highlight and assist students in recognising and articulating their communication, team work and problem solving skills.

Over a period of 12 months a virtual careers centre was designed and built within an existing virtual UniSA campus on the *OpenSim* platform *Reaction Grid*. In areas leading off the main career centre atrium, builds of an office and two meetings rooms have commenced. As the final layout and other elements of the scenarios are dependent upon student, teaching staff and employer input, the builds are still progressing. Once the development of the scenarios has been completed, individual students will be able to:

1. Undertake an interview for a position in an employment area of their choice and thereby practice their written and verbal communication skills, and their ability to articulate a range of other graduate skills.
2. Join in a team meeting and in doing so, learn to identify and value different roles people adopt in a team (Belbin, 2010) and take on one or more of those roles (*al la* de Bono's (1999) 'thinking hats') during repeated playing (see Figure 1, which shows the proposed scenario platform and indicates the various roles players may adopt).
3. Participate in a problem solving discussion where the various stages of problem solving are elucidated.

The stages associated with the development of the scenarios are:

Stage 1 – determine the appropriateness of utilising the 3DVLE as a pedagogical approach and seeking initial input into the development of the three scenarios using input from students and university staff.

Stage 2 – develop the three scenarios utilising input from employers, educators and students as to look, feel, process and activity within each scenario.

Stage 3 – pilot the three scenarios in order to fine tune their effectiveness using students.

Stage 4 – test the three scenarios against other methods of identifying and articulating employability attributes in order to determine their pedagogical and learning effectiveness.

This paper reports on the Stage One of the overall investigation.

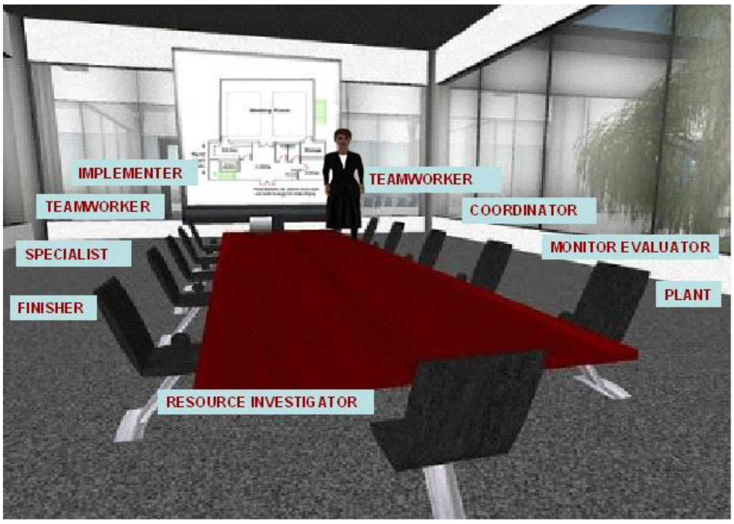

Figure 1: Screen shot mock up of proposed 'Team Meeting' scenario in the 3DVLE, indicating team roles (Belbin, 2010) that student avatars will be able to experience.
(Image adapted from http://dianaf.posterous.com/?tag=mpk16sl)

Methodology

In this first stage, the researcher aimed to explore with no preconceived expectations, ideas or opinions, the appropriateness and potential effectiveness of using the 3DVLE in highlighting and promoting employability attributes. Therefore, a Grounded Theory (Glasser & Straus, 1967) approach to the research was taken with the view that the final design and implementation of the three scenarios were to be informed by input from the primary stakeholders – students who will interact with the scenarios and staff involved in the direct education of students who may eventually incorporate the scenarios into course curriculum.

Employing qualitative research methodology (Corbin & Strauss, 2008), student and university staff opinions were sought on the appropriateness of using the 3DVLE in the delivery of career related services and, more especially, its use in highlighting and promoting employability attributes of communication, team and problem solving skills. This stage of the investigation was aimed at gaining early input into scenario development. This was achieved predominantly through the use of a short questionnaire, which sought responses to a series of open open-ended questions (Gamage, et al, 2009). However, as this may only provide feedback on the look and feel of the 3DVLE, feedback was also sought from university staff using a semi structured focus group approach in order to gain insight into how the scenarios could be refined to enhance their potential as learning tools.

Method

Ethics approval was gained from the University's Human Research Ethics Committee (UniSA HREC) and all participants (students and staff) were advised of the voluntary nature of the anonymous feedback and their rights to withdraw at any time. After showing and outlining the preliminary scenarios to student and staff participants, feedback in the form of an open ended questionnaire was sought. The written questionnaire contained four questions.

Feedback questionnaire questions:

1. How appropriate is it to use the 3DVLE for the delivery of career information to higher education students?
2. What are some of the features or ideas that you like most about the 3DVLE immersive virtual careers centre proposal?
3. What are some of the features or ideas that you do not like about the 3DVLE immersive virtual centre proposal?
4. What suggestions (additions, alterations, subtractions) do you have which would improve the 3DVLE immersive virtual careers centre proposal?

Student participants

Feedback was sought from two groups of students.

The first group comprised a class of 60 first year Computer and Information Science (CIS) students who were gathered to hear a 90 minute presentation by the researcher on the careers related topic 'self marketing'. With the permission of the Course Coordinator and the students, the researcher used the final 20 minutes of the session to demonstrate an early form of the proposed 3DVLE under construction. Using a computer linked to the lecture theatre's audio visual system, the image of the 3DVLE was projected onto a large screen. Over a period of 10 minutes the class of students was 'walked' through a simulation of the career centre atrium (Figure.2), the proposed content and available resources within the virtual careers centre outlined and adjacent rooms and the three scenarios explained. Reiterating the voluntary nature of any feedback to be provided, and being reminded of the ability to withdraw at any time, students were asked to complete the short feedback questionnaire.

The second group of students comprised three individual students, each of whom had attended a one-on-one career support session with a Career Adviser colleague. One student was studying pharmacy, one nursing and the other was studying education. At the end of their respective sessions, each student was asked by the Careers Adviser whether they would be willing to provide feedback on 3DVLE development project. Upon gaining agreement, each student was introduced to the researcher. Using a personal computer (PC), attached to a 56cm (on the diagonal) screen for the purpose, the researcher to 'walked' each student separately through the simulation of the career centre atrium, proposed resources and adjacent 'scenario' rooms for about ten minutes. The researcher also described the purpose and provided a broad overview of each of the scenarios. Students were then asked to complete the short feedback questionnaire.

Staff participants

Staff opinions and suggestions regarding the development of the scenarios were collected via notes taken by the researcher during a semi structured focus group session and the completion of the same open ended questionnaire completed by the students. Four university staff from the University's Learning and Teaching Unit (comprising two teaching staff and two professional staff all of whom provide learning advice and training to students) were approached take part in the research. The researcher explained that their participation involved viewing the proposed 3DVLE and listening to the scenario outlines and that they would then be invited to provide feedback on any shortcomings and/or suggested improvements via a focus group and completion of the short feedback questionnaire.

As with the students, the staff group was walked through the 3DVLE careers atrium, the proposed content and available resources within the virtual careers centre outlined and a general overview of the purpose of the scenarios explained. At the conclusion of the presentation the staff were asked to discuss as a focus group their impressions, suitability, etc. of the 3DVLE and scenarios. The discussion took approximately 30 minutes. The staff participants were then asked to complete the same questionnaire given to the students in order to formally capture their opinions on the suitability of using the 3DVLE, on what was proposed, as well as their impressions and suggestions for improvement. The open-ended nature of the questionnaire also provided staff with the opportunity to provide any other information which may have been stifled during the focus group session (Gamage et al, 2009).

Figure 2: Screen shot of the design and layout of UniSA's proposed careers atrium and career related resources in the 3DVLE

Results

Questionnaire

Question 1- How appropriate is it to use the 3D virtual learning environment for the delivery of career information to higher education students?

Students – CIS Class

Feedback was received from 60% (36 out of 60) of the students in the class.

Feedback on the appropriateness of using the 3DVLE for employability skill development was positive with 10 students (28%) indicating it was 'most appropriate' and 23 (64%) indicating that it was 'appropriate'. The remaining 3 (8%) indicated that they were 'not sure'. The three students undertaking studies in pharmacy, nursing or education (from now on termed 'independent' students) indicated that 3DVLE use was either 'appropriate' (1 student) or 'most appropriate' (2 Students).

Twenty (55.6%) of the computer science students respondents also provided comments to question 1. A large proportion of the free response comments were positive, emphasising the proposed interactivity, suitability for today's learners, ease of information accessibility and retention, as well as its novelty. Negative comments included lack of detail and need for refinement with respect to look and level of sophistication. The three independent students reiterated these comments.

Staff

One of the university staff participants stated that the use of the 3DVLE was 'most appropriate', while the remaining three staff members indicated that they were 'not sure'.

Three of the four staff participants provided comments, one finding the concept "very interesting and potentially very useful technology", one saw it as "an important means of engaging with students who are familiar with this technology" and the third suggesting the "need to measure start and end knowledge to get an answer" to the suitability question.

Question 2 – What are some of the features or ideas that you like most about the 3DLE immersive virtual careers centre proposal?

Students

Thirty two (89%) of the 36 computer science students responded to this question, as did all three of the independent students. Features that were liked included: the ability to have a practice at interviews, the ability to personalise (i.e. choose the interview outfit) of one's avatar, that it was online and thereby saved time and effort, and that it was fun and provided immediate feedback.

Staff

All four staff liked the idea of access to readily downloadable resources, that the role plays were a better way of learning and that they were engaging, fun and novel.

Question 3 – What are some of the features or ideas that you do not like about the 3D immersive virtual centre proposal?

Students

Twenty (56%) of the computer science students respondent to this question and commented on the need to improve the 'laggy' animation of the avatar, that the graphics were "archaic" or "lame" and that the look or detail needed to be improved. Only two of the independent students responded to this question, one commenting that the environment needed more features and the second commenting that the use of the technology "could be restrictive, in the sense when talking face to face new ideas are prompted as opposed to computer only saying what its been told to" .

Staff

All four (100%) staff participants responded to this question and addressed concerns such as: the need for its use to be accompanied by more traditional methods of learning and that the leaning needs to be scaffolded; that not all students would be interested in using immersive technology; and that It could widen the gap between the technology "haves" and "have nots".

Question 4 – What suggestions (additions, alterations, subtractions) do you have which would improve the 3D immersive virtual careers centre proposal?

Students

Twenty three **(**64%) computer science students and all three independent students responded to this question. Suggestions included the need for more people in the environment and interaction between those people, to make sure the site is accessible from "cheaper lower-end computers" as well as reiterating the need for better colour, graphics and animation.

Staff

All staff responded, suggesting "gaming" or reward elements as a way of providing improved student uptake and engagement, ensure that the site is easy to navigate, the need to perhaps consult a games developer and youth who play online games, and that it be supportive of participation.

Focus Group - open feedback responses

Response to the 3DVLE and proposed use was positive. Much of the discussion revolved around questions and comments such as: the plans for its uptake as students were unlikely to engage in additional activities that were extra -curricular?; the need for academic input into formal assessment of scenario responses; the length of time taken in scenario interaction; that the scenarios should be game-like and 'in-game' feedback on progress and support provided; the linearity and levelling up within each scenario.

Feedback Summary

Students' comments were generally positive. Several students indicated that the interactivity of the environment would improve their learning. Students indicated that it was easier to 'remember' the information because they were more actively involved. However one student commented that although the platform had a 'novelty' factor it would not be 'immersive' for an extended period of time.

The staff focus group consisted of only four staff. Comments indicated that the staff were unfamiliar with the environment and had mixed views about how effective it would be. Staff further suggested that evidence in terms of learning outcomes would be necessary before implementation.

Staff indicated that the role play in the virtual world would make the experience less difficult, so that students could build up their confidence. The availability of the practice environment for distance students and its novelty were identified as positive aspects, as was the 'fun' component of the exercise. The engagement in the activity was also identified as being an important attribute.

Staff had differing perspectives on features that they did not like about the potential 3D centre. Comments included that some students may not engage in the environment to the same extent as others, but that if the technology was easily navigable then this would be easier. Another comment was that the use of such technology increased the gap between the 'haves' and the 'have nots'. One respondent indicated that the open ended, reflective experience provided 'scaffolding' for future student learning.

Staff suggested that the game-like environment of the virtual centre needed to be improved in order to ensure student engagement and participation. A suggestion was made to consult with game-writers and with young people who play online games to determine appropriate methods of providing incentives to "play" the games. The importance of 'fun' was identified, as well as ensuring that the environment could be navigated intuitively. Staff focus group participants were quite consistent in the view that students would not use the resource unless it was more like a game, with rewards or feedback provided on how they were progressing.

Discussion

There are five broad ways in which virtual worlds may be used as a learning tool. These include rote learning, exploration, visualisation, simulation and for exploring or experiencing not possible in real life situations (Daden, 2010). The current study is the first of three stages exploring the dynamic use of the 3DVLE as a simulation learning tool. A tool which will provide three real world work related situations in which the user is the sole participant and actively controls their own avatar as part of their own learning. This is dramatic change from the way UniSA's Career Services section delivers or promotes student acquisition of the employability skills.

Overall the feedback on the proposed use of the 3DVLE was positive with students showing more acceptance of the technology than the staff participants. Questionnaire feedback from the staff in this study was somewhat different to that gained from research by Gamage, Tretiakov and Crump (2009) where "quite positive" feedback was exhibited by educators. This reversal may reflect two major differences between the sets of educators in our studies. The size of Gamage, Tretiakov and Crump's cohort was 22 compared to this study's 4, and the Gamage et al group was made up of 50% 3DVLE users and 50% non users. None of our focus group members had used the 3DVLE. Both student and staff feedback, however, emphasised the motivational aspects (fun, interactive, game-like) of using the proposed approach. This finding is consistent with results obtained in research by Tanti and Kennedy-Clark (2010) and Sweigart, et al (2010). In addition, Tanti and Kennedy-Clarks' research highlighted the need for students to interact and collaborate when using virtual technology in order to "gain more than just 'fast knowledge'" (Tanti and Kennedy-Clark, 2010, p. 966), this is similarly reflected in students' feedback comments.

Conclusions

Constructivism theory provides the framework for simulation-game pedagogical approach to safe, experiential learning (Starĉiĉ, 2008). However, for maximum learning to be gained, potential users need to be "engaged within the whole process of development and testing the product" (Starĉiĉ, 2008, p. 787). Feedback from both students (peer interaction) and staff (in-game support and feedback, scaffolding) point to a more dialectical constructivism approach (Dalgarno, 2002). This and other feedback has proven to be invaluable in the initial development stages of the proposed use of the 3DVLE in providing students with an authentic, practical, enjoyable and innovative way of gaining and developing work related attributes designed to supplement traditional approaches used by HE UniSA's Career Services section. The research has also helped refine approaches to students, university staff and eventually employers when seeking their input into the next stages of development and refinement of this specific 3DVLE.

The findings from this preliminary research have broader implications for other HE institutions interested in strengthening the development of student graduate attributes. Firstly, the apparent level of acceptance by today's student body in the use of the 3DVLE as a pedagogical approach. Students, especially those who have digital game playing experience, readily see the potential for involvement and enjoyment while learning. Secondly, students' willingness to be involved in the early phase of 3DVLE development. Their suggestions for improvement, however, do raise challenges in prioritising their suggestions against what is realistic from an educational and fiscal point of view. Thirdly, one may have to select academic involvement carefully. Those with little to no experience in using 3DVLE technologies may be less enthusiastic in the early stages of development than others who have been using 3DVLEs in their teaching and learning for some time. It may be useful to undertake trials with more experienced academics during the initial stages of the project to help build an evidence base that can then be used to encourage less experienced academics to participate in subsequent trials.

In addition to furthering the current research plans, the findings from this study have the potential of generating other lines of inquiry. One such area for investigation might be the exploration of differences in scenario design suggestions between student cohorts. The cohort in this study was students undertaking their first undergraduate year of study. How would their suggestions differ from students further along in their studies? If so, what are the differences and how should the design accommodate this diversity? The findings from such inquiry may lead to a significant change in scenario design.

Several limitations of this study are apparent. The short questionnaire did not seek demographic information (such as age, gender, experience using of 3DVLEs) of participants. Such information would have provided answers to a number of important questions and thereby provided clearer guidelines for the eventual look, feel and educational effectiveness of the scenarios. For example, did student responses represent their respective generation? Did student responses reflect gender preference for playing computer games or accessing virtual worlds? Answering these may have provided insight into why students responded as they did and guided the need or otherwise for seeking feedback/input from student and staff groups as yet unrepresented.

Other limitations revolve around the staff participants. Would have it been better if the questionnaire had been given to the group before the focus group session? Would they have responded differently if it was completed before rather than after? The size of the group was small, only one group was surveyed and only one area of the university was represented, potentially skewing feedback results. It is likely that a larger group have provided more discussion and therefore prompted varied feedback and suggestions.

This paper reports on the first stage of research that explores the potential of a 3DVLE in aiding higher education students to identify and articulate the range of employability skills. Results of this initial study have been valuable despite its limitations and can only lead to the development of improved studies and more effective use of 3DVLE technology for educational purposes. If the 3DVLE as proposed ultimately proves to be of value, it will be an additional tool in a range of learning and teaching approaches from which students can select to meet their changing learning needs, wants and expectations.

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21C to 700 B.C in a swipe: The Classics meet iPad

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The Tanya Jermaine collection of Greek vase reproductions was purchased by the Massey University School of History, Philosophy and Classics through an alumni donation in 2010. The collection was envisioned as a hands-on teaching resource for students to use and experiment with and proved to be the inspiration for a project aimed at mobilising the collection for a wider audience including distance students, high schools and the general public. Classics and the department of Museum Studies, supported by Centre for Teaching and Learning consultants, designed and created both physical and virtual exhibition spaces for the collection. One of the major drivers was to produce an engaging application that would replicate, at least in part, some of the tactile experiences that the vases provide to students in real life. After considering several options, a beta version of Adobe's Digital Publishing Suite was used to produce the mobile application.

Keywords: mobile technology, iPad, digital publishing, active learning.

Overview

A collection of Greek vase reproductions was purchased as a teaching resource by the School of History, Philosophy and Classics courtesy of an alumni donation in 2010.

> It is a really special collection… It provides us with unique and accessible teaching tools, and is an asset to the University and the wider community. The advantage of having reproductions of these subjects means that our students can use them and experiment with them in a very practical and hands-on way, and this brings potential for their use in learning across multiple subject areas (Dr Gina Salapata, 2011)

As well as a physical on-site exhibition and storage space, a virtual online space was envisioned to maximize the potential of the collection as a teaching resource. One of the major reasons for purchasing the collection was the ability for students to actively handle and use the objects, often as part of role plays in tutorials. The tactile, gesture-based operation of the iPad was seen as the most effective means to retain at least some of the hands-on experience of the collection enjoyed by internal students. A beta version of Adobe's Digital Publishing Suite (Adobe DPS) was tested and found to be a relatively swift and easy way to develop interactive content for iPad, Android and Blackberry tablets.

Benefits include:

- Adobe Creative Suite authoring – familiar tools that allow designers to create content with no programming skills required.
- An enhanced set of plug-ins for InDesign allowing fast creation of interactive content
- Output to Adobe's free Content Viewer
- Easy conversion/inclusion of print-based documents into mobile-ready applications
- Ability to commercialise and/or distribute content via iTunes

Issues:

- Relatively expensive proprietary software required to utilize the "free" DPS tools
- Expensive commercial publishing and distribution options for iTunes
- Text converted to images
- Difficult to integrate bespoke interactive content
- Expensive hardware
- Some navigation issues for inexperienced iPad users

The ability to create "3D", rotatable objects was fully exploited. Several of the vases were placed on to a turntable and filmed in high definition at 60 frames per second using a digital SLR. This footage provided over 300 high quality stills per vase to produce smooth, seamless 360 degree animations. Students are able to control the vases and explore them more fully by swiping the surface of the iPad. Commentary on the iconography, production techniques, and the social and historical relevance of the vases and their decoration is provided through text and audio. The application was further enhanced with slideshows and the ability to flip between portrait and landscape modes for alternative imagery and content. An adapted Flash-based web version was produced for use in the learning management system and on the University website for those without access to the relevant hardware.

Lessons learned: Where's the educational value?

The potential to create a more deeply engaging educational experience is currently hampered by the lack of tools to easily allow for student response and reflection. In this instance, the application is seen as an enhancement as opposed to a core part of the course materials. Distance students benefit from more immersive interaction with the collection and the application can be used as a resource alongside the actual vases with internal students. Applications are more akin to multimedia enhanced print-based documents but work is underway to incorporate links to other web-based apps which students could then use to record observations or data, respond to questions, contribute video or photo logs etc. Adobe DPS iPad applications are now being conceived as a means to organise and deliver a student learning experience, particularly those which might occur in the field or on location, with the iPad and a pre-installed suite of applications used as the means to record, publish and share student collated data via the web using 3G. It is anticipated that authoring solutions will become more versatile as tablet technology matures.

Future development

Funding applications are already in progress to further develop the University's capability in this area. A collaborative project with a local museum is underway that is intended to graphically illustrate the social life of artefacts. The application will enable users to trace the origins of a particular object or art work and its subsequent journeys to, and then within, the museum. Emphasis is being placed on socio-cultural and geo-political contexts; archival, documentary and pictorial sources; and first person narrative. Production of the application is being recorded in detail and will itself provide a valuable learning opportunity for postgraduate students in Museum Studies. Another proposal is looking into the potential for using iPad applications to aid in the facilitation and delivery of field trips for the Geography programme.

The University is currently pursuing a digital learning materials initiative designed to reduce print-based study materials in favour of digital distribution. The ability to relatively easily produce interactive, mobile ready content has great potential for electronic study materials as well as for non teaching related marketing materials, syllabuses and campus guides.

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Distributed leadership for integration of information and communication technology (ICT) in schools

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This study investigated the distributed leadership practices and system differentiation strategy in technology integration among three Singapore schools. These schools have achieved different levels of technology-related outcomes and are embarking on ICT integration of different scale and complexity. Luhmann's (1995) system theory was adopted to characterise the leadership distribution and differentiation strategies among the schools. Our findings showed that one school adopted a top-down leadership approach while the other two schools demonstrated leadership distribution. These two schools differed in their organisational differentiation strategy: one adopted segmentation differentiation while the other demonstrated functional differentiation. These variations in leadership practices seemed to be associated with the scale and complexity of ICT integration in the schools. We offered a preliminary explanation for the plausible relationship that exists between the level of complexity of ICT integration and the type of system differentiation.

Keywords: School technology leadership, distributed leadership, Luhmann's system theory

Introduction

The study of technology leadership has drawn considerable interest among educational researchers in recent years (Hadjithoma-Garstka, 2011). Research has found that technology leadership is an important factor for effective integration of technology in schools. Anderson and Dexter (2005), for example, found that technology leadership, compared to infrastructure and expenditure, was a stronger predictor of technology outcomes, including the level of technology use (Anderson & Dexter, 2005). Yuen, Law, and Wong (2003) suggested that technology leadership practices were associated with school characteristics, such as the stages of technology integration and the cultural characteristics of the schools. From a functional perspective, existing literature of technology leadership tended to focus on school principals as the central figure in leading technology change (Tan, 2010). Arguably, school principals are often not ICT experts and they do not necessarily assume the leadership role in technological implementation. A common practice among principals is to delegate key responsibilities to the head teachers and expert teachers (Dexter, 2008), which seems to be consistent with the concept of distributed leadership. Distributed leadership can be regarded as "a social distribution where the leadership function is stretched over the work of a number of individuals and the task is accomplished through the interaction of multiple leaders" (Spillane, Halverson, & Diamond, 2001, p. 20). Research that discussed technology leadership from a distributed leadership viewpoint has been less informed (Bennett, 2008).

Responding to the paucity of research in this focus area, we attempt to study how distributed leadership is enacted for technology implementation among three Singapore schools. Specifically, we aim to identify the variations of leadership distribution and investigate the differentiation mechanisms the schools adopt in technology integration. Guiding our study are the research questions:

1. In what ways are distributed leadership for integration of technology practised in three Singapore schools?
2. What types of system differentiation strategy, if any, do the schools adopt for technology integration?

The first question focuses on the identification of distributed leadership practices, if any, that were enacted in the participating schools. The second question addresses the differentiation strategies that the schools employed. Our selection of the three schools was informed by survey results revealed from a separate study on ICT implementation in Singapore schools. In August 2008, the Singapore Minister for Education launched the third MasterPlan for ICT in Education in the country. Working towards the vision "Harnessing ICT for Future Learning", one specific goal of this Masterplan is that students will possess competencies for self-directed and collaborative learning through the effective use of ICT (Teo & Ting, 2010). We selected three schools that achieved different levels for this goal. Even though the participating schools in this study are either elementary or secondary schools, many of the leadership issues related to technology integration will resonate with leaders in institutes of higher education. This could serve as a springboard for further studies in different types of learning institutions.

Literature review

This study on ICT leadership is shaped by two theories: distributed leadership and Luhmann's (1995) system theory. In recent years, scholars and researchers from various countries began to employ a distributed perspective to frame studies of school leadership (Spillane, Hunt, & Healey, 2009; Timperley, 2005). One reason was attributed to the potential of this theory to "generate new knowledge about school leadership and management" (Spillane & Healey, 2010, p. 253). Leadership literature has traditionally focused on principals and their roles and functions in reforming schools successfully (Heng & Marsh, 2009). This "heroic" model of leadership is deemed problematic as school principals often do not single-handedly lead schools to success (Spillane, 2005); this issue becomes more prominent in the face of ICT integration in schools where the ability of a school leader to take the sole responsibility and authority in implementing technology initiatives is called into question (Harris, 2003). Gurr (2004), for instance, argued that leadership models founded on a leader-centric, heroic and individualistic view are no longer appropriate in the context of leading technology change, but a shared or distributed view of leadership is better reflected in the practices of schools. Indeed, principals are unlikely to be the sole agent in leading technology-related changes because schools often have a multi-level leadership structure for technology integration (Dexter, 2008; Pulley & Sessa, 2001). There is often an array of individuals such as the heads of departments (HoDs) and teachers involved in leading the change process. Hence, taking a distributive perspective is one feasible way to explore and understand how various members of a school, apart from the principals, are involved in the leadership practices for ICT implementation.

Among the pioneering works, Spillane, Halverson and Diamond (2001) developed a distributed leadership concept to explain leadership for organisational learning. Building on Hutchins' (1995) notion of distributed cognition, Spillane, Halverson and Diamond (2001, p. 20) defined distributed leadership as "a social distribution where the leadership function is stretched over the work of a number of individuals and the task is accomplished through the interaction of multiple leaders." Distributed leadership recognises that leadership practices in schools involve multiple individuals from all levels (Leithwood, et al., 2007). Besides the top management, members of the teaching staff may take responsibility for leadership work as well, with or without formal designations. Distributed leadership is thus concerned about the practices among leaders rather than attributes or characteristics of individual leaders (Spillane, 2005). Leadership practice, as Spillane (2005) explained, is seen as an outcome of the interactions among the leaders to achieve their joint goals and visions, taking into account the context of the schools. Hence, a distributed leadership viewpoint seeks to understand the interactions between the leaders and their followers.

Several forms and patterns of distributed leadership practices have been proposed. For example, Gronn's (2002) conceptualised two distinct forms of distributed leadership, namely, the additive and holistic forms. The additive form of distribution describes an uncoordinated pattern of distributed leadership in which various leaders act independently with little coordination with other leaders within the organization (Leithwood, et al., 2007). On the other hand, the holistic distributed leadership depicts a "consciously managed and synergistic leadership among the sources of leadership in the organization" (Leithwood, et al., 2007, p. 39). Thompson (2003) suggested three types of interdependencies among the relationship between leaders and their followers: pooled, sequential and reciprocal interdependency. Pooled interdependency occurred when the joint productivity is the result of a combination of individual's work, but each individual's output is not dependent on the output of the others. Sequential interdependency describes a relay of outputs where individual build on the output of another, so the individual cannot start until he received the output of the other. Reciprocal interdependency happens when the output is produced via a collaboration of all individuals and individuals work together in order to produce the optimal output.

While the above patterns and forms could be detected in organisations where distributed leadership is well established, it could be challenging to identify and study these practices in its inchoate state. In this study, we adapted Luhmann's (1995) system differentiation as an analytical framework to examine the leadership distribution. In essence, Luhmann's system theory claims that a social system undergoes internal differentiation in order to deal with changes in its environment. According to his theory, when the environment becomes more complex with the increase in components and the possible relations between them, the system must develop mechanisms or structures to reduce the overall complexity. System differentiation thus leads to a division into subsystems with each focusing on different dimensions of the environment and the complexity of the subsystems. In this process, the overall complexity in a given system is thereby increased and hence, the paradox that "only complexity can reduce complexity" (Luhmann, 1995, p. 26). Luhmann proposed three main forms of differentiation: segmentation, stratification and functional differentiation. Segmentation differentiates a system into similar units on the basis of the need to fulfil identical functions continually. These subunits are functionally identical and do not provide new or alternative ways to meet the environment challenges. Stratification is a vertical differentiation of subsystems according to power and prestige which gives rise to a hierarchy. More complex relations with the environment occur as each subsystem works on a particular and distinct function in the system. However, subunits tend to operate independently in stratified systems and the effectiveness of subsystems is limited by its place in the hierarchy. Functional differentiation is the most complex form of differentiation as the system is divided into unequal subsystems specialising in different functions within a system. Although functionally differentiated, subunits rely on each other and form a complex network of which interdependence and communication are essential for its success.

While literature on distributed leadership is emerging, there are only a few empirical studies that examine school leadership in technology integration from this perspective. One exception is the study by Yuen, Law, and Wong (2003), who found that schools with strong cultural characteristics associated with technology integration adopted a multiple leadership strategy (akin to distributed leadership) and the teachers had autonomy in implementing ICT initiatives. A recent study has also revealed the potential of the systems theory to explain ICT implementation in schools. Employing systems theory, Tubin (2007) found that the ICT initiatives in schools could be characterised by systems differentiation. For example, schools that created a new level of computer trustees among the students were identified as adopting stratification strategy while schools that developed a specialized independent learning unit such as an excellence centre were regarded as using functional differentiation strategy. The study also attempted to associate leadership styles with each form of differentiation. There was, however, little elaboration on this aspect of her work. As our study involved looking at division of leadership roles for ICT implementation, system differentiation could serve as a practical analytical lens to characterise possible variations. We aim to identify the variations of leadership distribution in technology integration and investigate the different mechanisms that the schools adopt in technology integration. This study responds to the dearth of empirical study in distributed leadership for technology integration. At theoretical level, it aims to enrich explanation for distributed leadership from the perspective of system theory.

Methods

We adopted a case study approach because this methodology is highly appropriate when a holistic and in-depth investigation is required (Feagin, Orum, & Sjoberg, 1991). This study is part of a nationwide 5-year longitudinal study that involves survey of 110 schools and tracking of development of 12 schools. The study was commissioned in 2009 by the Ministry of Education to investigate into the implementation of the third ICT Masterplan in Singapore schools. This paper uses data from the second-year study conducted in 2010.

Among the 12 schools, three government-funded schools were chosen as contrasting cases in terms of their scale and complexity in ICT integration. School A is an elementary co-ed school located in the west of Singapore, which represents a typical Singapore school in terms of ICT integration. School B is a secondary co-ed school located in the north of Singapore. This school is awarded the LEADICT@schools status awarded by the Ministry of Education, and was provided additional funding to conduct experiments on specific ICT integration projects. School C is a Secondary Girls' school located in the south of Singapore. This school is one of the six schools that have achieved the FutureSchools@Singapore status at the time of the data collection. The FutureSchools are recognized for their school-wide ICT implementation and are supported with more generous funding than LEADICT@schools. Both School B and C could be considered as ICT-enhanced schools. The school management committees in all the three schools basically comprise the principal, the vice-principals and a team of Head of Departments (HoDs) in various subject areas and one head teacher placed in charge of the ICT matters (HoD ICT).

The data collection methods include quantitative survey of students, as well as interview with the principals and focus group discussion with teachers. The survey was administered to 7390 students in 2010, and included the following two sections: (a) 7 items on the use of ICT for self-directed learning (Cronbach α=.843); and (b) 5 items on the use of ICT for collaborative learning (Cronbach α=.878). For example, an item that assesses the use of ICT for self-directed learning is: "I find out more information on the Internet to help me understand my lessons better." An item that assesses the use of ICT for collaborative learning is: "When I work in a group, I use the computer to work with my group members to complete a project." The students were asked to respond to these items in terms of their frequency of engaging in these activities, on a Likert scale of 1 to 6 (1 for "Not at all" and 6 for "All the time"). This instrument has been validated (see Teo et al., 2010).

The interview and focus-group sessions were guided by open-structured questions to invite the participants to comment on the school ICT implementation. In each school, a team of two researchers conducted one face-to-face interview with the principal, one face-to-face interview with the HoD ICT and a focus group discussion with six to eight teachers. The data collection was conducted from July to September 2010. Each session was audio-recorded and transcribed. We first analysed and coded the transcripts for sources of leadership distribution and functions. We then identified possible differences among the three cases and examined these differentiation based on our analytical framework. Results reported in this paper were based on the variations found in the structural differentiation (leadership hierarchy) in ICT implementation.

Findings and discussions

To answer the two research questions, we first present the survey outcomes on the use of ICT for self-directed learning and for collaborative learning. Next, we examine how each school structured their leadership for technology integration and their differentiation strategy, if any, in the process of technology integration. We then make a comparison across the three schools.

Survey outcomes of the three schools

The survey results provide evidence about how successful each school was with regard to the Masterplan goal on student's learning outcome. Table 1 summarises the survey outcomes of the three schools.

Table 1. A comparison of the survey outcomes of the three schools

School (number or respondents)	Types of school	Use of ICT for self-directed learning mean scores (std dev)	Use of ICT for collaborative learning mean scores (std dev)
School A (62)	Elementary, mixed gender	3.34 (1.17)	3.93 (1.29)
School B (68)	Secondary, mixed gender	3.64 (1.00)	4.10 (1.09)
School C (77)	Secondary, Girls	3.91 (1.13)	4.55 (1.08)

The survey findings showed that similar trend existed among the three schools for the students' use of ICT for self-directed learning and for collaborative learning. School C showed the highest mean scores, followed by School B and School A. On the use of ICT for self-directed learning, analysis of variance at α=.05 level showed that there was significant difference among the three schools, F(2,204)=4.550, p=.012. Post hoc analysis using Tukey HSD showed that the significant difference existed between School C and School A (p=.008). Similarly, on the use of ICT for collaborative learning, analysis of variance at α=.05 level showed that there was significant difference among the three schools, F(2,204)=5.468, p=.005. Post hoc analysis using Tukey HSD showed that the significant difference existed between School C and School A (p=.005). In short, School C seemed to be the most successful in achieving the student-related goals specified in the ICT Masterplan whereas School A was the least successful. Next, we turn to the qualitative analysis to gain an insight into the leadership practices among the three schools.

School A: Top-down leadership

An interview with the HoD ICT in School A revealed that she was the key driver to communicate ICT goals and initiatives to the teaching staff. She made decisions about the foci for technology integration, revolving around the types of technology tools to be used.

> Basically this year was for them to use interactive whiteboard and then after that it's the Microsoft Excel. And… a refresher of the LMS... these three that I've focused on. Also because I didn't want to focus on too many things. Because no point training on too many things and nothing is being transferred... they don't use it.

She introduced several new ICT tools to the teachers, arranged for training for the tools and let the teachers decide which tools they would like to employ for their teaching practices.

> I shared with them Webspiration collaboration mindmapping tool online... then I told them... let's integrate this into our curriculum... and they started and it blends in well... I see that happening, it's like spreading, it's taking roots now.

She shared that she had trained a team of teachers who would provide coaching to the other teaching staff. The selected teachers would learn the ICT tools and try it in their own classes before they trained the other teachers. The HoD ICT would then supervise these teachers and they were given opportunities to share their practices during staff meetings.

> I started up this small team of teachers who do training for the rest of the teachers... for example like... the new system... they call it the... iConnect... each of us take a section. And then we ourselves will train our own staff. So right now it's what we're going to do for the new WES portal, the Vshare portal... we'll learn it, we'll do it in our own class and then we'll share it and train the teachers individually.

Thus, in School A, the principal and department head teachers of various subject domains were positioned in the ICT leadership structure. In terms of hierarchy, the HoD ICT operated at the same level as HoDs of various subject domains. However, the development and management of ICT programmes and applications were mostly directed and implemented by the HoD ICT. Thus, the HoD ICT acted as the key personnel to provide directions and create conditions for ICT implementation and her instructions were often cascaded down to the teaching staff through the various department heads. The school adopts a "heroic" model of leadership (Spillane, 2005) where there is a concentration of power and responsibility on the HoD ICT. This HoD was the key person directing and planning the ICT integration in the school. We could not detect significant differentiation strategy employed by School A. We conclude that School A was practicing top-down leadership approach for ICT leadership, as show in Figure 1. Note that this hierarchical structure represents the most common structure in mainstream Singapore schools.

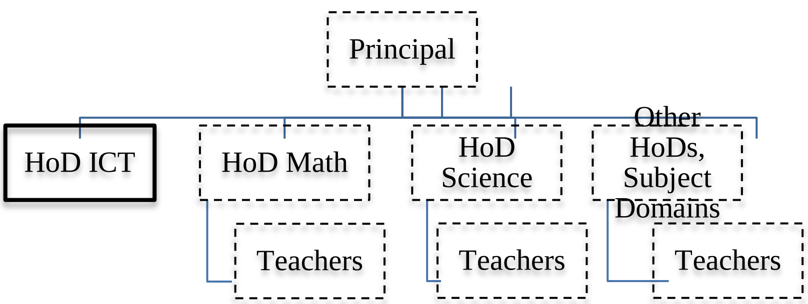

Figure 1. Top-down ICT leadership in School A

School B: Segmentation distribution

School B adopted a segmentation differentiation approach for ICT leadership where there was a division of the leadership structure into identical units that operated in a similar ways from which it emerged. Unlike the structure for School A where the HoD ICT directed and implemented ICT programmes and applications, the findings from School B showed that the department heads for various subject domains were the key personnel involved in setting the directions for technology integration. The principal and the HoD ICT assisted in supervising and facilitating their work. In the words of the HoD ICT, they helped to "make sure that… when every department design programs, design things, project work… they have a set of guidelines… linking it to our school vision as well."

The HoD ICT shared that School B is encouraging department-based ICT experimentation. As the school was participating in a nationwide initiative called "TLLM (Teach-Less Learn-More) Ignite", teachers from various departments were tasked to initiate action research projects. He described two existing projects implemented by the Mathematics department and the Science department respectively.

> The Maths department is involved in this... project. So they are exploring using tablet PCs for learning of graphs. So last year we've already had action research project on… that is one strand. The other strand is… the AR [Action Research] by the Science department. They are looking into the use of blogs for developing inquisitiveness in the students… that's another research we're doing.

One teacher from the science department provided an elaboration on one of the science projects. In brief, the science teachers collaboratively investigated the effects of blogs as a reflective tool on students' learning.

> For the science department, we are actually embarking on the science research project on reflections… so we are using ICT and reflection on the board… Students after every lesson... everyday will reflect… we split them into different groups, one group will reflect and post it up on notice board what they have learnt today, what are some of the things they have thought about, what do they feel about the lesson, is there any questions they want to ask about the lesson that was taught. Another group will do it on the blog. They will just post up their reflections on the blog… and the third group will do the reflective journal with no audience, that means they will just write inside their 'My Reflective Journal' book, and then they will just submit to the teacher. So we are testing for any effects… (Teacher, School B)

There was a distribution of leadership branching out from the individual departments where teachers were tasked to lead ICT programmes or initiatives. Figure 2 depicts this structure.

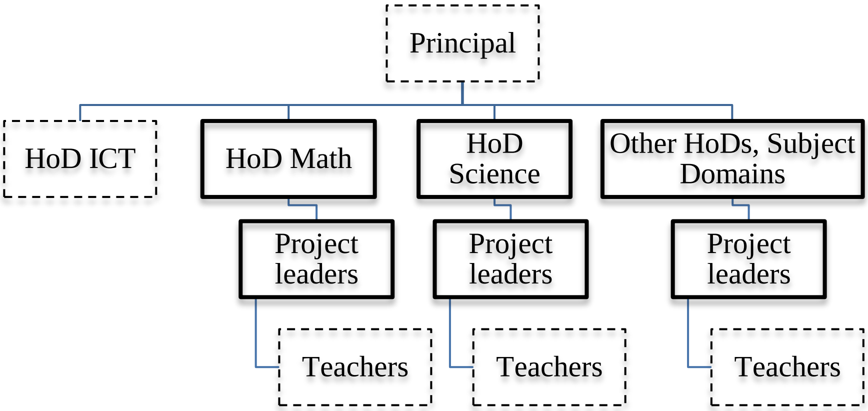

Figure 2. Segmentation differentiation strategy in School B

Noteworthy is that the projects conducted by various departments seemed to be independent of one another and were conducted in a similar fashion as action research projects. In other words, each department would start a project and assign experienced (senior) teachers to take charge of it; each project did not rely on one another for its planning and implementation. This division of structure is a characteristic of a segmentation distribution as new independent subunits continue to branch out from each department, forming identical units with similar functions.

School C: Functional differentiation distribution

Unlike School B where the principal and the HoD ICT play a facilitative role, the HoD ICT of School C reported that the principal and vice-principals, Heads of Department, senior teachers and IT directors were all involved in the planning of school ICT goals and initiatives. According to him, the principal and vice-principals examined the key MOE initiatives or directions and they did the envisioning exercise. The ICT department played a distinct role. Teachers, appointed as IT directors, worked with the HoD ICT in setting the directions for technology integration. These IT directors took charge of the sub-divisions within the ICT department. There are four sub-divisions within the ICT department: staff development, student development, infrastructure and special projects. The ICT plans from these sub-divisions were incorporated into the overall school plan.

> For ICT plans… it's a combination of… IT plans from… all the different departments… at the same time… I will have all the four different IT directors overseeing things like staff development, student development, infrastructure as well as special projects. Again they would have their own ICT plans, which I will incorporate inside my entire plan. (HoD ICT, School C)

The Heads of Department in charge of the various subject disciplines also provided individual department plans for ICT integration. Expert teachers such as senior teachers were also involved in the planning of key ICT programmes. For instance, a senior teacher, in collaboration with the HoD ICT and Pastoral Care and Career Guidance (PCCG) department, planned the school cyberwellness programme.

> A senior teacher… he's being supported by two key departments, the PCCG department and the IT department… we work very closely, the three of us, and in terms of so-called the cyber wellness plan that we've put in place for the school, it's at different levels. For example for the technology side, IT department, we have integrated into our lower secondary computer education programme alright so in Sec 1 and Sec 2, students will be going through computer education programme and a lot of projects it ties in with this cyber wellness. (HoD ICT, School C)

In the area of teaching and learning, School C involved teachers in the discussion on ICT implementation. The principal shared that they engaged all teachers in designing ICT lessons during an annual staff seminar.

> Every half a year, we have our staff seminar and… we have discussions about how are you using IT, introduce to them new IT tools and we also ask them to share, discuss, plan a lesson together and it is that constant communication, discussion of concerns, bouncing ideas off one another that is making it more ingrained in them, making them realise more possibilities… (P, School C)

The HoD ICT also reported that the leadership practice for integrating ICT into teaching and learning was a "bottom up" approach "where our teachers ranging from our e-coaches to the... staff... they will be the ones who's coming up with ideas. From there we actually embrace it." Teachers, therefore, had the autonomy to design and implement their own ICT pedagogical practices. This point is emphasised in the quote below.

> The teachers need to be able to articulate what it means... to think through what is it that they are doing in the classroom and... be able to articulate what does a good self-directed learning environment look like and how they are going to create the environment, how are they going to create and design the lesson in various different subject areas, which are very unique and very different. So we give them that space and that time to do that... (HoD ICT, School C)

We could conclude that School C adopts a functional differentiation strategy, where division of the leadership structure forms unequal subunits that operate with different and specialised functions for the ICT implementation. The principal and vice-principals take on a visionary role while the department head teachers and HoD ICT collaborate to implement ICT programmes and initiatives. In addition, there is a further division of the leadership structure into subunits that oversee specialised functional areas of the school ICT integration. For instance, under the HoD ICT, the leadership structure branches out to four subunits with specialised areas. Figure 3 depicts this structure. Note that in School C, leadership permeates several hierarchical levels, even at the level of classroom teachers.

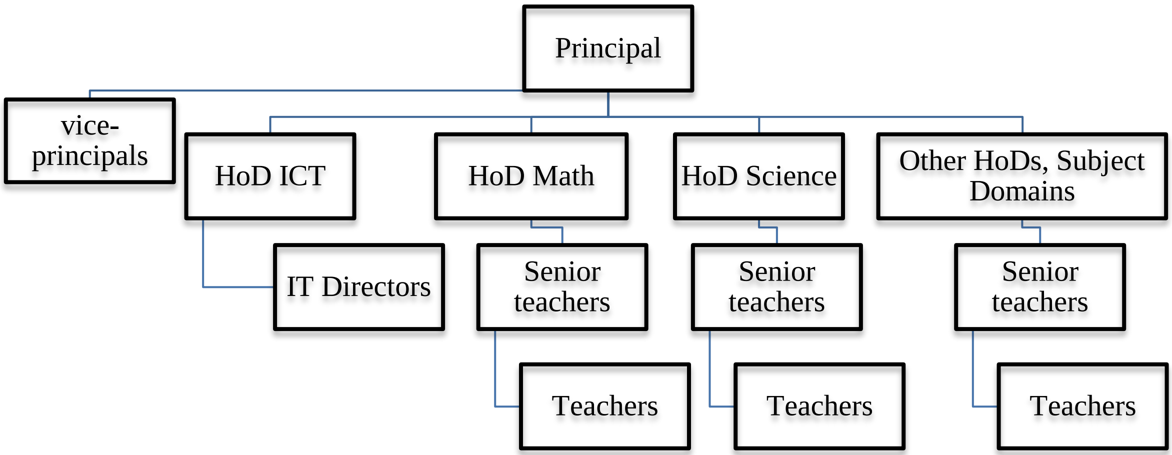

Figure 3. Functional differentiation strategy in School C

We have reported the findings for each school in terms of their leadership practices in ICT integration, in particular, the leadership structure and the differentiation strategy. A comparison of the three schools could help to uncover the plausible factors influencing the practices in these schools. Table 2 summarises the comparison.

Table 2. A comparison of the ICT leadership practices in the three schools

	Scale and Complexity of ICT integration	Differentiation Strategy	Distributed leadership
School A	• A typical Singapore school in terms of ICT integration • Least successful in achieving technology-related outcomes	• Standard leadership configuration	• Non-distributed • Leadership resides mainly in one person (HoD ICT)
School B	• LeadICT@School • Recognition for specific ICT projects	• Segmentation differentiation, forming identical and independent subunits with similar functions	• Distributed at two levels • Mainly Heads of Department of various subject domains and Project leaders
School C	• FutureSchool@Singapore • Recognition for school-wide integration of ICT • Most successful in achieving technology-related outcomes	• Functional differentiation, forming unequal subunits that operate with different and specialised functions	• Distributed at more than three levels • Whole-school approach

In this study, the three cases revealed structural differentiation in their leadership hierarchy for ICT implementation which could provide an indication of their distributed leadership practices. School A reflected a top-down leadership structure while School B and School C showed a distributed form of leadership structure. School B showed a limited degree of distribution in leadership and employed a segmentation strategy. On the other hand, School C demonstrated high level of distribution in leadership and a functional differentiation approach. These variations in leadership practices seem to be associated with the scale and complexity of the schools' ICT integration effort. School A was a non-ICT enhanced school; School B was under the LeadICT@School, recognised for its specific ICT project; and School C achieved the pinnacle FutureSchool@Singapore status for its school-wide integration of ICT. To suggest an explanation for such relationship, we first consulted two reported studies for ideas.

Yuen, Law, and Wong (2003) found that schools in the beginning stage of ICT implementation reflected a top-down management from principals while the leadership in schools in the advanced stage of ICT implementation involved multiple leaders. They suggested that schools in the beginning stage of ICT implementation tend to focus on developing students' ICT competencies and enhancing teaching effectiveness; a top-down management from principals could help both teachers and students to achieve the minimal level of ICT competencies. Schools in the advanced stage, however, engaged teachers and students in the use of ICT to implement new ideas for teaching and learning and hence the leadership involved multiple leaders. Thus, the principal was not necessarily the leader in initiatives related to ICT. In short, Yuen, Law, and Wong (2003) suggested that the leadership practices were influenced by the key concerns and stage of ICT implementation in the schools. On the other hand, Tubin (2007) used Luhmann's system theory (1995) to characterise schools by the types of system differentiation. She provided a cursory comment on the association between leadership style and each form of differentiation. Our study differs from the above two studies in two ways. First, since 1997, Singapore schools have experienced two ICT Masterplan in Education and are currently in the third phase of ICT Masterplan. Evaluation of the first ICT Masterplan found that both students and teachers possessed the basic ICT skills (Koh & Lee, 2009). Thus, it is likely that even School A has progressed beyond the stage of developing students' ICT competencies and enhancing teaching effectiveness. Second, Tubin (2007) focused on explaining the relationship between school's communication and the differentiation strategy. Though there was a brief attempt to associate leadership style and the type of differentiation, however, the leadership style seems to be focusing on the characteristics of a leader rather than distributed leadership. Nevertheless, these two studies provided ideas for us to explain distributed leadership practices using Luhmann's theory.

From our findings, we propose an explanation for the emerging relationship: A school that has successful school-wide ICT integration and adopts a functional differentiation approach could demonstrate a deeper level of distributed leadership. This explanation is consistent with Luhmann's explanation that "only complexity can reduce complexity" (Luhmann, 1995, p. 26). A school that engages in holistic and school-wide ICT integration is likely to encounter complex changes. This high complexity of change necessitates reaction mechanisms that are systemic in nature. It calls for new units that are more focused in their functions and there is a need to coordinate these functional units, resulting in stronger inter-dependency among the units. In addition, the complexity prevents a leader from providing direction and supervising at the level of functionally different sub-units; a higher degree of empowerment at each level is called for, and therefore, a deeper level of distribution of leadership. In short, the complexity of change influences the types of system differentiation and the degree of distribution of leadership. Incidentally, the survey findings indicated that School C was the most successful in achieving the technology-related goal among the students. Although the case study method prevents us from drawing a causal relationship, we could see this as a positive indicator of the practices enacted in School A. Acknowledging the limitations of a case study approach in generalising the findings, our explanation should be subjected to further verification.

Conclusion

This study set out to identify the variations of leadership distribution and investigate the differentiation mechanisms of the schools in technology integration among three Singapore schools. Using case-study approach, three schools with different scale of ICT integration effort were selected as contrasting cases to study the distributed practices.

Our findings revealed that School A, which represented a typical Singapore school in terms of ICT integration, displayed a top-down leadership approach. There was no apparent differentiation strategy. Within the standard leadership configuration of a Singapore school, the HoD ICT assumed the key leadership role in ICT integration. School B, which was recognized for its specific ICT projects, adopted a segmentation differentiation strategy where sub-units of similar functions were formed. In the case of School B, Heads of department for various subjects and project leaders took the leadership roles in implementing action research projects while the principal and the HoD ICT played facilitative roles. School C, which was recognised for its school-wide implement, adopted a functional differentiation strategy where new units of specialised functions were formed. In School C, four new positions of IT Director were created with unique functions: staff development, student development, infrastructure and special projects. Distributed leadership related to ICT integration permeated through various hierarchies within the school, including the teacher level. School C was also found to be the most successful in terms of the use of ICT for self-directed learning and collaborative learning among the students. By using the lens of Luhmann's system theory (1995) to study school leadership, we present a new perspective for explaining distributed leadership in ICT integration. We suggest that a relationship exists between the level of complexity of ICT integration and the type of system differentiation, which could influence the degree of distribution of leadership.

Research on how distributed leadership is practised among school personnel in leading technology change is at its infancy stage. This study represents an initial effort to contribute to this field of study. Extending from this study, we aim to verify our preliminary explanation for the observed relationship, to study the interdependencies among the sub-units, as well as to explore the relationship between distributed leadership and various outcomes of ICT integration, including students' and teachers' pedagogical use of ICT tools in teaching and learning.

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One-to-one Computing: Considerations and issues for the Higher Education Sector

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As a direct result of the Australian Government's Digital Education Revolution Program (DER), many of the school leavers soon to enter the Higher Education sector will be accustomed to a one-to-one student laptop learning environment. Therefore, it is not unreasonable to assume that these students will expect a similar environment when they enter university. Training pre-service teachers to use the one-to-one ratio effectively in the classroom is also critical to their capability in implementing requirements expected of them in the classroom in the 21st century. It is within this context that this research is set.

The authors report on a pilot project that aims to capitalize on the one-to-one student experience by transforming the current, traditional lecture and tutorial model adopted in most tertiary institutions, with one-to-one integrated lectures and workshops. This paper describes the first phase of the research: an investigation into how prepared Australian universities are to cater for these students.

Keywords: one-to-one computing, Information and Communication Technology (ICT), laptop pedagogy

Introduction

The international and national agenda driving information and communication technology (ICT) in education has been largely based on greater access to technology, faster connectivity, the expansion of access to information, various software applications and the use of ICT across the curriculum. Largely in response to this, the Australian government has recently invested $2.4 billion in the Digital Education Revolution (DER) to ensure that every Australian secondary school student has access to technology, a laptop for secondary school students in Years 9-12 along with sophisticated software and broadband internet connection for each school.

As a result of the DER, many schools from all educational systems throughout Australia (State, Catholic and Independent) have undertaken initiatives to provide students with ready access to laptops. Common to most of these projects is the idea that the students have individual access to the laptops but there are variations in the management of the programs. For example, some schools have given students ownership of the laptops and other schools purchased mobile laboratories, self-charging trolleys full of laptops, to be shared amongst classes and stored at school.

Background

One-to-one computing defined
The one-to-one computing model is an

> "instructional technology application in which all users have their own mobile multimedia digital devices that possess the capability of connecting to the Internet, such as a laptop, as opposed to the one to many computing model, in which one desktop computer is stationed in a lab and shared by many students" (Di Gangi et al., 2007, p. 367).

Whilst one-to-one student laptop programs differ in many ways, as indicated above, there are commonalities across most, such as:

- students have individual access to computers loaded with contemporary software such as word processing, spreadsheets and multimedia creation tools;
- access to internet is through wireless networks; and
- the focus on using laptops is for research, assignments, assessment tasks and presentations (Department of Education and Training, 2009).

The benefits of the one-to-one computing model is that the ubiquitous, 24/7 access to the technology makes it possible for students to access a wider array of resources to support their learning, to communicate with peers and their teachers, and to become fluent in their use of the technological tools of the 21st century workplace. When students are also able to take the laptop home, the enhanced access further facilitates students keeping their work organized and makes the laptop a more ‘personal’ device (Vahey & Crawford, 2002; Penuel, 2006), facilitating anytime, anywhere learning.

Teachers have also reported that when working in a one-to-one student laptop learning environment, students are more engaged and motivated to learn. The teachers also believe that the one-to-one student laptop environment facilitates more authentic, collaborative and project-based learning (Swan, Kratcoski, Mazzer & Schenker, 2005), which often leads to a greater incidence of higher-quality work.

Challenges of one-to-one computing

The success of the one-to-one student laptop initiative is determined by the way in which the technology is deployed in the learning environment and also the pedagogical model that underpins the initiative (Muir, Knezek & Christensen, 2004). Currently there are many schools and international universities who have implemented one-to-one computing initiatives of varying scale and depth. However, the ‘*Research: What it says about 1 to 1 learning’* Report (Apple Computer Inc., 2005) indicated there is no conclusive evidence to show that the quality of education has increased as a result.. Similarly, Albion (1999) and Muir et al. (2006) argued that laptops were presented as the answer without actual scrutiny about their effectiveness and appeared to be more of a trend. Furthermore, advantages of laptops over desktops are not conclusively demonstrated and there are a number of issues yet to be resolved, for example, connectivity, ease of transportability, obsolescence, laptop pedagogy, etc.

Some of the challenges presented in the literature and explored in this project are summarised below.

Pedagogical issues of one-to-one computing

Changing the learning environment for students to incorporate the integration of one-to-one student laptop ratios will be one of the major obstacles to overcome in the tertiary education environment. Current pedagogical practice indicates that it may not be apparent to lecturers how laptops can be used as learning tools as many lecturers do not necessarily incorporate higher levels of technology skills into their teaching and student assessments. In many cases, PowerPoint presentations remain the norm, even online instructional environments typically consist of presentations and static text files. Current literature reports that many lecturers are simply adapting traditional teaching strategies to incorporate more adult productivity tools and having students work independently and in small groups, but they have not yet begun to implement widely more student-centered strategies such as project or inquiry-based learning.

Lecturers may be missing an important opportunity as one-to-one student laptop initiatives have been found to promote student autonomy enabling them to work quickly and independently. Students can access and organise information as well as pursuing particular points of interest, going into the topic in more depth. They can work at their own pace and devise their own search strategies. Students using laptops have opportunities to work with a range of diverse media to create content. They can use multimedia tools for creative expression, presentations, project work, narratives and design and create multimedia presentations, which, it is hoped, will lead to them a better understanding of content (DET, 2009).

Lecturer professional learning is also a very important factor in the effectiveness of the one-to-one student laptop environment. Lecturers need to be aware that laptops can enhance teaching and learning, feel confident and prepared and take an active role in professional learning to transform pedagogical practice. Formal professional development has been a critical component of many one-to-one programs, and the features of these activities are important for implementation. In the school-based implementation models, many researchers reported that what was most critical was a program that focused on helping teachers integrate technology into their pedagogical practice (Penuel, 2006). Some of the professional development that is targeted to help teachers become more "student-centered" in their teaching has been especially effective in transforming pedagogy in laptop classrooms. A good example of such a program is the iNtegrating Technology for inQuiry (NTeQ) model (Morrison, Lowther, & DeMuelle, 1999), which helps teachers develop extended problems and projects that use real-world resources, student collaboration, and computer tools to reach solutions or create final products (Penuel, 2006).

Lecturers may be very willing to adapt to one-to-one student laptop classrooms and they may also have high ICT skill levels, but they still require a lot of support. They need time and opportunities to learn about what teaching strategies, assessment strategies and resources are effective in a one-to-one laptop environment (DET, 2009). The DET also reported that another barrier to implementation was the concern for increased levels of classroom management.

Classroom Management in the One-to-one Classroom

Lecturers wonder what effect internet access will have on student behaviour during classes. There is concern that student attention will be directed away from the lecture content to non-academic pursuits such as social networking sites, e.g. Facebook and Twitter, playing games, and watching videos (DiGangi, 2007). A reduction in face-to-face interaction can also negatively impact on student learning. Students can absorb vast amounts of information but the cost may be in a reduction of social engagement between peers (DET, 2009).

The concerns of these lecturers are legitimate and there is the real possibility of disengagement with students as much time is spent on computers for planning, programming, assessing and so on. The experience in school classrooms is that laptops can provide disruptive and competitive distractions in class, requiring teachers with strong classroom management skills to reduce the occurrence and impact (DET, 2009).

Institutional Readiness

The quality of the institution's wireless infrastructure, including the availability of support for addressing problems as they arise, is a significant factor in shaping the success in a program (Penuel, 2006). The *'Most Unwired College Campuses'* survey (Intel Corp, 2005) noted that 98% of the top 50 US campuses are covered by a wireless network. A similar situation is reported in Australian universities, however, their ability to support one-to-one student laptop initiatives has been questioned. For classrooms using wireless networks, the reliability of the network is frequently an issue and is definitely a barrier to widespread use by teachers (Hill & Reeves, 2004; Tatar, Roschelle, Vahey, & Penuel, 2003).

It is evident that effective one-to-one computing must address factors such as reliable technical connectivity and support, along with other considerations such as the transformation of pedagogy to include more project and inquiry-based learning and effective classroom management strategies.

Method

Pilot

A one-to-one student laptop pilot study will be undertaken from August to November, 2011, by two lecturers in the Australian Catholic University's (ACU) Faculty of Education to deliver curriculum content and professional skills in two pre-service secondary teachers' units. In doing so, they will examine the issues, challenges and successes of the one-to-one initiative. The participants of the pilot study will be 70 undergraduate and postgraduate education students enrolled in the Bachelor of Arts/Bachelor of Teaching (BT/BA) and Graduate Diploma (Grad dip.) programs at ACU. The participants will be encouraged to supply their own technological devices, e.g. laptop, iPad, smartphone, etc. with the only prerequisite being that the device must have the capability to connect to the university's wireless network. With laptop ownership estimated at 90% due to the DER project, this is not considered an unreasonable request. It is recognised, however, that not all students will have DER laptops nor the means to purchase them so laptops will be made available for loan through the Faculty of Education and the university library.

Researching this new approach will require an action research methodology where participant observations and evaluations will form the basis of data collection. This approach seems the most appropriate choice as it provides the opportunity to utilise a "disciplined process of inquiry conducted by and for those taking the action. The primary reason for engaging in this type of research is to assist the actor in improving or refining his or her actions," (Sagor, 2005, p. 1 citing Sagor, 2000). Results from this endeavour would hopefully enhance teaching practices and student outcomes. Notes from the discussions held between the two lecturers who are staffed the unit, student responses from unit evaluations, and evidence of the assessments handed in by students will also be analysed and reflected upon to provide a potential blueprint for other educators and institutions implementing a one-to-one student laptop program. By using lecturer observations, student evaluations, and work samples, triangulation of data becomes possible thus strengthening the validity of the research (Cohen, Manion, & Morrison, 2007).

Upon completion of the unit, and phase 1 of the research, the researchers hope to provide greater insight into the following research questions:

- What determines institutional readiness for a successful one-to-one computing initiative?
- How are teachers and students using the technology in their classrooms (both within Australia and internationally)?
- What is considered recommended practice, and does this translate to the Australian Higher Education Sector?

- What challenges have been identified in the previous studies that may be relevant to the Australian Higher Education sector?
- What pedagogical issues have been raised?
- What are the classroom management issues, if any? and
- What are the overall benefits of the one-to-one environment for both teachers and students

Conclusion

The project outlined in this paper aims to investigate how the one-to-one student laptop initiative might transform the traditional, tertiary model made up of lectures and tutorials, with one-to-one integrated lectures and workshops. The researchers will develop and evaluate an appropriate one-to-one pedagogical model, the findings of which, it is anticipated, will enrich not only the delivery of the units offered in the Faculty of Education but other schools and universities implementing one-to-one initiatives.

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Technological pedagogical differences in the teaching of English and Mathematics in a primary school

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Abstract

This case study research attempts to examine the difference in technological pedagogical approaches adopted by teachers in the teaching of English and Mathematics in a school in Singapore. The study adopts the learning *from* and learning *with* technology framework in reporting and analysing the findings. From the lesson observations, review of teachers' written reports and curriculum plans, interviews with teachers and group interviews with students. Mathematics teachers adopted predominantly the learning *from* technology pedagogy with occasional learning *with* technology approach. In contrary, English teachers facilitated students to learn *from* and also *with* technology. This case study illustrated how technological pedagogical approaches were influenced by the subject (i.e., English and Mathematics). This study also highlights the limited use of the co-constructivist approach by the teachers in the teaching of both of the subjects.

Keywords: technology and pedagogy, learning *from* and learning *with* technology, integration of ICT into the curriculum

Introduction

The main intent of this case study is to have an in-depth understanding of how ICT has been integrated into the teaching of English and Mathematics in a primary school in Singapore. Of the various learning subjects offered in the primary schools in Singapore, both the English Language and Mathematics are two very important academic subjects that take up a significant portion of the students' time in school. Students have English Language and Mathematics lessons each day. However, the nature of the two subjects is different – the learning of the English Language focuses on the expression of oneself through the use of text and in multimedia format to develop not only language skills but also media literacy, whereas the learning of Mathematics focuses on acquisition of problem-solving skills and concepts. Due to the differences in terms of the content of the two subjects, the pedagogical approaches could be different and this in turn influences how technology could be used to teach these subjects.

The main objective of this paper is to explore how ICT has been integrated into the teaching of English Language and Mathematics in a primary school. The paper also investigates whether there is a difference in terms of pedagogical approach adopted by the teachers in using ICT for the teaching of English and Mathematics.

Background

This research study took place in a primary future school in Singapore. The FutureSchools@Singapore program is an initiative by the local infocomm authority and the ministry of education. The main intent of future school initiative to have a group of schools to harness the use of ICT effectively for engaged learning. The future schools at the various levels (i.e., primary, secondary and post-secondary levels) are set as models for other schools for innovative transformation of the education experience that leverage on ICT. Currently, there are a total of 3 primary school level future schools in Singapore. The schools under the FutureSchools@Singapore program are poised to lead the way in the seamless and pervasive integration of ICT into the curriculum for engaged learning in the schools and classrooms. The school has implemented a successful one-to-one computing program for all its students and this case study focuses on how eight teachers have integrated ICT into the teaching of English and Mathematics for their primary 4 students.

Theoretical framework – learning *from* and *with* technology

Broadly speaking, learning *from* and learning *with* technology (Ringstaff and Kelley, 2002) could provide a very useful and simple conceptual technological pedagogical framework when teachers try to integrate ICT into their teachings. Learning from the computer leans itself more towards the behaviouristic theories of learning whereas learning *with* technology has its roots from the constructivist and social constructivism paradigms. More passive behaviours such as reading and listening are associated with learning *from* technology, while more active behaviours such as creating, writing and updating are associated with learning *with* technology (Harris & Rea, 2009). Learning *from* computers takes various forms – computer-based instruction, computer-assisted instruction and intelligent learning system, to name a few. Basically, learning *from* computers sees the computer system as a tutor. While learning *from* computers can help students to enhance their performance on basic skills, learning *with* computers could facilitate the learning of higher-order thinking (Jonassen, 2000; Lim & Tay, 2003). As compared to the learning of basic knowledge and skills, it is much harder to quantify the learning of higher order type of thinking and skills. Bower, Hedberg and Kuswara (2010) further propose a framework for technology learning design, suggesting four types of online pedagogies – transmissive, dialogic, constructionist and co-constructive. These pedagogies are categorised according to their degree of production and collaboration as shown in Table 1 below. This synthesised framework would be used to discuss and analyse the findings of this case study.

Table 1: Pedagogies according to the degree of Production and Collaboration – Learning *from* and *with* Technology (adapted from Bower, Hedberg, and Kuswara, 2010 and Ringstaff & Kelley, 2002)

	No collaboration	**Collaboration**
No production	Transmissive (learning *from* Technology)	Dialogic (Learning *with* Technology)
Production	Constructionist (learning *with* Technology)	Co-constructionist (learning *with* technology)

From the literature reviewed, it seems to suggest that the teaching of English (Abas, Fong, Yu & Lee, 2010; Tay, Nair & Lim, 2010; Andrews, Freeman, Hou, McGuinn, Robinson & Zhu, 2007; Melhuish, 2008;

Mullamaa, 2010) and Mathematics (Bosco, 2004; Chong, Sharaf & Jacob, 2005; Crisan, Lerman & Winbourne, 2007; Law, 2009; McAlister, Dunn & Quinn, 2005) could adopt the various approached mentioned above – learning *from* and *with* technology, with or without production and with or without collaboration.

Research design and methods

A case study approach (Stake, 1995) is used in this research study to look into how ICT has been integrated into the teaching of English and Mathematics in this primary school. More specifically, this research case study examines the technological pedagogical approaches adopted by the English and Mathematics teachers in their integration of ICT into their classes.

The different research methods in this study act as a means for triangulation. The findings are derived and triangulated from the various research methods presented in the next section. The various research methods were: (1) lesson observations, (2) document reviews, (3) interviews with teachers and (4) group interviews with students. The findings were derived from data collected from the observation of three lessons conducted by the teachers; lesson reports and reflections written by five teachers; individual interview with eight teachers and group interviews with seven groups of students (four students in each group).

Findings

Learning *from* technology

The online quiz module found in the online management system of the school was a feature used by both English and Mathematics teachers to facilitate students' learning of the subjects. From observations and interviews with both teachers and students, the self-marking function in the quiz module cut down marking time for teachers and could also provide them with a quick and accurate overview of the students' understanding of the basic content knowledge being taught and learned. In addition, students were also given instantaneous feedback on their responses. The teachers also observed that students were more motivated to repeatedly try to get the correct answer. The readily available item analysis made it easier for the teachers to take any follow-up actions to address any misconceptions. Students learn *from* technology through their attempts of the online quizzes to practice and reinforce the content knowledge that they have learned. The online quizzes provided for a more transmissive pedagogical approach without much degree of negotiation or collaboration and production. Both teachers and students reflected that the online quizzes were more frequently used in Mathematics lessons as compared to English lessons. Mathematics teachers reflected that due the nature of the subject, students needed a good basic procedural skills, knowledge and concept of how to work out the correct answers. The English teachers also shared that they did use the quiz module to reinforce some of the grammar items taught in class.

Both the English and Mathematics teachers set up blog sites for the dissemination of online teaching and learning information and resources. Through the interviews with the teachers and students, the Mathematics teachers used this approach more frequently as compared to the English teachers in the in consolidating the links to online free digital resources. For instance, one of the Mathematics teachers created and maintained the blog sites weekly for the various levels with the Internet links to the relevant teaching online resources, games and manipulatives. These blogs allowed students to access the suitable educational online games and manipulatives that were related to what was taught in class. The teachers used some of the free and readily available online manipulatives to make their lessons more interesting and engaging. This is another instance of learning *from* technology with the transmission of learning content via the online platforms. The consolidated links by the teachers to the quizzes and online digital manipulatives could be found on the blog site for the ease of students to learn *from* the technology and promote more independent learning. The above instances represented learning *from* technology, without production and collaboration.

Learning *with* technology

The English teachers engaged the students in the creation of their digital stories, a key approach used by the school for the learning of language and digital literacy skills. The lesson idea was a very simple one. The students used an appropriate software application to create a digital story with text, digital images and sound recordings (i.e., students' own voices in narrating their stories). Pupils were given a series of scaffolding tasks prior to the completion of their digital storytelling assignment, which included brainstorming for ideas in groups or pairs for profiles of characters, drafting of story outlines and finally recording their narration of the stories. Teachers provided feedback for improvement when pupils completed the various tasks at different times. The completed digital stories were then published in the school network and also Internet, via blog sites, so that peers and parents could view and also provide their comments. This process of putting the students' ideas into text and colourful visuals excited and engaged them. Facilitated by technology to present their digital stories, students could easily create and refine their stories and learn from each other in the creation process. In recording the narration of their stories, students attempted multiple readings and recordings till they felt satisfied with their digital readings. This was another instance where English teachers facilitated students to learn *with* technology (with elements of production and traces of collaboration); the student created their digital stories (Tay, Lim, Lim, 2011).

Several English teachers encouraged their students to post their reflections and thoughts as online journals via online blog sites. The teachers modelled the writing and steps on how to post their journal online. The students' online journals were commented by both their English teachers and fellow classmates. This process encouraged the students to express themselves more clearly as they need to be understood, especially their fellow classmates. The students were also observed to write more frequently through their blogs. The students were engaged in constructing or producing their own online journals; they were also engaged in online dialogue and exchanges through the comments posted via the blogs. This was another instance of learning *with* technology, with students writing their own journal with comments from friends and teachers.

One of the Mathematics teachers taught her students computer programming. Her exploration provided encouraging evidence that computer programming had the potential to equip the young children with digital literacy and Mathematics thinking skills. This is one example of learning *with* technology through a constructionist pedagogical approach. All students from the various primary 4 classes were also exposed to the creation of pictorial graphs using the spreadsheet software application to analyse trends and patterns. This was a simple instance of learning *with* technology from a constructionist perspective.

Discussion

From a technology pedagogical perspective, the student learned *from* and also *with* technology in both subjects, with and also without production and collaboration. From the findings, it seemed to suggest that Mathematics teachers adopted a more learning *from* technology and transmissive approach as compared to the English teachers. From the interviews with the teachers, the learning of Mathematics require basic computational skills and the reinforcement of these skills need more 'drill and practice' type of pedagogy through the use of quizzes found within the learning management system. However, there were snippets of learning *with* technology in the learning of Mathematics, where students were taught computer programming and also the creation of pictorial graphs using the spreadsheet software application. In general, the teaching of Mathematics took a more learning *from* technology and much lesser occasions for learning *with* technology. The elements of collaboration were limited in Mathematics lessons.

On the contrary, the English teachers seemed to use a hybrid of pedagogical approaches in their teaching of English. Both learning *from* and learning *with* technology approaches were used. Teachers made use of the online social networking applications to transmit information, learning resources, online quizzes and also to allow students to comment on each other's journals and digitally written works. Students were also given opportunities to construct or write their own digital stories or compositions with their personal voices embedded in both offline and online software applications. In summary, as the nature of the subject, the students were given opportunities to express their thoughts with the ICT tools available. However, the co-construction aspect was not evident in the English lessons.

Conclusion

This paper looks into the difference in technological pedagogical approaches adopted by the teachers in the teaching of English and Mathematics. The above discussion suggested that the difference in the technological pedagogical approach adopted by the teachers was influenced by the content subjects (i.e., English and Mathematics in this case) they were teaching. In addition, we have also to be aware that other factors, such as individual teacher's beliefs, curriculum plans that explicitly state the use of ICT and other contextual factors may also influence how technology is being used in the classrooms (Crisan, Lerman & Winbourne, 2007).

In conclusion, the findings seem to also suggest a lack of the use of co-constructivist approach by the teachers in both the subjects. Hence, future research could look into how to support and encourage teachers in the use the co-constructivist approach in the primary school context.

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A Multivariate Survey Analysis: Evaluation of Technology Integration in Teaching Statistics

Abdellatif Tchantchane and Pauline Carolyne Fortes

Teaching and learning in higher education has been influenced by the rapid rate of innovation in technology. We have experimented with the integration of technology in our foundation Statistics subject and measured students' performance relative to those taught statistics by the traditional teaching of the same subject: a total of 144 students of 30 different nationalities taught by the new methodology were surveyed at the end of the subject before the final examination.

Keywords: integration of technology, teaching statistics, multivariate analysis, pedagogy

Introduction

Statistics played a vital role in our daily math world. It is a method used on how to interpret, analyze and evaluate the findings of any research inquiries. Having this in mind, an increase of dilemma on how to cope with the shifting from traditional tool to modernize method. A growing movement has seen in introducing statistics in all levels of education (Garfield & Ahlgren, 1988). Many statisticians as well as mathematics teachers have been involved in this reform. In the modern society, there is a strong awareness with the relevance of statistics in any form of research and fact finding articles. Thus, university students and teachers' still find Mathematics and Statistics an anxiety-provoking and difficult subject. True enough that many research studies confirmed this perception (Baharun & Porter, 2009; Fortes & Tchantchane, 2010). Another challenge that called the attention of many statistic educators is the diverse group of students with different societal traits, expectations and backgrounds making the teaching methodology more diverse (Peiris & Beh, 2006; Fortes & Tchantchane, 2010). Therefore, it is important for teachers to put a standard method on how to teach statistic effectively with the use of either Scientific Calculator (traditional tool) or Excel Spread sheet (modernized tool or technology).

Integration of technology is really perceived by educators as a very important tool for effective delivery of teaching for all levels of education. This concept has been supported by National Council for Mathematics Teachers and American Statistical Association. In U.A.E., very seldom we see articles involving new technology as a modernize tool in teaching Statistics as compared to the numerous studies conducted in Australia, USA, and New Zealand. Exploring the impact of teaching statistics with the use of Excel as a new technology has been a challenge not only to educators but to students as well. The University of Wollongong in Dubai, teaches introduction to statistics with the use of traditional method which is using only a Scientific Calculator. In the recent years, students were required to take down notes during class lecture or tutorial and solving problems with the aid of a scientific calculator; moreover graphic calculators were not allowed during examination. Currently, the University is using technological tools such as online course materials wherein we provide up dated lecture and tutorial materials which can be found by our students in the university website, but still we find this approach inadequate for students to learn statistic in a more simplified way. It is well-thought limited because students are not able to explore real, large and complex data and student are confined with formulas, sometimes they find it vague or abstract. More often than not, students find Statistics more difficult and complicated compared to Mathematics subjects.

Difficulty in understanding Statistic became a major concern to all educators. This has driven them to a question on how to improve the academic performance of the students and motivate them in understanding the concepts with the use of a new method to simplifying the operations of statistics. To address these issues, we attempted to integrate the new technology as a new tool in teaching statistics that will not only remain but will improve the curriculum and without sacrificing the content of the subject. Though we expect challenges ahead with this innovation and perceive that through the use of this new technology it will further facilitate students to learn statistical concepts with greater understanding and ease. It will rectify students from the burden of working out on the statistical formulas from which they can have more time to analyze, interpret simple or complex data, and justify their conclusions based on a data.

Students can develop positive attitudes in classes that include computer-based instruction and collaborative group work.

We therefore, aim to answer the following research questions:

i. In teaching introduction to statistic, will the integration of a new technology have an effect on student's academic performance?

ii. What will be the perception of the students in the integration of a new technology that will be used in statistic

iii. Are the learning outcomes such as organizing data into tables and graphs, summarize data using appropriate statistical methods, able to draw conclusion from the data, and show relevance of statistics to a wide range of discipline in everyday life is achieve using technology

This study will attempts to fill the gap of literature from different countries for it can be comparable factor with UAE since the focus of teaching statistics is not yet as popular as teaching mathematics here in the region.

Technology in Teaching Statistics

In the advent of technology and its gaining popularity in the 21st century, there was a need to integrate technology in teaching and learning in the academic subject areas (Neiss, 2005). This reform radically affects what we teach and alter our way of teaching. Similarly, in 2005, Thomas and Hong (cited in Neiss, 2005) developed the concept of teachers such pedagogical technology knowledge (PTK), and recently known as (TPCK). From this concept, techology has been an important instrument for learning statistics, hence teachers must also develop an overarching conception of their subject matter in teaching with technology (Neis, 2005). Integration of technology in teaching and learning is about the content and effective pedagogy. In the case of Statistics, the substantial change in teaching statistics created strong synergies between technology, pedagogy, and content (Moore, 1997; Velleman, 1995). According to Moore (1997) requiring students to work in groups and discussing their works orally and in writing, various diagnostic tools to analyze data, and computer-intensive statistical practive facilitates student learning. Figure 1. illustrates the framework of technology, pedagogy, content and knowledge.

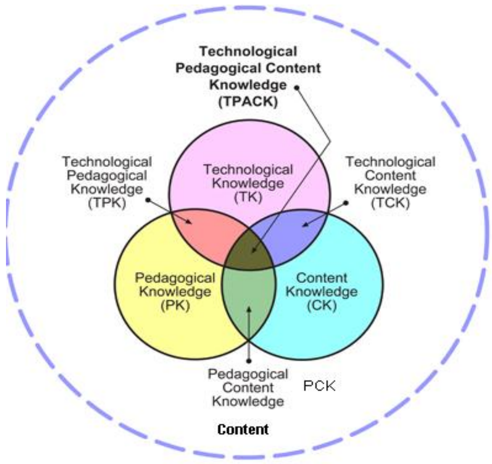

Figure 1. **The Venn diagram of TPACK**

In addition, National Council of the Teachers in Mathematics has this technology principle "Technology is essential in teaching and learning; it influences the mathematics that is taught and enhances learning" (NCTM, 2000). It further explained that technology such as calculators and computers are reshaping the mathematical landscape and encourage school mathematics to reflect the changes. In this principle, with the use of technology appropriately and conscientiously, students can learn mathematics more deeply, speculate and make inferences and be able to work at higher levels of generalization or abstraction (NCTM, 2000).   These principles suggest therefore that technology plays a very important role in the learning curve of the students. Similarly, the American Statistical Association (ASA) supported the principle the use of technology for developing conceptual understanding and analyzing real data (GAISE, 2007).

Various investigations has been made on the different approaches of teaching methodology with the integration of technology and the impact in student's learning (Neiss, 2005; Baharun & Porter, 2009; Gorman, 2008; Sam & Kee, 2004; Prabhakar, 2008; Tsao, 2006). Many government agencies even invested huge amount of money in professional development of mathematics teachers in technology-enhanced teaching and learning.   In Puerto Rico, the Institute for the Enhancement of Teaching and Learning (IDEAS) was created in 1994. One component of the institute is the Faculty of Development Program focused on content and pedagogical techniques through the use of technology in the classroom, non-traditional teaching and learning styles in enhancing teaching and learning to help students to learn (Morales & Roig, 2002).

Interestingly, the most important impact of the integration of technology in the classroom was the students enjoyed the learning experiences and resulted to a more responsible for their own learning. Though there may be drawback of technology-enhanced teaching and learning, still outweighed by the advantages based on the previous research findings. Here are some of the positive effects of integration to the new technology based on the research findings:

- *integration of technology can be used as a tool for supporting and enhancing student's learning*
- *wider learning benefits which may accrue from integrating ICT*
- *can provide unique opportunities for students to do mathematical tasks in new ways that may have*

foster learning and development

- *significant tool for promoting mathematical problem solving, reasoning, and exploration*
- *students are motivated to generalized and formalize so that they can device their own ways to command the computer to draw graphs or to solve numerical problems*
- *students can build their own understanding using computers as resource tools, or as a communication tool to share their ideas with other learners*
- *They can share and compare their individual understanding and experiences.*

Technological Tools in Statistics Instruction

The rapid popularity of the capabilities of technology increased, and more software tools have been released, and technology has been considered in facilitating students' learning of statistics (Garfield, Chance & Snell, 2000). While software has been available for doing statistical analysis, the use of technology in teaching and learning statistics is continuously developing. There are several types of technology being use in statistics instructions namely, statistical packages and spreadsheets, Web or computer-based tools, graphic calculator, or programming languages. Calculators and computers reduce the computational burden; allow more extensive exploration of statistical concepts.

In Malaysia, in 2000, there was call of for a need to integrate information technology in the teaching and learning of mathematics (Sam & Kee, 2004). Though some of the teachers as well as parents believed that the use of calculators may lose basic mathematical skills and understanding of the students as the prerequisite for advance mathematics, teachers introduced graphic calculator in teaching Math courses. The result indicated a positive impact on the culture of statistical learning, students became active in group participation, and students enjoyed learning statistics and also improved their understanding and skill in statistics. According to Liang (2000) computer programs showed students attracted to the interactive computer programs designed for business statistics course, students were motivated to attend classes when computer programs are applied to teaching. In addition, students were able to understand confusing topics, and felt that teaching them to use computer facilities really improves their own abilities to apply similar programs in analyzing real-world problems.

As mentioned in Sharma & Barrett (2007), supporting a course with technology can allow learners and teachers more flexibility in both time and place, and complements and enhances face-to-face teaching. Introducing new technology into the classroom can present challenges with students' reception acceptance (Gorman, 2008) and the use of technology for teaching statistics has been explored recently (Su & Liang, 2000; Morales & Roig, 2002; Baharun & Porter, 2009; Prabhakar, 2008; Velleman, 1995,) and findings suggested more on positive impact.

Nowadays, students are more confident with computers, this can support to motivate students, and apparently using computer applications is more effective learning (Peiris & Beh, 2006). It is clear that the need to strengthen research into statistics education is becoming more and more relevant in many workforces whot are involved in decision-making process (Peiris & Beh, 2006; Peiris & Peseta, 2004).Therefore, this study is based on the concept that classroom teaching blended with technology can be a significant factor in promoting academic innovation and in transforming the teaching and learning in statistics paradigm.

Teaching Methodology and Survey Design

The typical content of introduction to statistics is divided into three sections: descriptive statistics, probability theory and inferential statistics. Descriptive statistics includes presentation of data (charts, frequency distribution table, histogram, polygon, scatter plot, and box-plot), measures of central tendency (mean, median, and mode), and measures of dispersion (range, interquartile, variance, coefficient of variation, standard deviation). Probability theory covers rules of addition and multiplication, independent and mutually exclusive events, marginal and joint probability, probability distributions, normal distributions, and inferential statistics includes sampling and estimating population mean and confidence interval. This new subject designed includes 1-hour lecture, 1-hour tutorial and 1-hour computer laboratory. We introduced MS Excel as part of the pedagogy which is a widely used package, user friendly, accessible and cost-effective. Students learn to set up a simple spreadsheet and use it in posing and solving problems, examining data, and investigating patterns/distribution of the data, producing summary statistics and charts, writing equations and using data analysis tools and Excel statistical commands. Students are expected to attend each lecture but not compulsory, while attendance is compulsory for each tutorial & computer laboratory class within a 13-week of session. All lecture notes, tutorial and laboratory works, review materials for all assessments were uploaded in the university intranet.

For the survey, a structured questionnaire was used to collect the demographic information about the students which also includes gender, nationality, and background in statistics (if there's any). There were questions about their perception towards Statistics, the teaching styles, expectations and their perception on the integration in the course. These items were measured using a 5-point Liker –type scale, ranging from Strongly Disagree (SD) to Strongly Agree (SA). A statistical analysis was carried out to test the hypotheses of this research.

Findings

Survey Analysis

There were 144 students responses out of 162 officially enrolled in the introductory Statistics offered by the Faculty of Computer Science and Engineering at University of Wollongong in Dubai. Demographic information such as nationality, gender, expected grades in Mathematics and Statistics, as well as the perception of students towards teaching with the use of technology data were collected through structured questionnaire. Out of 144 respondents, 47.22% were female and 52.8% were male from 30 different nationalities. About 60.4% (87 out of 144) are first time to study Statistics while 39.6% (57 out of 144) already studied in their secondary education or repeaters. Survey details showing the percentages of their responses in each item with the corresponding mean and standard deviation are given in Appendix A. The survey results indicate the following:

1- more than 86% of the students feel knowledgeable in organizing data in tables, producing graphs and summarizing data.
2- only 18% of the students feel that statistics is harder than Mathematics
3- 35% of the students feel that the 2 hours lab is too long while 47% are happy with that.
4- 53% among the good students (with C or D or HD) think that a one hour lecture is not enough.
4- 80% of the students have a positive perception towards the teaching staff
5- 40% among the weak students with (F or PC or P) recommend the book and found it helpful versus only 30% among the good students (C or D or HD)
6- 56% among the weak students find probability the hardest topic in Statistics
8- Among those who have already taken statistics 75.5% got above average compared to about 71% among those who have taken statistics for their first time.

Inference about the difference between the traditional and technology teaching

In order to measure whether students' performance when taught with traditional way vary significantly with those students' performance taught with integrated technology, the differences between the proportions are transformed to an approximate standard normal distributed random variable Z. For each performance category (HD, D, C, P, F) the calculation of the Z value is obtained using:

$$Z = \frac{\hat{p}_{techno\log y,c} - \hat{p}_{traditional,i}}{\sigma_{p_{technology,c} - p_{traditional,c}}} \quad (1)$$

Where for each category of performance the corresponding sample proportions are determined:

$$\hat{p}_{\text{traditional,C}} = \frac{\text{X}_{\text{traditional,c}}}{n_{traditional}} \quad (2.a)$$

$$\hat{p}_{\text{technology,C}} = \frac{\text{X}_{\text{technology,c}}}{n_{techno\log y}} \quad (2.b)$$

Where $X_{traditional,c}$ and $X_{technology,c}$ are the number of students in each of the performance category respectively in the traditional class and the technology class. $n_{traditional}$ (=100) and $n_{technology}$ (=159) are the total numbers of students who attended respectively the traditional teaching and the technology teaching. $\sigma_{p\text{-technolgy-p-traditional}}$ is the standard error of the difference between the two populations' proportions:

$$\sigma_{p_{technology,c} - p_{traditional,c}} = \sqrt{\frac{p_{techno\log y,c}(1 - p_{techno\log y,c})}{n_1} + \frac{p_{traditional,c}(1 - p_{traditional,c})}{n_2}} \quad (3)$$

However since the standard error is unknown, we use the pooled proportion estimate defined by:

$$\hat{p}_C = \frac{X_{traditional,c} + X_{techno\log y,C}}{n_{traditional} + n_{techno\log y}} \quad (4)$$

As can be seen from Table 1, the results reveal that students tend to achieve significant better performance with technology and the failure rate is reduced significantly from 37% from 14% (p_{value}= 0.00).

Table 1. Inference about the difference between the traditional and technology teaching using Z-distribution

Performance Category	Traditional Teaching	proportion %	Teaching with Technology	proportion %	Pooled Proportion	Standard error	Z stat	p_{value}
High distinction	10	0.10	51	0.32	0.24	0.05	-4.08**	0.00
Distinction	14	0.14	30	0.19	0.17	0.05	-1.02	0.15
Credit	18	0.18	27	0.17	0.17	0.05	0.21	0.41

Pass	17	0.17	21	0.13	0.15	0.05	0.84	0.20
Pass conceded	4	0.04	8	0.05	0.05	0.03	-0.38	0.35
Fail	37	0.37	22	0.14	0.23	0.05	4.33**	0.00

** The difference is significant at 0.01

Chi-Square test

To test the hypothesis that there is no relationship between teaching methodology and the students' performance, a chi square test has been conducted to test the homogeneity of proportions of the various performance groups:

H_0: $\pi_{HD} = \pi_D = \pi_C = \pi_P = \pi_{PC} = \pi_F$

H_a: At least one of the proportions differs than the others.

A two-way contingency table Chi-square analysis reveals a chi-square value of 28.7 (p_{value}=0.0) indicating that the null hypothesis is rejected. Therefore there is a significant variation in the performance proportions between traditional and teaching with technology. However, conducting a sub-hypotheses of the $\pi_D = \pi_C = \pi_P$ could not be rejected with a chi-square value of 0.5 (p_{value}=0.7) indicating that the difference in proportions between these three categories are not that significant. The sub-hypothesis $\pi_{HD} = \pi_F$ is rejected with a chi-square value of 27 (p_{value} = 0.0). These results are in concordance with those determined using Z distribution.

Factor Analysis of the survey

We have employed factor analysis as a data reduction technique in order to define the underlying structure among the variables (item 1 to item 40). Such technique would group highly correlated variables into groups or factors which would help us to find patterns of relations among the variables. Figure 2 illustrates the overall model of our analysis.

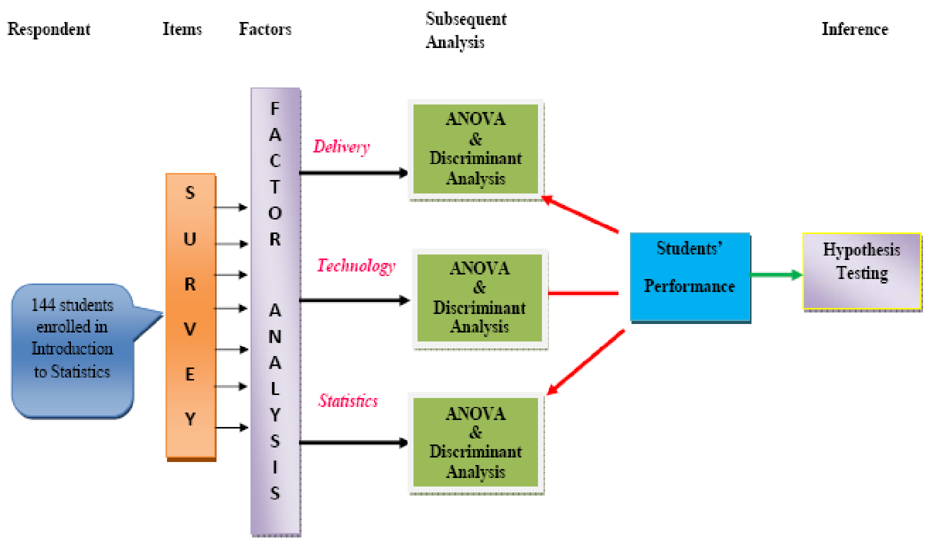

Figure 2. Overall model of the analysis

To start this analysis, we issued the following SPSS commands: *Analyze->Dimension Reduction->Factor*. Based on the 40 items correlation matrix, *Principal Component* and *Varimax* were selected respectively as the extraction and rotation methods in the analysis. In order to make the output easier to scan and since factor loading less than 0.5 are too small to be considered, we suppressed the low absolute loadings at 0.5. Analysis results revealed that the first factor explains 44.21% of the total variance of all items. The second factor added 7.2% to the accumulated variance and the third factor explained only about 4% for a total of about 56%. Examining the items clustering to each of the three factor, we conclude that the first factor concerns students' perception and satisfaction towards the delivery of the subject and teacher evaluation clusters twenty one items of the survey questions (8, 11, 14-16, 18, 19, 22, 23, 25, 27, 28, 30, 31, 33-40). The second factor concerned perception towards the use of technology and includes 7 items (1-3, 5-6, 20, 24). The third factor consisting of 5 items (4, 12, 21, 29, 32) concerns students perception towards statistics. Items 9 and 17, corresponding to whether statistics is easier than Mathematics and whether the computer lab timing was too long, did not hang to any of the three factors. As well the two items related to the text book did not cluster to any factor. Note that while the results are not sensitive to the extraction and rotation methods, the number of factors retained is very crucial. We have retained three factors based on the Scree plot and the interpretability of the factors. Further, we have measured the reliability of each of the three sets of items corresponding to the three factors retained. The reliability analysis test conducted confirmed a Cronbach's alpha=0.96 for the first set of items, Cronbach's alpha=0.85 for the second set and Cronbach's alpha=0.83 for the third set. For the reliability analysis, no item had to be reverse-scaled. The values of the Cronbach alphas and their corresponding split half coefficients were the same suggesting that there are no anomalies in the data survey and that each set measures a single construct. Based on this analysis three new variables were constructed by averaging the items corresponding to each factor and were labelled by *delivery*, *technology* and *statistics*.

Factor Analysis subsequent Analysis: One Way ANOVA

A one way ANOVA analysis was conducted to examine any association between the three new constructs *delivery*, *technology* and *statistics* and students' performance. Students were grouped into three performance categories (Fail+Pass Conceded, Pass+Credit and Distinction + High Distinction). The categories means' for each construct are compared by ANOVA. As can be seen from Table 2, the means for the students' perception towards *technology* differ significantly (p=0.005) among students performance. Similarly, the means for the students' perception towards *statistics* increases with the respect to the performance but the difference is only significant at 5%. However students' perception towards the subject *delivery* and teacher evaluation did not depend on students' performance.

Table 2. Means comparison as a function of students' performance

Construct	Fail and Pass Conceded	Pass and Credit	Distinction and High Distinction	F_{STAT}
Delivery	3.78	4.01	4.11	2.1(.132)
Technology	3.90	4.01	4.32	5.5(.005)**
Statistics	3.44	3.85	3.88	3.1(.05)*

In parenthesis are p values. Means' scale is 1-5.

** Null hypothesis is rejected at 1%. * Null hypothesis is rejected at 5%.

Factor Analysis subsequent Analysis: Discriminant Analysis

Discriminant Analysis is performed to establish whether differences in perceptions (subject delivery, technology benefits and Statistics) exist between the three students' performance groups. To start this analysis, we issued the following SPSS commands: *Analyze->Classify->Discriminant*. The three constructs are defined as independent variables and the three levels students' performance as the grouping variable. Stepwise method reveals that only the factors *Technology* and *Statistics* are significant to predict students' performance from his/her response to the survey. The hit ratios using the two predictors are given in Table 3. As can be seen, students who did not do well in the subject were poorly discriminated from the other groups. This is due to the fact that even the students who did not perform well in the subject had a relatively similar positive perception towards the delivery, the introduction of technology and Statistics.

Table 3. Hit Ratio of the two predictors

Performance Group	Hit ratio	Hit ratio with cross validation	Hit ratio by chance
Fail and Pass Conceded	5%	1%	14%
Pass and credit	30%	21 %	30%
Distinction and high distinction	90%	89%	56%

Conclusion

The inclusion of technology has given the students the opportunity to apply the statistical concepts to real-world situations. The students learned to present data into frequency tables, histograms and contingency tables with the use of Excel program. They also learned to summarize data using Excel data analysis tools and to produce box plots. Furthermore, the analysis of the survey highlighted the students' positive perception regardless of their overall performance and the failure rate was reduced from 34% with traditional teaching to only 14% with the inclusion of technology. Overall, the survey expressed a significant result showing that the use of Excel as new technology, students performed much better.

The application of Excel at the foundation level of statistic will help the students in various situations; maximize their time in analyzing the data and other quantitative subjects such as accounting, finance, computer application, and management decision making tools. Nevertheless, we must remain deliberately cautious with the use of new technology is not the subject but only tools that will help simplify the approach in statistic. Thus, we need to keep in mind that we still have to focus on teaching the concepts of statistics and not the technology used.

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Appendix A

Table1. Percentages, Mean and Standard Deviation for each item

	Items	1 S.D	2 D	3 N	4 A	5 S.A	Mean	SD
1	I can organize data into tables and graphs using Excel program.	.7	3.5	5.6	43.1	47.2	4.00	.79
2	I can summarize data using computer program.		2.8	11.1	42.4	43.8	4.27	.76
3	I can easily interpret the data using Excel Program.	.7	3.5	9.0	46.5	40.3	4.22	.80
4	Statistics is relevant in my everyday life	.7	9.7	35.4	29.9	24.3	3.67	.97
5	Working with my classmates in the computer lab is very useful.			17.4	41.0	36.8	4.08	.89
6	Using computer program is very helpful in problem solving.	2.1	4.9	11.8	31.3	50	4.22	.97
7	The textbook is very helpful in answering my assignment.	11.8	14.6	36.8	23.6	13.2	3.12	1.17
8	Exercises given in the tutorial is very helpful			11.1	35.4	47.9	4.24	.91
9	I find Statistics easier than Mathematics	6.9	11.1	23.6	25	33.3	3.67	1.24

10	I recommend the textbook for Statistics related subjects	12.5	16.7	39.6	19.4	11.8	3.01	1.15
11	The concepts of Statistics is well explained in the lecture	.7	2.8	11.1	47.9	37.5	4.19	.79
12	The subject is interesting and fun	2.1	5.6	20.1	39.6	32.6	3.95	.97
13	One hour lecture is not enough to discuss concepts of statistics	8.3	25.0	19.4	29.2	18.1	3.24	1.24
14	Teachers are very helpful and supportive	2.1	5.6	11.8	38.2	42.4	4.13	.97
15	Hand-outs are helpful and excellent	2.1	2.8	7.6	43.8	43.8	4.24	.87
16	I can ask questions and get points clarified	1.4	6.9	15.3	44.4	31.9	3.99	.93
17	The tutorial and computer lab is too long	10.4	25.0	18.1	29.9	16.7	3.17	1.20
18	There is a sufficient review materials provided for the exams	1.4	3.5	16	43.8	35.4	4.08	.88
19	I can learn concepts when my teacher gives examples based on real life situations	1.4	7.6	16.7	49.3	25.0	3.89	.91
20	Computer lab session is better than purely lectures and tutorials	1.4	6.9	17.4	40.3	34.0	3.99	.96
21	I find statistics interesting and relevant	1.4	8.3	19.4	45.1	25.7	3.85	.94
22	I can easily learn and apply the concepts learned in the lecture using computer program and in the tutorial	.7	5.6	16.7	48.6	28.5	3.99	.86
23	Exercises given in the computer lab is very helpful	1.4	3.5	9.7	48.6	36.8	4.16	.84
24	Using computer program, I can analyze data better	1.4	4.2	13.9	47.2	33.3	4.07	.87
25	The teaching staff are approachable when I need help	2.8	6.3	14.6	41.7	34.7	3.99	1.00
26	I find probabilities hardest topic in Statistics	12.5	24.3	23.6	29.2	10.4	3.01	1.20
27	The teacher gives presentation helpful for examination	1.4	4.9	18.8	48.6	26.4	3.94	.87
28	The teacher encourages me to think on my own	2.8	4.9	16.7	45.8	29.9	3.95	.95
29	I can apply in other subjects what I have learned in Statistics	1.4	9.0	21.5	47.2	20.8	3.77	.92
30	My learning experience in this subject made me enthusiastic about further learning	3.5	6.9	25.7	41.7	22.2	3.72	1.00
31	The teachers give consultation hours where I can reach them and offer additional help	.7	6.3	18.1	47.2	27.8	3.95	.88
32	I can relate that Statistics is used in the real world	2.1	7.6	18.1	50.7	21.5	3.82	.92
33	The teaching staff gives regular feedback		6.3	19.4	50.0	24.3	3.92	.82
34	The lecture notes, hand-outs are well-organized, well written and useful	.7	4.9	10.4	43.1	41.0	4.19	.86
35	The type of questions assigned for homework helps me learn the material better		6.3	7.6	44.4	41.7	4.22	.83
36	The midterm review lecture was informative and helpful	2.1	3.5	11.1	41.0	42.4	4.18	.91

37	The midterm exam difficulty level is fair	2.1	6.9	18.8	41.7	30.6	3.92	.97
38	Explanation of concepts is adequate	1.4	5.6	12.5	51.4	29.2	4.01	.87
39	Demonstration of solution process is adequate	.7	4.9	17.4	50.7	26.4	3.97	.83
40	There are enough examples given per lecture/tutorial	2.8	5.6	11.1	51.4	29.2	4.00	.93

Likert Scale: 1 – Strongly disagree, 2 – Disagree, 3: Neutral, 4- Agree, 5: Strongly Agree

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Is anybody there? Bootstrapping attendance with engagement

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The report card for the introductory programming unit at our university has historically been unremarkable in terms of attendance rates, student success rates and student retention in both the unit and the degree course. After a course restructure recently involving a fresh approach to introducing programming, we reported a high retention in the unit, with consistently high attendance and a very low failure rate. Following those encouraging results, we collected student attendance data for several semesters and compared attendance rates to student results. We have found that interesting workshop material which directly relates to course-relevant assessment items and therefore drives the learning, in an engaging collaborative learning environment has improved attendance to an extraordinary extent, with student failure rates plummeting to the lowest in recorded history at our university.

Keywords: introductory programming, IT course, student engagement, attendance

Introduction

Krause et al (2005) in their report commissioned by the Department of Education Science and Training into the first year experience in Australian Universities, found that time on campus and class attendance were important indicators of engagement by students.

Schneider (2010) addressed the issue of attrition in his introductory engineering unit by monitoring attendance. He was able to identify students with poor attendance patterns and communicated with them to determine if there were any issues which had lead to non-attendance. After abandoning a manual record-keeping system because of the impracticalities of processing 175 students each time, he introduced an electronic attendance record system using a simple bar code scanner. Schneider recorded attendances by having students complete written in-class assessments in lectures. The attendance data helped identify students potentially 'at risk' and the assessment sheets provided the opportunity to analyse any relationship between attendance and final grade. Schneider found that students who achieved High Distinctions attended nine out of ten lectures where he took the roll. The question is of course, would those students have obtained the same success without regular attendance, and were they attending simply because that is the nature of high achieving students? On the flip-side, students who failed the subject had attended between one and eight of the ten lectures, which indicates that regular attendance does not necessarily guarantee success.

This paper attempts to further analyse the effects of student engagement on attendance and final outcome.

Engagement

In a project commissioned by the Department of Education, Science and Training (DEST), Krause et al (2005) found that "...an important indicator of engagement is time devoted to academic endeavours, including class attendance and time spent on campus". How is 'engagement' measured? Can we assume that students who attend lectures and remain awake are engaged? More students are armed with media enabled devices, and there are obvious distractions available to them if the lectures do not grab their attention. So can we measure engagement by monitoring attendance and completion of assigned work in a workshop?

The Australian Council for Education Research (ACER) defines engagement as "...students' involvement with activities and conditions likely to generate high-quality learning". In 2009, participation in the Australasian Survey of Student Engagement (AUSSE) involved 75% of Australian and New Zealand universities with over 30,000 responses (ACER, 2009). Several of the ingredients for student engagement identified from analysis of this survey infer an interactive learning environment which can more easily and efficiently be supported in the physical sphere. These include, but are not necessarily limited to: active learning; student-staff interactions and a supportive learning environment. Hence, to some degree, a dependency may exist for engagement on student attendance at lectures and/or workshops and tutorials. ACER suggest that we can improve student engagement by supporting learning through "enhanced and integrated relationships with peers, academics, student services and the broad intellectual and social domains of university life" (ACER, 2009).

Higher education researchers recently looked at the transition of students into universities as an important factor in retention and progression (Kift, 2008). Nelson, Kift et al (2008) describe the key issues with commencing students was that they wanted to learn but their expectations were often not adequately met. Meeting some of those expectations by establishing authentic processes, collaborative learning for problem solving and co-operative learning techniques resulted in increased student engagement for the University of Adelaide (Falkner & Palmer, 2009). Hansen and Eddy (2007) found that as long as they could challenge students with projects that applied what was learned in class, they engaged well.

Improved Engagement in Programming

QUT recently restructured its Bachelor of Information Technology (BIT) course to improve student engagement and increase retention without jeopardising the quality of its graduates (Corney, Teague, & Thomas, 2010). The latest incarnation of its introductory programming unit INB104 ("Building IT Systems") was designed to encourage engagement by students by stimulating their motivational focus: either an interest in programming; focus on games, web development or information systems. INB104 gives a shallow introduction to three of the basic information technologies: programming, information systems and web development and is seen as an interactive, interesting and inspirational introduction to how IT applications and systems work.

Active Learning through Pair Programming

The INB104 teaching and learning approach is aimed at maximising student involvement. Workshops are run as busy and noisy experimental computer labs. There is little time here for quiet contemplation as students follow the Agile pair programming protocol (Beck, 2005). Other than in extenuating circumstances, no students work alone. Students select the person with whom they will spend the remainder of the semester working. Workshops each week conclude with a selection of student pairs demonstrating their solutions with the remainder of the class critiquing them.

Tutors enforce the regular swapping of roles of driver and navigator at regular intervals. The "driver" has control of the keyboard and mouse e.g. drafting an algorithm; implementing the code; debugging and executing the code. The "observer" is responsible for thinking strategically, asking questions, watching for errors, suggesting alternatives, and providing technical input. Students are encouraged to be vocal and not let a minute go by when they are not communicating in some manner. Expectations are that students continue to collaborate with their partner outside workshops in order to complete the exercises and work on assessment projects together. Learning in this collaborative environment becomes a social process where students learn by working with others. Attendance at workshops is, therefore, strongly encouraged.

Assessment Driven Learning

The concept that "assessment drives learning" has been presented by education practitioners in fields similar to information technology, such as mathematics (Jurges, Schneider, Senkbeil, & Carstensen, 2009). If the assessment tasks are well designed, they can lead the student to learn the material contained in the curriculum. INB104 workshop activities are linked to the material introduced at the lecture with a strong connection to similar tasks set as assessment items. This continuity and reinforcement of concepts is vital for providing relevance to the weekly schedule and engagement with the material. Students choose a number of projects to complete for each of two stages of their portfolio submission, with each project weighted according to complexity. For the first stage of submission, students choose from projects which test their proficiency with basic programming concepts of sequence, selection and repetition. Final stage projects cover programming, databases and web pages and present more challenging programming concepts, and offer the opportunity for integration of two or more of the technologies. All projects required use of the basic programming building blocks, extensive use and design of functions, research into built-in functions, external libraries and data structures, evidence of algorithm development and supporting documentation reflecting students' experiences during development of the portfolio.

The portfolios were pair submissions, with the unenforced requirement that each student contribute equally by adhering to the pair programming protocol. We could not be certain of course that students were sharing the workload fairly, nor taking equal responsibility in the roles of driver and navigator while working outside the supervised workshops. Nor could we eliminate the possibility of plagiarism. However, to somewhat counter plagiarism as well as unfair distribution of work and possible parasitic behaviour by students, we apportioned part of the assignment marks to an oral examination of their submissions. If one or both of the pair could not answer questions about the design and implementation of their projects, they both received low marks for the collaboration component. The oral examination also alerted us to the more obvious cases of plagiarism where neither student could explain their solutions.

Attendance Data

Previously, the trend of attendance by first year programming students at QUT followed a downward trajectory over the course of a semester. For example in 2008, over 80% of students initially attended workshops, and by the end of that semester barely 10% were turning up. A similar pattern has been recorded for previous semesters (Teague & Roe, 2009). Figure 1 shows the change in attendance trends since INB104 has been offered.

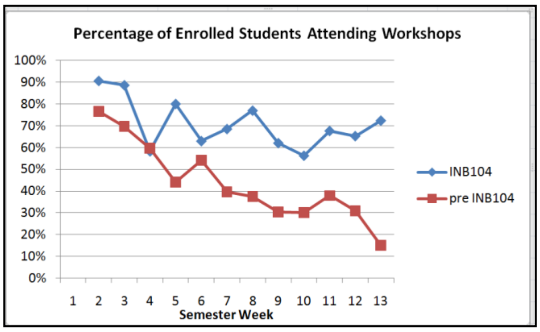

Figure 1: Workshop Attendance Rates

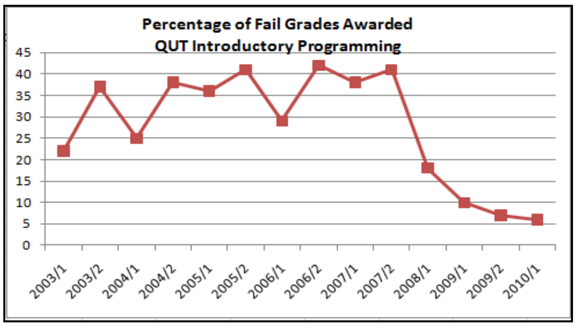

Figure 2: Failure Rates for Introductory Programming

We cannot infer from these figures that a higher number of students were engaged with the learning experience simply because they showed up. However, we feel justified in believing that the change of format and active learning environment, heavily reliant on collaboration, with assessment-related activities which pique the interest of a larger proportion of the students had a very positive influence on engagement. Figure 2 shows the dramatic reduction in the percentage of students who fail the introductory programming unit at QUT in recent offerings. The downward change in trend began in 2008 when a trial of pair programming was introduced into the unit as part of the first author's research (Teague & Roe, 2009).

The data reported below was collected from semester 2, 2009 and semester 1, 2010 where 190 and 311 students respectively were enrolled. Since the unit redesign, not only have attendance rates increased dramatically and remained high throughout the semester, but failure rates have fallen, and retention has remained high. The assessment items for this unit have been marked by a team of four or five academics including the authors of this paper who were responsible for marking roughly 40% of the students in the class. The range of marks awarded by each academic in the team followed roughly the same distribution. We believe there is no experimenter bias in the data reported.

For semesters 2, 2009 and 1, 2010, 35 of the 501 enrolled students (7%) failed, with 20 of these attending less than half of the workshops for the unit. Conversely, only 42 of the 466 passing students attended less than half of the workshops. This means that a high proportion (almost 60%) of students who failed had poor attendance records, and 9% of students who passed had poor attendance records. Figures 3 and 4 show the ranges of overall marks for the unit based on the number of workshops attended by students for Semester 2, 2009 and Semester 1, 2010 respectively. Unlike Schneider (2010) who found that HD students had attended 90% of the workshops, our data does not suggest such a strong relationship between high attendance and grade, with some of our HD students attending less than half of the workshops, and others with regular attendance achieving a much lower grade. However, there does seem to be a trend to a lower average mark when fewer workshops were attended.

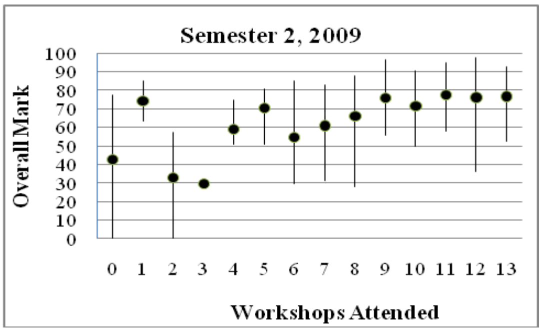

Figure 3: Marks v Attendance Sem 2, 2009

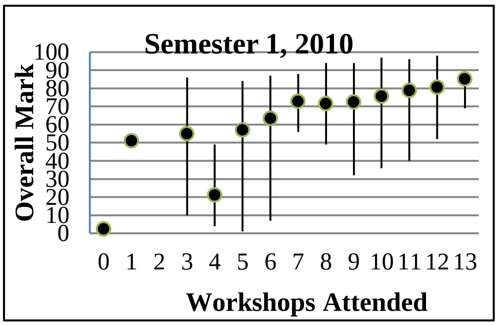

Figure 4: Marks v Attendance Sem 1,

Tarring all poor attendees with the same 'likely to fail' brush is unwarranted. As can be seen from Figure 3, the range of final marks for the students who attended no workshops at all was between 0 and 77. We are dealing with only five students in this instance, with an average mark of just 43. It is useful to know that some students are capable of very successfully completing this unit without attending a single workshop, but this does not diminish the value of using attendance data to target at risk students. The following semester, only two students attended no workshops at all, and both received very low fails. There are also high achieving students with correspondingly high attendance rates. The question here is, would some of these students have performed just as well with poor attendance? Figure 4 shows that some students who attended less than half of the workshops, still achieved final marks above 80%. The range of skills that students have on entrance to this introductory unit is quite varied. It is likely that students who have the necessary skills to pass the unit on entry to university do not feel the need to attend. Further work to prove this hypothesis is warranted in future offerings.

We believe that the overall reduction in failure rates can be attributed to the active learning environment and the assessment scheme implemented in the redesign of the unit rather than improved attendance rates. While the teaching team was changed for this new implementation, the current members of the team were involved to some extent in the design of the previous offering. Conversely, improved attendance can be attributed to the collaborative learning environment where students have a stake in each other’s learning.

Conclusion

Our own anecdotal evidence shows that students who do not pass have failed to submit one or more items of assessment. That is not to say that if a student misses a piece of assessment they will necessarily fail. Many of the low failures come from students who try one or two of the first assessment items and do not carry on. Curiously, these students remain enrolled in the unit, but take no further part. It is not unreasonable to assume poor attendance by these students is a result of disengagement with the material being taught.

The peer-pressure associated with pair programming, which generates a sense of ownership of their learning as well as a stake in their partner's performance, acts as the underlying motivator for attendance. Ensuring that assessment items interest students on a cognitive level and directly relates to the weekly activities means that we have more enthusiastic, engaged students in the workshops. Workshop attendance has improved to an extraordinary extent, with student failure rates plummeting. Students tell us in their feedback and reflections that they love the range of real-world, engaging projects, and come to appreciate the benefits of the active and collaborative learning environment we offer. Our holistic approach to teaching introductory programming seems to have hit on a winning formula. Our work on achieving and maintaining an engaged cohort of introductory programming students will continue to focus on assessment driven learning, the measure of which will be attendance, assessment submission and qualitative student feedback.

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Englishmen in New York: Redefining academic publishing in digital spaces

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While the internet, culture and technology have been reshaping publishing and information media for years, academic publishing and scholarship still functions within a model that is effectively several hundred years old. It is time to start asking the hard questions about what it means to publish as an academic, how we engage with published research and how higher degree students engage with research publication.

While it is true that most journals now exist in an online format, the vast majority of these simply echo a print format in electronic form - the scholarly paper as a document has remained unquestioned, and persists despite often low levels of true readership. Yet, outside of academia, the definition of publishing is no longer limited to a 'container' of content. Text can exist in a contextual network and be framed by fluid, constantly changing content around it. Identified in this paper are issues in traditional publishing and some of the possibilities and considerations in breaking open the 'container' model to move into an open and dynamic online space. Central to this is the enabling of thesis and dissertation publication in alternative formats via the oScholar project.

Please note that this paper makes use of QR codes - a QR-enabled mobile device is recommended but not required when reading this paper.

Background

If we look at the commercial publishing industry, the last decade has caused huge changes in the way text is created and marketed. Easy to observe is the transition into electronic media - eBooks, digital magazines, newspapers and PDF articles. Each of these simply moves a familiar text type into an electronic domain and creates a successful market. This move has facilitated an immediacy and flexibility in a market's engagement with published material - one can now download an eBook in seconds and transfer it to any number of devices to be read anywhere. Earlier this year, Amazon announced that eBooks were now outselling print books (Sydney Morning Herald, 2011). This type of market shift can be defined as 'sustaining innovation' - a technology shift that allows old things to be done in new ways (Bower & Christensen, 1995).

Perhaps less obvious, but of potentially greater significance, is the development of alternate publishing avenues via the internet. Electronic versions of traditional print media are no longer the only ways in which we engage with text. Blogs, websites, micro-publishing and social media have evolved as major players in the publishing market. Anyone now has the ability to publish, and the format of publication has become radically redefined in these media. Initially, this open and interactive form of unreviewed publishing was seen to be inferior. However, it has created an entirely new and extremely prolific and lucrative market that challenges the traditional concept of publication - an innovation termed ‘disruptive’ by Bower & Christensen (1995).

Academic publishing, by contrast, has expanded almost exclusively into the sustaining innovation market. Many journals are now available in electronic format and are catalogued in online databases. While most of these are locked behind paywalls and must be accessed via an institutional proxy, the open-access movement and advent of engines like Google Scholar mean many academic works are also freely available. Many institutions also provide databases for the open hosting of electronic theses and dissertations (ETDs). The traditional scholarly monograph has also developed into the electronic media, with many now available as either paid eBooks, or freely in whole or part via Google Books, Scribd and similar resources. However, in many cases, the format of these scholarly works is still the journal article or monograph - unchanged from the advent of academic publishing several hundred years ago. The way that we engage with the research and publication process is essentially unchanged. Effectively, academic publishing has ventured into a new domain - online - believing it to be an environment analogous to paper. Like the proverbial Englishman in New York, though, sooner or later it will become apparent that, despite some similarities, it is in fact a very different and strange world.

A number of key issues have been identified with the current methods of academic publishing - low readership (Reid, 2011), long lag times between submission and publication (Pannell, 2002) and lack of context (O’Leary, 2011). Reid observes of the traditional approach to moving academic publishing online that trying to create an economically viable system in which books can be written and published but only sell in small numbers is missing the point (2011). Engaging in the disruptive innovative practices prevalent in the commercial publishing industry offer a way to address some of these issues and move scholarly research into a new era.

Already some interest has been raised in this area - Swinburne’s Institute of Social Research conducted a roundtable on scholarly publishing in 2009, which developed a series of five principles to sustain academic publishing into the future. Of these, two are particularly significant:

- Scholarly and scientific publications can and should be more broadly accessible with improved functionality to a wider public and the research community.
- The results of research need to be published and maintained in ways that maximize the possibilities for creative reuse and interoperation among sites that host them. (Swinburne Institute of Social Research, 2009)

While much literature can be found on the promotion of the former within the open educational resources (OER) movement, the latter point is significant in its implications for the stand-alone text model. O’Leary (2011) describes this as the ‘container model of publishing’ - current publishing methods are limited by an academic adherence to a stand-alone work that remains independent of any context around it.

The thesis issue

Engaging higher degree research students in the research process and in a research community is an issue of current concern, especially in regards to retaining these students in continuing academic careers. Rowbotham (2011) discusses recent results from the National Research Student Survey, which indicate 54% of higher degree research students intend to pursue an academic career. Theses and dissertations - the product of higher degree research - are particularly vulnerable in our current publishing market. The adage of a thesis having a readership of five is not far removed from reality for paper-based theses. Electronic theses and dissertations (ETDs) fare better, being “100 times more likely to be circulated than print theses and dissertations” (Moxley, 2001: 61).

However, without the benefit of experience, reputation or peer review, it is likely that the work of many students will go unread and uncited. There is potential in the exploration of open and dynamic research publication to improve the experience of HDR students, and thus increase their engagement in research and academic publishing.

A particular issue with traditional thesis production, whether electronic or analogue, is the invisibility of the research process. To a postgraduate student, new to research and often lacking confidence, a traditional thesis published as one large work means it may be a year (or longer) before getting feedback from anyone other than the proverbial five. There is also no chance of the work being cited prior to the thesis being published. In contrast, most online publishing platforms support 'feed' publication - publishing smaller sections as they are written. In online spaces, "scale is not our friend. It may well be the enemy" (O'Leary, 2011). Esposito (2011) advocates "the art of the vibrant pamphleteer" - leveraging digital spaces to eliminate the constraints on length and time delivery and produce more dynamic text forms. This mode of publication opens up the research process to feedback, sharing and possible citation in a much more immediate environment - exposing students to research communities much earlier than a traditional thesis would allow. It also facilitates the sharing and 'mashing up' of data - "Consider: The coolest thing to be done with your data will likely be thought of by someone else" (Paolo Mangiafico; in Bonnet, 2009).

The social construction of texts outside of O'Leary's 'container' model is echoed in Cornell University's panel on the academic publishing crisis (2008: see fig. 1 for excerpt). Texts are a product of interaction between individuals with multiple roles and perspectives, rather than being a result of a single perspective.

Fig. 1 - Cornell Publishing Crisis Panel - video excerpt
http://bit.ly/kyBENo

The good, the bad and the ugly

Breaking down the container model and publishing thesis research in open, dynamic spaces brings with it the need to consider implications from a variety of perspectives. The issues are broken down into three categories - the good, the bad and the ugly.

The good

Moxley (2011: 61) outlines some of the opportunities that are lost by not publishing thesis research publicly online - wide readership, the ability to benefit from multimedia, a reason to produce high-quality writing and motivation to complete the research program. These 'lost opportunities' can be extrapolated to all research output and academic publishing.

In addressing the issues of readership, a reason to produce high-quality writing and motivation, Reid notes that "the audience for this fairly modest blog blows away the audience for your book. It blows it away in a month." (2011). Jones (2011) indicates that his PhD section of his blog has had 2000 hits. Wide readership is perhaps the most immediate benefit that can be found in publishing in online spaces. Cross-pollination via social media increases visibility even further - promotion within an online professional network can result in an immediate and wide audience. To give a quick and informal example, a blog post by the author published in the morning can expect close to 100 hits by the end of the day.

A particular benefit of publishing outside a 'container' that is not considered in traditional publishing is interaction - not only will the audience read the published work, some will also respond. Comments, retweets, bookmarking and tagging work to create the context that is absent in container publishing. These make up what O'Leary (2011) terms "critical assets" for online publishing.

An additional benefit in this area - one that highlights the disruptive nature of publishing in dynamic, online spaces – is access to research is not limited to those who have access to institutional proxy systems to access paid articles and databases. As Fister (2011) notes of traditional publishing, "Do you know someone – maybe a recent graduate – who doesn't have a campus ID and is wasting away? Too bad! Sharing with them is strictly against the rules". Publishing outside of electronic 'containers' removes the restriction of paywalls and authentication and allow access to researchers not in traditional academic positions.

The bad
The difficulty with publishing outside of traditional containers - journals, monographs and conferences - is its visibility in the current research system. The Australian Research Council clearly defines journals and conference papers as the two media in which it will acknowledge research output (a search for the word blog on their website, for example, yields no results at all). As institutions rely heavily on research rankings and funding, non-ranked, openly published research is unlikely to be granted consideration. However, free of these considerations, theses and dissertations are a potential way to lead in new forms of academic publishing.

Current tracking and archiving systems are also ill-suited to acknowledge publications in non-traditional environments. While tracking and archiving are easy tasks to perform when considering publications from a website perspective, current systems for measuring scholarly impact are limited to traditional container formats. Ingraham (2005) describes the issue quite nicely:

> '...scholarly argument is fundamentally rooted in print. Scholars communicate with well-developed and commonly understood conventions... Such conventions do not currently exist for emerging electronic media. From a semiotic perspective, this may be viewed as a problem of rhetoric. The effectiveness of an academic argument rests partly on the quality of the evidence, partly on the robustness of the reasoning, and partly on the representational conventions through which the argument is mediated'.

It is clear that new ways of evaluating academic discourse are required. Additionally, the systems in place for evaluating the experience and qualifications of reviewers is not easily transferred to the online domain, where anyone is free to comment, and new methods of evaluation are required here also.

The ugly
Perhaps the most daunting aspect of open, dynamic publishing is that it renders one very specifically accountable for what has been written. The traditional double-blind peer review process is replaced by a review audience of tens, hundreds or thousands immediately upon clicking 'publish', and unlike journal review feedback, both positive and negative review is public. An additional hurdle is the interactive, contextual nature of working in online spaces - 'trolling' and negative comments and postings are part of the environment. However, it should be noted that publishing online does not increase the amount of criticism and negative review, simply the exposure to it - one previously would have to wait for a paper to be written critiquing one's own paper, and the criticism would have to be accepted for publication. Most criticism does not see the light of day in traditional publishing containers - and as Pannell (2002) outlines, peer review feedback is far from timely, and often anonymous.

The oScholar project

Fig. 2: oScholar project site
http://bit.ly/kwm1as

One example of a potential pathway to foster disruptive innovation in the publication and dissemination of theses, dissertations and research is the oScholar project. The project is based on the open-source WordPress platform, and allows HDR students and academic staff to create their own site for open research publication. In addition to the standard, easy-to-use publishing tools, oScholar also incorporates tools to enable referencing, citations, multimedia and social media interaction, as well as analytics software and a social media analysis database.

The development of the platform was largely informed by O'Leary's 'container theory', and was designed to foster the creation of a social context for published work. All "critical assets" named by O'Leary - tagged content, research, footnoted links, sources, audio and video background and "good old title-level metadata" - are incorporated. The addition of a connection to Amplify - an online microblogging and reposting service - allows Mangiafico's "mashup" of research content by readers.

To provide some way of redressing the difficulties inherent in tracking, archiving and transparent review processes in dynamic digital spaces, oScholar uses standard Google analytics software in addition to a ThinkUp social media analysis database. ThinkUp allows tracking, geotagging, and archiving of social media comments and interactions, which are transparently linked to an individual's online presence. These go some way towards designing new 'representational conventions' in which academic argument can be mediated (Ingraham, 2005).

Conclusion

The current culture of open and dynamic dissemination of text online as a disruptive innovation has the potential to generate some significant improvements to academic publishing, particularly in regards to the publishing of theses and dissertations. While there are some issues inherent in adopting disruptive processes, the potential for creating an environment in which it is possible to develop new methods of scholarly discourse analysis is significant. Projects such as oScholar offer the ability to begin to move into these new spaces, and provide a case study for formally recognising theses, dissertations and other research output in dynamic, online spaces.

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Online Community Engagement through Simplicity, Relevance and Connection

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This paper reports on the first stage of a phased approach to the development of an intervention which aims to support adult literacy educators in developing e-learning for their learners. The intervention is being implemented within an online environment created using Moodle, and studied using a design based research methodology. This initial iteration of the intervention was designed to encourage the members of the extant community of adult literacy educators to develop an online community, and to engage with the online environment. Engagement was encouraged though the facilitation of communications within this physically spread community, and the provision of online access to their community resources. Simplicity, relevance and connection were the elements found to be central to participant engagement within this first phase of the intervention.

Keywords: professional development, online community, design based research, e-learning

Introduction

An intervention to support the vital work of adult literacy educators, by enabling them to incorporate e-learning for their learners, is being developed using the learning management system Moodle. Its phased implementation will allow the environment to develop alongside the growing skills of those within the community it supports. A study of the intervention is being undertaken using a design based research approach, similar to the Integrative Learning Design Framework model proposed by Bannan-Ritland (2003), which allows for its collaborative development and widening scope. The phases of implementation will take place within the iterative cycles of design, use, evaluation and redesign of the study. Two theories underpin this intervention; the situated learning theory of Legitimate Peripheral Participation developed by Lave and Wenger (1991) and the Learning/Adoption Trajectory of Sherry, Billig, Tavalin and Gibson (2000). Using a combination of these theories, to investigate how an online environment for adult literacy educators can support the development of e-learning for their learners, this research aims to develop a self sustaining model of professional development and relevant design principles.

This first phase of the intervention focused on supporting the development of an online community for the geographically spread members of an Adult Literacy Education Centre (ALEC), and their engagement within the Moodle environment. Future phases aim to develop the environment to encompass the provision of e-learning for their clients, alongside this community area, in such a way that an online community of practice develops. The ALEC at this time had a staff of twenty. The participants in this first phase of study consisted of the manager of the centre, the office administrator, and seventeen tutors working in three different types of location. Tutors whose work was ‘at base’, each taught one class in a set classroom. ‘Community’ tutors taught small groups of clients in locations provided by community organisations. ‘Workplace’ tutors taught individuals or small groups of clients in locations provided by workplaces. Community and workplace tutors may have taught several groups in several different locations each week. A small group of tutors worked at the ALEC base developing resources for use by other organisations. The staff’s initial engagement within the environment was encouraged though the facilitation of communications within this organisation, and the provision of online access to community resources. Simplicity, relevance and connection were the elements of the design and use of the intervention found to be central to engaging the ALEC staff with their range of needs and skills.

Simplicity

Interviews, site data analysis, and the designer’s narrative journal indicated that several design choices had simplified the participants’ introduction to the environment. Access to the Moodle site was given to staff only, so that they could focus on collegial interaction and collaboration within this new environment. The less complex ‘student’ level of access to the site was given to the majority of tutors, to help them engage within the site more easily. The designer’s narrative indicated that this was done to encourage the tutors to actively take part in the site without being concerned about ‘breaking’ it, or having to learn too much before it was possible for them to participate. Tutors were able to view and download material made available to them, and contribute through forum posts and replies, but they could not make any changes to the site or upload content except within forums. The manager, office administrator, and four tutors who had added leadership responsibilities within the organisation, were given greater levels of access to allow them to take up their responsibilities within the online environment.

The simplicity of the design and navigation of the Moodle elements which were combined to create this environment, were successful in engaging the participants. Preece (2001) tells us that the “usability” of a site is largely dependant on the ease with which its users can find what they are looking for. The designer was very conscious of the need for participants to be able to easily navigate the site, and to be able to find the content they required. Keeping the environment simple accomplished this. As a tutor commented, “It’s so useful, and a simple design, that it’s a pleasure to use” (Participant G).

The ALEC Moodle site opens with a plain login ‘Welcome’ page from which members can access all areas in which they are enrolled, from a list on the left. All staff were enrolled in what was called the ‘Tutors Only’ space, which was to become the central point for staff in the Moodle site. The design of the Tutors Only space was kept as simple as possible. It consisted of three areas; the ‘Main Page’, the ‘Resources’, and the ‘How to…’ areas. Each of these areas was created using a Moodle ‘course’ and the designer provided consistent navigation between them at the top left of each area, to link them as one space.

Navigation, one of Preece’s (2001) four design criteria for usability, was developed in this space to provide the clarity and simplicity most valued by participants. The collaborative nature of this design based research allowed the incorporation of tutors’ suggestions for improvement, which highlighted their preferences for organisation in this space. “I think for me it's just that sense of clean and really simple with lots of transparency … and easy to follow, and I think the foundations of that are there. I suppose at the end of the day it’s just being able to have those designated areas well marked” (Participant B). The changes made to the Main Page, following consultation with staff, were typical. This area was created with supporting textual instructions and an additional form of navigation, to aid new users. While initially this worked well, after a few months of use tutors felt that it cluttered the area, and they preferred the simplicity of the one form of navigation without the textual support.

One of the most crucial elements in participant engagement was the support to enable tutors to engage. One-to-one sessions and small group training were the preferred methods of face to face training, over larger group sessions, for both designer and participants. “We just need training, as far as I'm concerned, and not in a huge group” (Participant F). The designer noted that tutors using their own computers simplified the training process by focusing the learning on the site, rather than the equipment.

Sahin and Thompson (2007) found, in their study of technology adoption, that “there is a need to provide high quality resources for faculty to learn about technology in a self-directed environment” (p.182). Supporting resources, such as documentation on how to use the site and its tools, were provided within the ‘How to…’ area of the Tutors Only space. This area provided easily accessible just-in-time support for tutors who wanted, or needed, to learn to use the site on their own. The support documentation was carefully structured in steps with accompanying graphics of the site itself. These documents, with their strong graphic element, were found to be very helpful by participants, especially the administrator who needed the broadest understanding of the site to support both her own use, and that of tutors who sought help from her.

> I learn by steps so I find your printouts really good. I can do anything as long as I have your printouts on how to do things… I know that a lot of the other tutors, that don't use computers a lot, do as well. Because it's so much easier to 'see' and 'do' than it is to listen for once and try to remember. (Participant S)

'Tutors Only' was designed as a functional work space. As such the designer gave it a clean, business-like format, with very few distractions. Through the interviews it became clear that the functionality of a simple design should be provided without making the site too plain. Preece (2001) includes an aesthetically pleasing design as one of the user satisfaction determinants of information design, and aesthetics were important to these participants too. For some staff the initial design was too plain and this proved counter-productive, "If I have too much white space and just words, I tend to just switch off a bit" (Participant A). A number of staff members showed a marked preference for a livelier space. "We should make it more colourful - that encourages me" (Participant E). "[It would be good to have] more images on it so that it's an exciting place to look at" (Participant M).

Relevance

Koch and Fusco (2008), from their work encouraging online community development within 'Tapped In', tell us that "getting started involves translating activities regularly conducted face-to-face into a form that works well online and serves a purpose" (p.10). Staff commented that having the weekly newsletter, and the forms and templates vital to the record keeping of the organisation available online, was very helpful for administration, and allowed them to be more self sufficient. "Just knowing that there is a central repository of current Unit Standards, and all forms that go with them, and I can just download them and print them, that's the shining thing for me" (Participant B). "I can go online to Moodle and know that what's there is the right version, the right thing to use. [I can] download it and use it confidently, so it's been massively useful in that sense" (Participant G). Having the documentation and resources relevant to the tutors' practice easily available in this online environment, not only encouraged engagement, but was seen as an advantage over the previous paper-based system, even by those who were initially reluctant to use it. This enthusiasm was however tempered with an awareness that the people responsible for keeping the resources up to date needed to be accurate in their work.

While the availability of resources was seen as one of the site's most positive contributions, the relevance of the resources was at times a matter for concern. For those tutors considering adding resources to the site, the biggest challenge was, "finding out what's relevant to other people" (Participant N). Concerns were expressed by tutors, that the resources they add may not be relevant in the future, or seen as relevant by others, particularly when they considered the wide variety of teaching content and contexts amongst the staff. "There's not a lot of things that we can put up that are generic for everyone" (Participant Y). This highlighted the importance of clear, simple organisation within the resource area of the site, which enabled relevant resources to be added in an easily accessible way.

Tutors have appreciated the ability the site gave them to share both information and opinions. Information was shared in the form of resources and suggestions of practical teaching methods, and opinions were shared in the form of encouragement and dialogue as well as constructive discussion of the issues they face. Tutors commented on the ability they now had to broaden their teaching practice by accessing resources and teaching strategies used by tutors from other parts of the organisation, and the recorded activity within the Moodle site shows this shared access. They also recognised the ability these shared resources have to provide new tutors with appropriate, useful resources, "I think it's a good place for new tutors to be able to look at things and say, 'Well, somebody's put it on there [Tutors Only], obviously they find it useful.'" (Participant O).

Not all tutors saw the site as something which was relevant to their work. "I'll use something that is relevant to me and is useful, and I haven't quite seen the relevance yet" (Participant N). Tutors, who did use the site regularly, commented that other tutors would increase their use of the site once they could see its benefits. They suggested that the site itself could be used to encourage further use. As one tutor put it, "Once they are [using it more] there'll be more stuff there and there'll be more reason to go on and it will become more of what it's meant to become. It's a sort of chicken and egg situation" (Participant K). The relevance of the forums seemed to have been clearer to tutors and the choice to become actively involved, easier to make. "I'll browse the news, like the staffroom, but I usually go into it because I want work related, not personal … What's in the newsletter? What's happening in the resource site? And then I'm in and out" (Participant A).

A design decision made to encourage 'sociability' (Preece, 2001) was to force participant 'subscription' to all forums. This meant that a copy of all forum posts was emailed to all staff. The designer made this choice "to encourage people by letting them see what is happening in the forums" (Design Narrative, 24/6/10) while the community was being established. Many tutors have found that having the forum posts emailed to them meant they could easily ignore items which hold little relevance for them.

> [The email] is really helpful, because that reminds you that there is a space and you know what people are thinking. And you can sort of follow up with that. And you can think 'Well that's relevant to me', and yes, I'll go and perhaps fire off an email or go on there and go and check Moodle (Participant C).

These forum emails helped tutors to both be aware of what was happening within the community, and feel connected to it, without them having to remember to login and check recent activity. The emails also provided an easy electronic link to the site.

> I think the fact that we were notified of anything that went on there through email was a really good reminder for me to go back in to it … Now every time I get an email notification I go 'Oh, that's great' and you go back onto the Moodle site (Participant A).

Connection

Through their engagement in the 'Tutors Only' area tutors felt a growing awareness of each other in this widespread organisation. The potential the site has for helping them to grow closer as a community was recognised by staff. At the manager's request a section on the 'Main Page' was set aside to highlight achievement by staff and their clients. Tutors suggested using the site to help them learn more about each other and their roles within the community through the addition of staff details such as who they teach, what they teach, and their contact details. The connectivity available through the site also helped to improve face to face experiences within the wider community. As one tutor explained, "if you've had a few online conversations, or even dropped in a little on online conversations of these people then when you see them again you feel a little bit more connected, you know, a little bit more comfortable around them" (Participant G).

During this phase of the research 'Tutors Only' was also seen as a way of drawing the individuals in the community together and keeping them connected. Many tutors appreciated having this new ability to easily keep up with events and information. "Keeping me in touch really….It probably wouldn't have happened before" (Participant C). "It just puts your finger on the pulse really, of what's going on" (Participant T). "Being able to tune in to the buzz of people communicating through Moodle is quite fun, and quite informative, so it adds to my sense of communication with people I don't see" (Participant G).

Enabling better connections between the tutors by facilitating more open communication was an important step in increasing engagement and aiding the development of a community within the environment. Network diagrams of the forum discussions have shown that the connections during this phase of the research are very much centred on the manager, and highlight the importance of engaging organisational leadership in developing this online community. The manager appreciated the ability the site gave to communicate openly with staff because it was "a more public forum for people to see each others' ideas and become more of a group that way" (Participant M). The three parts of the organisation did not often work together, which made it difficult for them to feel as though they were one community. "We were overdue for something to pull us all back with something central as a focus. We have been desperate for something for a long time" (Participant O). 'Tutors Only' has been recognised as having the potential to provide this. "[It's] bringing more communication between the 'community', the 'at base' and the 'workplace' [tutors], … Everyone sort of did their own thing … but now it's come together" (Participant S).

Future Directions

Koch and Fusco (2008) state that, "Demonstrating the immediate value of an online [Community of Practice] CoP is crucial: the majority of people will not spend time now if a CoP only has future value" (p.6). The site activity logs and statistics showed a gradual increase in activity within the site and a growing level of engagement by staff in both its use and its development during this phase of the research. However, while the amount of activity within the site continues to increase, it appears unlikely that the depth of participant engagement will develop much further until the intervention becomes more relevant to their practice. As the intervention progresses to the next phase of its development, and some tutors move into the Learning/ Adoption Trajectory stage of Teacher as Adopter (Sherry, Billig, Tavalin, & Gibson, 2000) the Moodle site will incorporate the provision of e-learning for their adult literacy clients, and should become more relevant. As a tutor commented, "If there was some way that our learners could use the space, I could see heaps of use for it, but … it's not there" (Participant Y). In the next phase of the intervention it will be.

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A 2010 Snapshot of Educational Technology use by Teaching Staff of Charles Sturt University

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This paper presents a snapshot of Charles Sturt University teaching staff attitudes towards and usage of technologies for teaching and learning, drawing on an institution wide online questionnaire completed in 2010 by 246 teaching staff. One of the most interesting findings from this study is the high usage figures for many teaching technologies, including technologies which most would assume would still be used only by early adopters. The study also highlights technologies with relatively low current usage but very high desired usage, including plagiarism checking software for student use, and online assignment marking and return. The study also indicates that teaching staff have genuine educational reasons for choosing to use technologies in their teaching. The findings of this study make it further very clear that assumptions about staff or students' technology preferences, usage or proficiency based on age would be highly misguided. A key finding from this study is that teaching staff at Charles Sturt University are highly diverse in their attitudes towards and usage of technology and consequently, university initiatives need to cater effectively for different stages of technology adoption.

Keywords: Technology adoption, eLearning, Educational Technology use, teaching staff

Introduction

The adoption of technologies for learning and teaching is of crucial importance to the transformation of university learning and teaching from face-to-face delivery models and distance education models to more student centred models that blend the advantages of different modes and media within a flexible learning framework.

Given the rapidly changing nature of educational technology, the survey was executed so that the University can more effectively provide educational technology to its staff. It was also hoped that the survey would provide a better understanding of the professional development and support needs of teaching staff. It aimed further to obtain information to help inform evidence-based educational technology developments and change management.

Educational technologies in this study include information and communication technologies (computers and networks), teaching and learning spaces, mobile devices, video conferencing and multi-media. Anecdotal evidence suggests that while early adopters have managed to use technology as a tool to facilitate transformational pedagogical change there are still many university teachers who have engaged only in a token way with educational technologies.

This paper, then, reports on results obtained from an anonymous survey of 246 teaching staff at CSU about their attitudes towards and practices with technology for teaching. The University sought feedback through this survey on the use of educational technology by teaching staff, their skill levels in using these and on how they might expect these technologies to help them with their teaching.

Background

The adoption of learning management systems and associated "new" technologies took hold in Australian Universities in the 1990s in part due to peer pressure amongst the Vice Chancellors (Pratt, 2010) after a move to a more competitive funding structure introduced in 1989 (Marginson, 1997). By 2001, 23 out of 40 Australian Universities had at least one award course that could be completed fully online with no face-to-face component (Bell, Bush, Nicholson, O'Brian & Tran 2002). As more and more institutions entered the online education market it became apparent that there was a great variation in need amongst staff in relation to the use of technology. Spicer (2003) stressed that platforms needed to not only be simple to use for design and management but also well integrated with other institutional systems. Pratt (2010) noted that such planned selection and implementation was severely lacking when it came to the adoption of such technologies by Australian Universities. Spicer (2003) also noted variation in staff competence with technology and online delivery which he suggested needs to be addressed by a diversity in levels and style of support, particularly "just in time". The variations in support styles is needed to address the range of academic users from the well discussed early adopters, who may just need help navigating the latest platform and tool, to the reluctant adopters who need technical support they can rely on to be available for every step in the process. Failure to address staff technical proficiency has meant that despite the much touted capacity for technology to enhance an academic's ability to engage with new pedagogies or expand their use beyond the classroom walls; the actual educational experience presented is a product of staff proficiency, especially in the early foray online, rather than design (Honey and North, 2010; Tynan & Barnes, 2011). Hannon (2008) also noted a gap between stated best practice and what is actually happening, which he attributed to a decline in technology and pedagogical support once the initial "roll out" of a platform is over. Lack of sustainability is often a result of the project centred model of IT/educational design support provided at most Australian universities through small centralised units (Tynan & Barnes, 2011). One survey of Australian academics found that staff felt that to be effective online teachers they needed training in pedagogy more than technology (Kim & Bonk, 2006). Australia is not the only country finding that the traditional modes of staff professional development aren't keeping up with either internal technological advances nor the ongoing developments and innovations available publically to students and staff alike; these same issues have been noted in Europe and the USA (Schneckenberg, 2009). In reviewing the central value of adequate professional development to enable staff to develop enhanced pedagogies that meet the needs of the students and the discipline Gosper et al (2010, p. 261) stresses:

> Programs need to go beyond the provision of technical information and training to encompass the development of a deeper understanding of the capability of learning technologies based on sound teaching and learning principles.

Arguably, an institution first needs some concept of the technical proficiency of its academic staff so that limited resources can be effectively deployed. Further, the perceptions and attitudes of staff need to be considered so that more inclusive and effective training and technology selection strategies can be implemented; a user led approach rather than the top down approach historically evident in Australia. Gosper et al. (2010) took the first step in their analysis of the use of learning technologies as well as perceptions of technology value by staff and students at four Australian universities. While their work noted a significant difference between staff and students perceptions of the value or benefit of online technologies they did not relate this to potential variations in the different populations' general use, acceptance and values in regards to technology. Several authors have noted the technical divide between the current generation of students (Gen Y or Net Generation) and those of the academics, a mix of baby boomers and Generation X, perceived as being less IT literate, can cause the latter to be less optimistic with their evaluations of the benefits of technology (Prior, 2004).

When examining technology use and preferences of academic staff it is worthwhile to keep the caution noted by Ragusa (2010) that with the selection of any new technology over another we need to consider the purpose behind the selection as well as at what expense and acknowledging the consequences of specific choices. It is also worth perhaps considering the willingness of staff to adopt technology for reasons other than competence. Lansdell (2010) noted that some of the staff at one Australian University were reluctant to transfer their legal course to an online delivery mode as they felt that the students would not be able to adequately develop professional interpersonal skills. The same study also noted concerns about loss of control over where the content, in this case personal legal experiences, may end up once online. This lack of perceived value or indeed reduction in capacity to teach students what they need to know via an online platform has been echoed by others across a range of disciplines (Gosper et al., 2010; Hanson, 2009). A third area of concern was a preference to not have all of their teaching activities able to be viewed by others, not wanting the university "watching over their shoulder" (Lansdell, 2010) nor the student body (Hardy, 2010).

While this paper focuses on staff use of educational technologies, it doesn't matter how staff or why staff select one technology over the other if they fail to consider the needs and preferences of the students who are supposedly the beneficiaries of these technologically enhanced experiences. Therefore, we need to contextualise the issue with studies of student technology use and preferences. It can be argued, in the absence of appropriate research, that institutional imperatives and resource prioritisation around technology used for teaching and learning is based on assumptions of the expectations and needs of contemporary students, often referred to as "Digital Natives" or the "Net Generation." (Prensky, 2001; Tapscott, 1998). A number of subsequent studies have found that assumptions about this "generation" of students are not especially accurate and in general, university students today use a fairly limited range of technologies such as the internet (for searching/'surfing'), email, mobile telephony, sms and office applications. They do not however, use newer Web 2.0 technologies such as blogs, wikis, and collaborative social media applications to the degree we might expect based on the assumptions made about the so call Net Generation. (Margaryan & Littlejohn, 2009; Kennedy, Dalgarno, Gray, Judd, Waycott, Bennett, Mason, Bishop, Chang, & Chuchwood, 2007; Kvavik, 2005). A number of studies would suggest that there are in fact not enough differences in the way these students learn to allow us to classify learners in this way without creating a number of significant misconceptions about what they may or may not expect from their educational experiences as a result. (Kennedy et al, 2007; Bennett, Maton, & Kervin, 2008; Selwyn, 2008). To then base the need for the teaching staff of higher education institutions to become more tech-savvy in their teaching and learning approaches solely on these assumptions maybe misguided. Margaryan and Littlejohn (2009) did find that assumptions about the tech-savvy nature of contemporary university students a common motivator amongst lecturers to use new technologies in their teaching.

In their study of undergraduate students in two British Universities, Marharyan and Littlejohn (2009) found that students use a limited range of social technologies for learning such as collaborative applications or virtual worlds as well as their institution's Virtual Learning Environment (VLE) and websites such as Google or Wikipedia. Notably, their study found that the attitudes of students to learning was more significantly influenced by their lecturers' approaches, and that students tended to expect what would be considered fairly traditional approaches to teaching and learning in the university environment. Students tended to use creative and social forms of technology such as Facebook, blogs and publishing sites, more for entertainment purposes, and used traditional and static forms of technology (such as VLEs to download lecture notes, office applications and content-based websites) for learning (JISC, 2007). Seeing the myriad technologies as an opportunity to improve teaching and learning for students, rather than as something students already know and expect to use, may be a more solid foundation on which to build the educational technology skills of teaching staff in universities.

The Study

CSU Context

Charles Sturt University is a multi-campus university with a large proportion of its students studying at a distance rather than on campus. Specifically, in 2010 23,367 students were enrolled in Distance mode, 9,568 in On Campus mode and 5,029 in a mixture of On Campus and Distance modes. In 2010 the University employed 673 full-time equivalent academic staff, in four faculties (Arts, Science, Business and Education), as well as adjunct staff in a number of partner institutions within Australia and offshore. The University has required all subjects to have an online presence containing at least the subject outline and a discussion forum since the late 1990s, with online assignment submission available in all distance subjects since the early 2000s. The Sakai based Learning Management System (named *Interact* within the University) was introduced in 2009, providing an announcements tool and a resource sharing tool in all subjects and tools such a blog, a wiki and a chat room at the discretion of the subject coordinator.

Questionnaire Design

The questionnaire was designed in close cooperation with staff from the University of Waikato, New Zealand in mid-2010. The questionnaire was based on the following surveys: University of Waikato, Staff and Student eLearning surveys 2008; ECAR Research study 6, 2007; Student Information and communications Technology project, University of Edinburgh; Association of College and Research Libraries, Informing Innovation survey 2009; VERSO, 2008; UNSW@ADFA, Students' ICT Experience, 2008; Victoria University, Student Questionnaire, 2009; Macquarie University, Student Experience of Technologies in Universities, 2010; University of Wollongong Survey, 2008; UTAS, Staff and Student experience with eLearning technology surveys 2010.

The questionnaire was thereafter customised to address key concerns about educational technology at CSU and had the following sections: Demographics – Personal; Demographics – Institutional; Technology Access; Use and awareness; Features currently used; Features they would like to use to support their learning; Views and Experience; University Services. A similar questionnaire was designed and administered among CSU students. This paper, however, reports on the survey among teaching staff only.

Administration and Sample Demographics

Ethics approval for this survey was obtained from the CSU Learning & Teaching Services Ethics Committee. The questionnaire was made available online in Survey Monkey between 13 July 2010 and 1 August 2010. It was widely promoted in CSU and its partner institutions through general communication channels and also through CSU's micro-blogging tool Yammer and a learning management system site called "About ICT integration" (which has just under 500 members).

The survey was conducted anonymously and it was made clear that even though Survey Monkey used the IP address of the computer to enable staff to continue if they exited the survey before the end, this would not be used to identify their contribution. It was also made clear that any publication as an outcome of this survey would not identify any individual or any particular subject in any way.

Teaching staff were encouraged to complete the full questionnaire, but could exit the survey at any time and return later to finalise it on the same computer or exit without completing. It was stated that participants had the right to withdraw from the research at any time, without penalty and they could also contact the first author of the paper if they wished to withdraw after having completed part of the survey. The survey took approximately between 30 and 45 minutes to complete. This paper reports summaries of the responses to a subset of the questions in the survey relating to general attitudes towards and usage of technology, attitudes and usage of selected educational technologies, and usage of the CSU Learning Management System. Generally items have been chosen for reporting where it was considered that their usage was sufficiently common across the sector to warrant wider interest.

The survey was completed by 246 teaching staff members, including 105 males, 137 females, and 4 not stating their gender. 208 respondents were employed directly by the university, while the remaining 38 respondents were teaching staff employed at one of 12 partner institutions. There were 63 respondents from the Faculty of Arts, 40 from Business, 70 from Education and 49 from Science, with 24 indicating that they were not in a faculty (some staff from the Divisions of Student Services, Library Services and Learning and Teaching Services completed the survey because they have some involvement in teaching. 21 respondents indicated that they were aged 55-60, 43 were 51-54, 32 were 45-50, 47 were 40-44, 34 were 35-39, 24 were 30-34, 21 were 26-29, 10 were 22-25, 11 were 18-21 and 3 indicated that they were less than 18.

Findings

General attitude towards technology

In order to get a sense for teaching staff respondents' attitudes towards new technologies, they were asked to choose which of a series of descriptors described themselves ranging from "I love new technologies and am among the first to experiment and use them" to "I am skeptical of new technologies and use them only when I have to". As shown in Figure 1, only 9% of respondents indicated that they loved technologies and were among the first to use them, while 31% of respondents indicated that they liked technologies and used them before most people they knew. The fact that the largest proportion of respondents (35%) indicated that they use technologies when other people start to use them, and 26% of respondents indicated that they used technologies after other people had started using them, indicates that there was a fairly even distribution of respondents ranging from those very positive about technology to those much less positive.

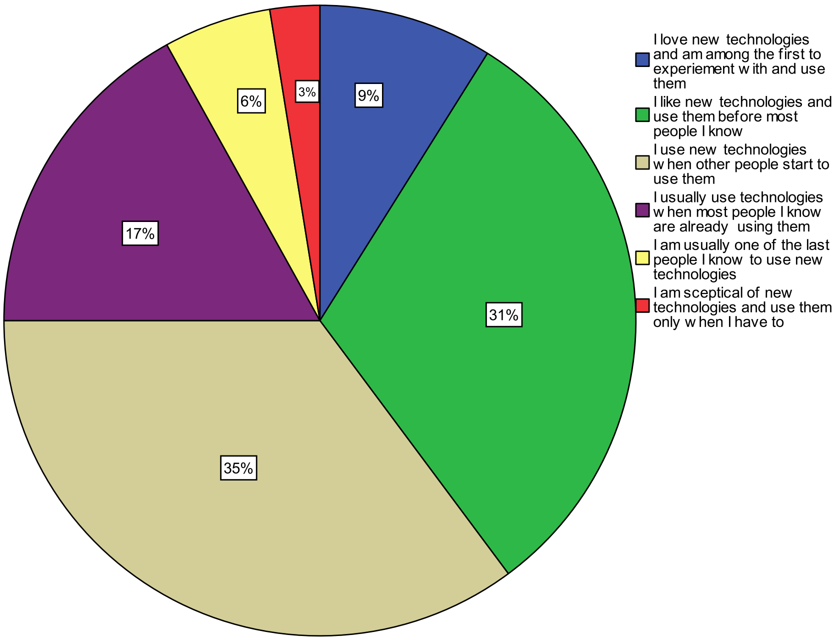

Figure 1: Attitudes towards new technologies

General usage of technology

In order to get a general picture about teaching staff familiarity with a range of technologies, teaching staff were provided with a list of 60 technologies, tools and online information sources and asked to indicate whether they had never heard of it, heard the name but were not sure what it was, knew what it was but had not used it, used it occasionally, or used it regularly. Table 1 shows responses relating to 8 of these 60 technologies. Not surprisingly, tools such as Email (97%), Spreadsheets (76%) and Presentation Software (82%) that are central to the work of a teaching staff member were used regularly by the vast majority of respondents. Less used were Social Networking, Wikis and Podcasts with around 50% of respondents using them either regularly or occasionally. Interestingly, only a small proportion of respondents indicated that they had used Microblogging or Virtual Worlds, with 42% of respondents indicating that they had not heard of Virtual Worlds or were unsure what they were.

Table 1: Technology Use and Awareness

Technology or Tool	Never heard of it	I've heard the name but not really sure what it is	I know what it is but have never used it regularly	I use this occasionally	I use this regularly
Social Networking (eg. Facebook, LinkedIn, MySpace, Orkut, Ning)	0.4%	5%	36%	32%	26%
Email (Hotmail, gmail, Outlook)	0.8%	0.4%	0.8%	1.3%	97%
Wikis	3%	11%	39%	28%	19%

Electronic Simulations and Virtual Worlds (Second Life)	22%	20%	50%	5%	3%
Microblogging Services (Twitter, Tumblr, Yammer)	7%	19%	52%	14%	8%
Podcasts	3%	9%	34%	31%	23%
Spreadsheets (eg. MS Excel)	1%	0.4%	4%	18%	76%
Presentation Software (PowerPoint, Keynote)	1%	0.8%	4%	12%	82%

Attitude towards educational technologies

Participants were asked to nominate the "single most important benefit for me of using educational technology in my subjects", choosing from six options. The proportion of respondents choosing each option is shown in Figure 2. The largest proportion of respondents (46%) chose "improving the quality of my teaching", with 35% choosing "making it easier for my students to get access (where students would have been unable to attend some or all of the required on-campus classes e.g. due to distance, family commitment, work)". Only 2% chose "Personal management (Able to teach at times and in places convenient for me)" suggesting that student convenience is a much more important factor in technology use than teacher convenience. The high number of respondents using technologies because they see them as improving their teaching quality and the low number (4%) indicating that they could see no benefits in the use of technology is quite encouraging.

Use of the Learning Management System

Participants were asked three questions about whether they used the university Learning Management System (LMS), which goes by the tag "CSU Interact" and why or why not. The first question was "Do you use CSU Interact to support the delivery of some of your subjects" with 212 respondents (86%) choosing "Yes" and 34 respondents (14%) choosing "No". Respondents who chose "Yes" were provided with a list of fourteen possible reasons for using the LMS and asked to tick all that applied. Table 2 shows how many of the 212 respondents using the LMS indicated that the specified reasons applied to them. Understandably, the most common reason was that use was part of Faculty or School policy. Equally important, however, was to allow access to supplementary resources, followed closely by "to increase the opportunities for communication" and "to allow access to lecture notes, slides and handouts". Of lower importance were "for formative assessment (feedback only)" and "for summative assessment (count towards grades)".

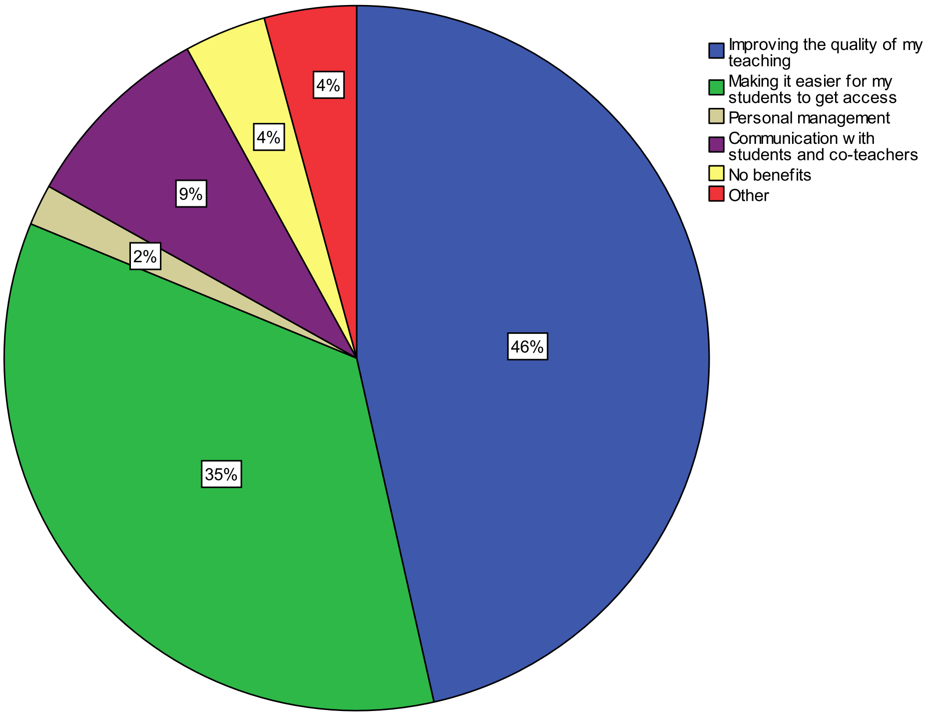

Figure 2: Attitudes towards educational technologies

Table 2: Reasons for using the Learning Management System

Reason	Respondents (of 232 using the LMS)
It is Faculty/School policy	151
To allow access to supplementary resources	150
To increase the opportunities for communication	147
To allow access to lecture notes, slides and handouts	143
To increase the flexibility of teaching & learning	125
To provide blended subjects (where some core content, communication, readings or assessment is included online)	97
To allow access to audio or video resources	97
To selectively release online activities and content	69

To provide fully online subjects	63
For formative assessment (feedback only)	62
For summative assessment (count towards grades)	55
My students demand it	40
To use or link to simulations and virtual worlds online	28
Other (please specify)	11

Participants who indicated that they did not use the LMS were asked to indicate why not, by choosing one or more reasons from a list of eight provided. Table 3 shows the number of respondents out of the 34 not using the LMS who chose each provided reason. The most common reason (11 of 34 respondents) chosen was “there is no compelling reason to use it”, followed by “other (please specify)” (10 of 39 respondents). Responses given for “other (please specify)” included, “It takes a long time to create resources”, and “Do generic workshops as well as coordinate an online subject, don't use interact for these workshops”.

Table 3: Reasons for not using the Learning Management System

Reason	Respondents (of 34 not using the LMS)
There is no compelling reason to use it	11
Other (Please specify)	10
Lack of awareness or professional development	7
It doesn’t support my teaching style	6
It would be detrimental to my students’ approach to the subject	5
It’s too time consuming to use	5
I’m concerned about Intellectual Property issues	3
Other people manage my CSU Interact subjects for me	2

Table 4: Frequency of use and desired use for selected educational technologies

	Frequency of Current Use			Frequency of Desired Use		
	Weekly or more (1)	Less than weekly (2)	Never (3)	Weekly or more (1)	Less than weekly (2)	Never (3)

Announcements	59.5%	33.9%	6.5%	69.8%	24.3%	6.0%
Lecture recordings	16.3%	19.4%	64.3%	41.5%	29.0%	29.4%
Discussion forums	63.9%	21.8%	14.3%	65.2%	25.3%	9.6%
Chat room	23.3%	25.6%	51.1%	38.1%	30.3%	31.7%
Wikis	15.0%	32.6%	52.4%	32.4%	32.9%	34.7%
Blogs	14.2%	25.7%	60.2%	29.1%	32.7%	38.2%
ePortfolios	10.7%	16.9%	72.4%	25.2%	31.8%	43.0%
Assignments – students getting marked work back online	12.4%	37.6%	50.0%	19.0%	60.7%	20.4%
Plagiarism checking by students before submitting their assignments	5.8%	17.0%	77.2%	20.0%	62.8%	17.2%
Animation	8.9%	22.2%	68.9%	25.5%	35.7%	38.9%
Quizzes for learning / self review / assessment	13.2%	33.3%	53.5%	28.8%	52.1%	19.2%
Subject information on my students' mobile devices (handheld)	4.9%	4.0%	91.1%	22.2%	25.0%	52.8%
Digital object management system (Equella)	4.0%	2.2%	93.8%	14.8%	23.3%	61.9%

Usage of selected technologies in teaching

Respondents were asked to indicate the frequency with which they use each of 34 technologies in their teaching, and the frequency with which they "would like" to use each of these technologies. Table 4 shows the frequencies for 9 of these technologies. By far the most frequently used technologies were the discussion forum and the online announcements tool in the LMS. Supporting students using online forums or cohort wide announcements has been possible at CSU for more than 10 years. Such tools have commonly been used to supplement traditional print-based distance education pedagogies as well as traditional lecture and tutorial face-to-face teaching models. The fact that Web 2.0 tools such as Wikis, Blogs and ePortfolios are now being used by 25% to 45% of teaching staff suggests that many teaching staff have begun to evolve their online teaching strategies beyond those that simply support traditional distance or face-to-face approaches. The high number of teaching staff indicating that they desire to use online assignment feedback and plagiarism checking software, despite relatively low current use suggests that these tools which have become available at CSU more recently will gradually become much more popular. The very low current usage of the digital object management system and tools for providing subject information for mobile devices, is indicative of the fact that at the time of the survey such facilities were not widely available. The relatively low percentage of staff planning to use these tools may be indicative of a general lack of awareness of the possibilities in these areas.

Comparison by Age, Gender and Faculty

To explore the possible differences in technology use between sub-groups of respondents, a series of Multivariate Analysis of Variance (MANOVA) procedures were carried out using age, gender and faculty as independent variables and, firstly, usage of the set of general purpose technologies listed in Table 1 as dependent variables, and secondly, usage of the set of educational technologies listed in Table 4 as dependent variables.

The analysis focusing on general purpose technologies indicated that there were no significant differences between male and female staff usage of any of the technologies. There were few age related differences in technology usage, with social networking being the only technology for which a significant main effect for age was found ($F(9,144)=2.863$, $p=0.004$). Post hoc analysis using Tukey's HSD test indicated that the mean response for the 22-25 age group was greater than for all of the older age groups ($p < 0.05$), that is, that the younger teaching staff members used social networking tools significantly more frequently. There were no significant faculty related differences for usage of general purpose technologies.

The analysis focusing on teaching technologies also found no significant main effect of gender, indicating that there is no difference in usage by male and female teaching staff. There were also no significant age related differences in frequency of use of these technologies. There were some faculty differences, with main effects found for announcements (F4,135)=5.326, p=0.001), blogs ($F(4,135)=3.487$, $p=0.010$) plagiarism checking software use by students ($F(4,135)=3.503$, $p=0.009$), and formative quizzes ($F(4,135)=3.316$, $p=0.012$). Post hoc analysis using Tukey's HSD test indicated that teaching staff who were not in a faculty (eg. Student Services, Learning and Teaching Services and Library Services staff) used announcements significantly less frequently than staff from the faculties. Similarly, staff from the Faculty of Education and non-faculty staff used Blogs significantly more frequently than staff from the Faculties of Science and Business. Staff from the Faculty of Business used plagiarism checking software significantly more frequently than staff from the Faculties of Education, Arts and Science, probably reflecting initiatives within the Faculty of Business to promote the use of such software when it was first made available. Finally, staff from the Faculty of Arts used formative quizzes significantly less frequently than staff from the Faculties of Business, Science and those not in a Faculty.

Relationship between general technology usage and usage of technology for teaching

In order to explore the relationship between teaching staff personal usage of technology, and their usage of technology for teaching, a mean technology usage score was calculated, from the usage responses for the eight technologies in Table 1. Pearson's correlation coefficient was then used to test for correlations between this mean technology usage score and usage as well as desired usage of each of the teaching technologies in Table 4. Significant correlations ($p< 0.05$) were found between the mean technology usage score and usage of eight of the thirteen teaching technologies in Table 4 (lecture recordings, discussion forums, chat room, wikis, blogs, online assignment marking, animation, and formative quizzes). Significant correlations ($p<0.05$) were found between the mean technology usage score and desired usage of all thirteen teaching technologies. This indicates, as would be expected, that personal usage and awareness of technologies is a strong driver of use of technology for teaching. The lack of correlation with some technologies is interesting. In the case of usage of ePortfolios and plagiarism checking software, it may be that the range of initiatives within the university to promote usage may have led to early adoption of these tools by people who were not naturally high users of technology. In the case of the provision of subject information for mobile devices and the use of the object management system, it may be that the very low usage of these technologies prevented meaningful correlation scores from being obtained.

Discussion and conclusion

One of the most interesting findings from this study is the high usage figures for many teaching technologies, including technologies which most would assume would still be used only by early adopters. Mainstream tools like the announcements tool (usage of close to 95%) and discussion forums (usage of close to 85%) have become almost ubiquitous at CSU, while 28% of respondents are using ePortfolios, 40% are using Blogs and 48% are using Wikis all of which would be seen by many as leading edge Web 2.0 technologies. These findings can be contrasted with those of an earlier study by Shannon and Doube (2004), who in 2003 found that 55% of their University of Adelaide respondents used web teaching tools 'less than a moderate amount'. The data from this survey would suggest that there has been a substantial increase in the adoption of online teaching tools in recent years. It is interesting to also contrast these findings with those of Kennedy et. al. (2011) who report on a questionnaire completed in 2010 by teaching staff at the University of Melbourne, an institution with a predominately face-to-face teaching profile. A key difference is the proportion of staff making use of a discussion forum (94% at CSU compared to 37% at the University of Melbourne). Similarly, Web 2.0 social networking tools like Wikis (48%), Blogs (40%) and ePortfolios (28%) are becoming mainstream parts of university learning and teaching at CSU, while their usage is more moderate at the University of Melbourne (15% for Wikis and 9% for Blogs). It is likely that due to a lack of opportunity for face-to-face communication in many CSU subjects, teaching staff at CSU have explored the capabilities of online communication tools to a much greater extent than their counterparts at the University of Melbourne. The even higher desired usage figures for these technologies suggest that their usage will continue to increase in the coming years to the point where the majority of CSU teachers will be making use of them. Interestingly the use of lecture recording is much higher at the University of Melbourne (58% compared to CSU 36%) reflecting the value of such technologies in a face-to-face context.

The study also highlights technologies with relatively low current usage but very high desired usage, including plagiarism checking software for student use, and online assignment marking and return. At the time that the survey was completed both of these tools had only recently been made available, and so it is possible that many teaching staff had not yet had the chance to make use of them but had plans for doing so. It is likely that future surveys will pick up substantially increased usage of these tools. The survey also highlights two technologies with very low current use and relatively low desired use, namely tools for the provision of subject information on mobile devices and the object management tools. The low current usage is reflective of the fact that these tools were not yet widely available at the time that the survey was completed. The low desired usage has implications for the university in terms of the professional development required if the adoption of such tools is seen as desirable. It is likely that many teaching staff are not aware of the capabilities of such tools and so, without substantial promotion, will not use them even once they are made widely available.

The responses to the question about attitude towards educational technology and to the question asking for reasons for use of the LMS suggest that, even though usage of the LMS is required by university policy, teaching staff have genuine educational reasons for choosing to use technologies in their teaching. The fact that many teaching staff are making decisions to use online tools within their subjects that are not mandatory, such as Wikis, Blogs and ePortfolios, suggests that these staff are making decisions based on perceived pedagogical benefits. All of this said, the responses to questions about attitude towards technology in general (indicating that more than half of the teaching staff use technology when or after others start using them) and questions about awareness of and usage of technologies in general, indicate that there is still a large proportion of staff who have little experience with emerging technologies like virtual worlds, podcasts, social networking tools and micro-blogging tools. This suggests that as Spicer (2003) points out, support for teaching staff needs to cater for staff at a wide range of levels of technology awareness and experience.

Responses to the questions about general usage of technology suggest that a sizable minority of teaching staff use social networking tools, wikis and podcasts regularly. This runs counter to the notion suggested by Prensky (2001) of a Digital Immigrant teaching population teaching a 'Digital Native' population of students. Even though some teaching staff would fit into the age bracket characterised as Generation Y, and so might on this basis be assumed to be 'Digital Natives', the lack of age effects for usage of most technologies indicates that it is not in fact the younger staff who make up the group of frequent users of emerging technologies. Furthermore, earlier studies (see Kennedy et al., 2007; Kennedy et al., 2008) suggest that many students are not regular users of Web 2.0 technologies and that age is not a good predictor of student and staff use of technologies in general. , Consequently, assumptions about staff or students' technology preferences, usage or proficiency based on age would be highly misguided. Our study would perhaps suggest that the main assumption that could be made in relation to teaching staff and educational technology use, is that as their technology proficiency increases so will their preference for a choice of tools that fit their diverse pedagogical needs.

To conclude, the most important finding from this study is that teaching staff at Charles Sturt University are highly diverse in their attitudes towards and usage of technology, including general technologies and learning and teaching technologies. Consequently, any initiatives designed to facilitate wider use of technologies for learning and teaching need to cater effectively for teaching staff at different stages of technology adoption.

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My teacher is an Android: Engaging learners through an Android application

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This concise paper describes work-in-progress research that examines the development of an Android "app" for a topic in a first year Statistics paper. The Android platform was chosen as Android devices are the top-selling mobile devices, outselling Apple iPods/iPhones/iPads. In addition, the operating system is open-source and development can be done through the Android AppInventor programme, accelerating the development process by providing a point and click interface to bypass much of the programming. The paper briefly examines the literature relating to student engagement and the use of mobile devices in teaching, before describing the process of developing the app. It is concluded by describing future research that will be presented at the conference.

Keywords: Android app, student engagement, teaching statistics, mobile learning

Introduction

The demographic profile of students at many universities in Australia has changed in the last decade (Department of Education, Employment and Workplace Relations, 2010). As has the balance of campus-based, blended learning, and distance education programmes, with universities vying for different target markets and student profiles. One of the more recent demands, from both campus-based and distance students, is for the integration of mobile devices into education programmes (Hoskins, 2011). Although tools, technologies, paradigms and student cohorts continue to change, one thing that stays the same is the need for learner engagement, and learning resources that encourage this.

This paper will examine the development of an Android app for a topic in a first year Statistics class. It details the decision making process for choosing the Android operating system, a review of literature on app development and mobile learning, and some reflections on the process. This is followed by a brief description of how the app will be implemented with the students and evaluated. The ultimate goal of this research will be to quantitatively and qualitatively measure the student engagement and improvement from using the app. The plan for this will be briefly discussed at the end of the paper, and discussed further at the conference.

The ability to correctly identify the statistical test that is required for a given number and type of variables is a technical skill that students commonly struggle to master. In the past students have been provided with flow charts or decision trees to help select the correct statistical test. However, this has only had limited success, mainly due to students not using them (particularly as an ongoing resource). The goal of this app is to translate these flow charts into a mobile application that students can refer to and practice with. By using an app rather than a javascript on the web, students can access the content on their phones even when they are unable to connect to the internet or do not have credit for data on their phone.

Literature Review

Last year, Brand and Kinash (2010) decried the paucity of published research on the effectiveness of mobile devices in higher education learning (as well as the lack of detail regarding the learning functions, and the different blends between face-to-face and mobile learning). However, they did note that it was a relatively new research area, and further literature has been published in the area since then, with publications and presentations of note including Yau and Joy (2011) and Searson (2011). In each case it was argued that mobile learning platforms were an important part of learning, particularly with younger members of Generation Y, and even more so with Generation Z (aka the Internet Generation (Blanchard, 2009)). Bullen, Morgan and Qayyum (2011) found that in fact generation was not as relevant to the effectiveness of a resource for digital learners as the familiarity, cost, and immediacy of the resource. The benefit of mobile devices to learning was echoed in another recent publication, with Williams and Pence (2011) describing how smart phones had added a new dimension to the teaching of chemistry. However, even the additional research in the area has focused on the use of existing apps, or the use of regular web services via mobile devices, rather than on the development of a new custom-made app. This area is still emerging and has little literature outside of computer science, where the focus is on learner created apps.

The specific purpose of the app is to help students better understand the application of which statistical tests are most appropriate for a given type of data. It is an area of increasing importance in first year Statistics courses, as they move from a technical focus to a more critical and conceptual focus (Gould, 2010). Statistics is a subject that many students find challenging. This is especially the case for first year service courses. Chance, Ben-Zvi, and Medina (2007) describe how technology has driven numerous changes in the content, pedagogy and course format of statistics. They emphasise the potential of enhancing student learning through new technology, but do provide the caveat, "…technology has an impact on education only if it I used appropriately". Everson and Miller (2011) talked in broad terms about increasing student engagement through technology, including clickers, "Poll Everywhere" and mobile technologies.

Although there is a plethora of websites and literature regarding the development of mobile software and apps, there is less specific to developing learning materials, and even less about the Android operating system. Matos and Grasser (2010) describe the Android operating system as a "rich platform", for development and programming. Although their article is about having students develop Android apps, they provide helpful advice on the technical aspects of the development process. According to Shanmugapriya and Tamilarasi (2011), the key to good pedagogical development is to consider the "where, what and how", which correlates with the previously mentioned "familiarity, cost, and immediacy" from Bullen *et.al.* (2011), and one of the key findings of Herrington's (2008) student interviews on smart phone digital teaching resources, that a key benefit is the possibility of "spontaneous use". The recurring theme of these articles is that the app must be easy to access, easy to understand and easy to use. If students consider the marginal cost, in terms of effort, to be greater than the marginal benefit to their learning, they are unlikely to engage with it.

Application Development

Choice of OS

The decision of what operating system to use was a fairly simple one. The two main systems are Android and the Apple iOS. The differences between the two systems are well covered by Goadrich and Rogers (2011). The Android platform was chosen as Android devices now outsell Apple products (Nielsen, 2011), and are becoming increasingly prevalent amongst students due to the broader range of phones and plans that they cover. The Android platform is open-source and the process for developing applications is more user friendly than the competing platforms. The distribution of applications is also more flexible in the Android development. Apple apps can only be downloaded via the Apple Apps Store, whereas Android application files can be distributed independently of their App Market. In addition, Android is also more inclusive, with students who do not have access to an Android device still able to use the applications through a computer based Android emulator. Although this would not be mobile, it would mean that no student missed out on access to the app. In the long term, the preference will be to develop for iOS and Android in tandem in order to have applications reach the greatest number of students.

Development interface

One of the advantages of the Android operating system is the opportunity to use the AppInventor site (http://appinventor.googlelabs.com) to create Android apps without having to program. Figure 1 shows the main AppInventor window. The main advantage of using AppInventor was that it accelerating the development process through a point-and-click interface and a series of tutorials to help train developers. The main downside to using the AppInventor is that it limits the flexibility of the development. In the short term this is not a large issue, however, in the long term, developing future apps will be developed in Java, using the Eclipse IDE (Integrated Development Environment). During the review process the Google announced that it was going to discontinue the AppInventor. However, shortly after that MIT announced that they would take over the support and development of AppInventor in their newly formed Center for Mobile Learning (MIT New Office, 2011).

App content and design

As previously discussed, the app itself had to be easy for students to use, but at the same time, it needed to do more than just replicated web-based content. Otherwise there would be little motivation for the students to use it. The app has buttons for students to select the types of variables and scenarios from drop-down lists. The app will then provide the most appropriate statistical test for the scenario, together with a brief text description of that test. Additional functionality that has been suggested but not yet implemented include a description of how to conduct the statistical test in analysis software, and the addition of a brief audio commentary about the test. At the time of writing this article, beta testing of the app had not been completed, so further detail, and any changes, will be provided at the conference.

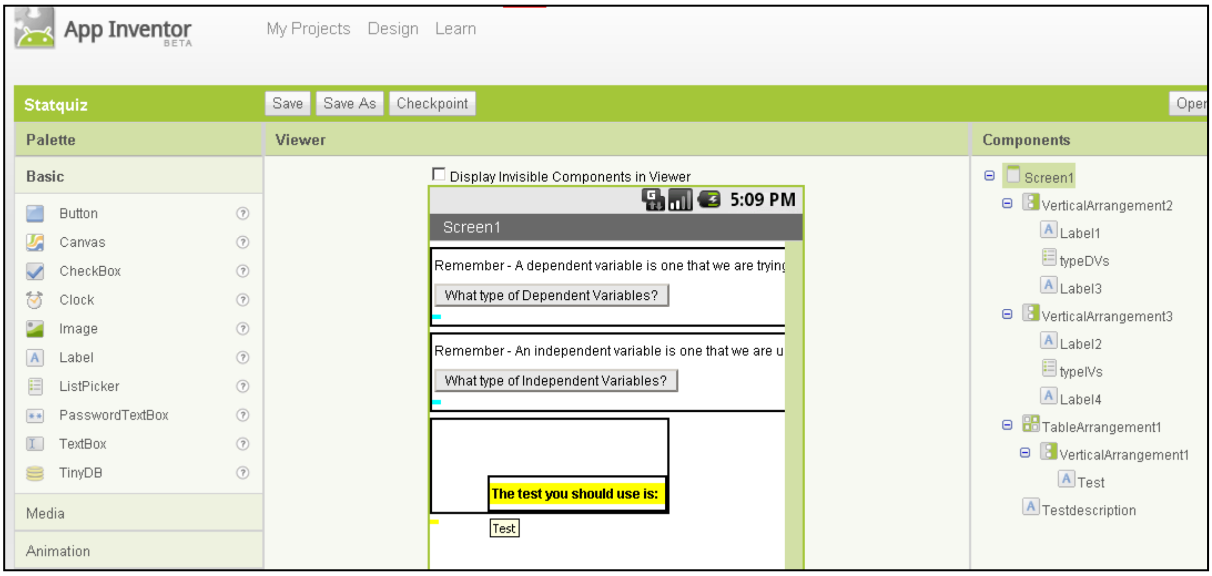

Figure 1: Google AppInventor

Reflections on the Development Process

An important component of any development process is to reflect. There are several points of reflection from the development process to-date. The first is that software development, even with the programming mainly removed, always takes longer planned. The original time-line for the project had the beta-version of the app complete in time for initial user testing before the publication of this article (and initial user feedback and evaluation). However, this will now take place over the coming months and be presented at the conference. One of the key decisions in the process was to use AppInventor rather than programming the app from scratch. This sped up the development process, but it also limited the flexibility of the development. Although it was a good starting point, further updates to the app, and any new apps will be developed from scratch. This will allow for future apps to be more graphically appealing, which is an important component of designing engaging software. For this initial foray into application development, the Android operating system made more sense. However, given that both Android smart phones and iPhones appear to be popular among students, simultaneous development on both platforms would be preferred, despite the additional time that this would take.

Future Directions

This article has shown the development of a simple Android app for a first year statistics course. The next step will be to "beta test" with some students and tutors for the subject, before making the app available to students. This will be followed by an evaluation of the app, which will be two-pronged, collecting quantitative and qualitative data from the students. This will be supplemented by a student survey.

Post-article research tasks:

4. Beta test app with tutors and former students
5. Make app available for semester two students
6. Survey students on usage and feedback on the app

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The move to Moodle: Perspective of academics in a College of Business

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This paper describes the results of a survey among academics in the College of Business at an Australiasian university in the aftermath of a move to Moodle. The survey aimed to gather evidence of the relationships between university lecturers and the online environment, from which future practice could be informed. The findings were largely positive. A strong majority of respondents reported some degree of integration of Moodle with their teaching, along with a long-term commitment to Moodle utilization and improvement over time. However, only a limited number of respondents agreed that Moodle had helped them improve their teaching, indicative that academics were still in a period of transition from shallow systems compliance to deep pedagogical change. Overall, the experience showed that the move to Moodle needs careful planning and communication and must be part of a wider strategy to integrate e-learning solutions throughout course design and institutional culture.

Focus terms: Moodle; e-learning; evidence based practice

Introduction

The development of e-learning has become an important aspect of teaching and learning (Stein, 2011). In 2009, one Australasian university embarked on an ambitious three-year digitalization and curriculum renewal project. The key initiative was replacement of WebCT with Moodle. Importantly, the implementation of Moodle was not a technical migration from an old system to a new one but rather an opportunity for the University to transform the incumbent model of teaching. Against this backdrop, a directive was given from the Head of the College of Business that all teachers of the Bachelor of Business Studies should blend e-learning into traditional, on campus delivery as a way of enhancing teaching and learning during 2010.

According to Salmon (2005) ‘teaching online has almost nothing to do with computers and everything to do with time, motivation knowledge and the new agency of cyber-experience, as well as good appropriate teaching'(pp. 214–215). To investigate this further, the aim of the present study was to gather evidence of the relationships between university lecturers and the online environment using the College of Business as a case study. The intention was to use results of the study to inform future practice. Specific objectives were to:

- determine the level of use and effectiveness of Moodle;
- understand staff perceptions of the online learning environment;
- assess the types of supports needed for the effective digital delivery of learning resources.

Research design

This research involved an online email survey that collected responses from participants through a web-based questionnaire. The study took place in June 2010 in the aftermath of a move to Moodle, which had been instigated by the Head of the College of Business at the beginning of Semester 1, 2010. The sample included all academics in the College of Business, of which 86% responded (n=54). The survey included 50 questions that required responses against a Likert-scale.

Findings

Results revealed that almost all respondents (98%) had a basic knowledge of Moodle and most respondents (77%) had made an effort to fully integrate it into their teaching or paper. In doing so, the majority (62%) expressed confidence in their ability to use Moodle. In terms of long-term adoption, the majority of respondents (88%) intended to make further use of Moodle, perhaps unsurprising given that the College of Business management had clearly stated it commitment to widespread adoption of an online component in all papers and programmes. In hindsight, the survey did not measure the motivation behind respondent's sustained utilization of Moodle, although several comments alluded to a perception of mandatory adoption.

Table 1: Staff responses to questions relating to their adoption of Moodle

	Agree	Neutral	Disagree
I have a basic knowledge of tools and features available on Moodle.	98%	2%	0%
I have made an effort to fully integrate some of the different tools and features available in Moodle in my teaching/paper.	77%	13%	9%
I am confident in my ability to use Moodle.	62%	21%	2%
I have the intention of using Moodle again next semester.	88%	9%	3%

Functionality

When talking about the different 'tools and features' available in Moodle, the online environment can be divided in to two groups: (a) passive features that facilitate aspects of course administration; and (b) interactive features that encourage and support communication between learners / between learners and teachers.

Passive features:
Results indicated that the facilities to post lecture notes online were well utilized, either as 'PowerPoint Files' (67%), or 'Written Notes' (47%). In terms of sharing other sources of information, 57% of respondents indicated that Moodle was a convenient mechanism for sharing 'Website Links'. Additional comments reported that links had also been provided to blogs, HTML pages and document files. However, other features were less popular, including: 'Glossary' (18%); 'Video Presentation' (18%); 'Audio File / Podcast' (12%).

When it came to submitting assignments, fewer than half respondents (47%) reported that they required students

/ gave student the option to do so via Moodle. Respondents' comments provided further insight in to this result by describing a variety of functionality limitations with the assignment tool and the grading component.

Interactive features:
The 'Discussion Forum' was used by a high proportion of respondents (82%) and was the most utilized of features surveyed. Respondents of both the Student Survey and the Staff Survey indicated some frustration with the 'Discussion Forum' saying that it's difficult to know which forum messages are new and unread. This limitation was particularly noted in comparison to WebCT, which would indicate how many messages had not been read.

The 'Quiz/Questionnaire Survey' was leveraged by less than half of respondents (45%). However, the Student Survey indicated that this feature was utilized by 86% of students, of whom 94% agreed that it assisted their learning. Of the other interactive tools, very few respondents used the 'Chat' feature (14%) and 'Wiki' feature (8%). Although these usage figures are low, they should be viewed in the context provided by one respondent's comment:

> In my first year on Moodle, I am happy to just be in control of being able to post material, generate discussions, power points in pdf, post study guides etc, and to be able to hide material from student eyes. I am sure I will grow into a more skilful operator later!

Effect on teaching

A limited number of respondents (35%) agreed that Moodle had helped them improve their teaching; while a similar number (31%) agreed that implementing Moodle had helped them think more deeply about teaching. In hindsight, the latter item did not allow respondents to qualify whether they are not thinking 'more deeply' because (a) they consciously decided not to take the implementation of Moodle as an opportunity to reflect; (b) they would have liked to have reflected more but experienced constraints; or (c) they consider themselves to be reflective thinkers on a continuous basis.

Table 2: Staff responses to questions relating to their teaching practice

	Agree	Neutral	Disagree
The implementation of Moodle has helped me to think more deeply about my teaching and course design.	31%	38%	31%
The use of Moodle has helped me improve the quality of my teaching.	35%	40%	25%

Effect on interactions

Responses relating to Moodle's effect on teacher-student interactions were as divided as respondents' perceptions about Moodle's effect on teaching. Comparing affirmative responses for level of interaction (36%) against quality of interaction (21%), there is some indication that where frequency of interaction has increased, it has not necessarily resulted in better outcomes. However, when asked about 'connectedness' with students (which could be seen as a sign of quality interaction), of the respondents who answered the question relating to distance students, 70% agreed that Moodle had helped. In contrast, 25% agreed that Moodle had helped feelings of connectedness with internal students.

Table 3: Staff responses to questions relating to interactions

	Agree	Neutral	Disagree
I believe the use of Moodle has enhanced the level of staff-student and student interaction in my paper(s)	36%	35%	29%

I believe the use of Moodle has enhanced the quality of staff-student and student interaction in my paper(s)	21%	44%	35%
Moodle has helped me to feel more connected with my internal students	25%	19%	56%
Moodle has helped me to feel more connected with my distance students	57%	24%	1%

Benefits

Respondents were posed a series of possible ‘benefits’ of Moodle. The five items which gained the highest number of positive votes were: Makes content available for study and revision (67%); Reduces the cost of producing student handouts (63%); Offers more variety of content (60%); Helps to keep my course up-to-date (52%); Offers students more flexibility over their learning (50%). These are aligned with Moodle’s ‘passive’ features and primarily the ability to post lecture notes online.

Moodle’s ‘interactive’ benefits gained positive votes by less than half of respondents: Increases staff-student interaction (44%) and increases student-student interaction (42%). Notably, these results are more positive than those reported under ‘interactions’. It is possible that respondents perceived the potential benefit of Moodle’s interactive functions as being more positive than its current interactive value. Either way, a number of respondents commented on the importance of immediacy when interacting with students today. In this context, Moodle was described in a positive light by one respondent as, “a ‘now’ interface with all the social tools expected from ‘now’ students”.

The item relating to teaching practice was considered among the weakest benefits: Increases the effectiveness of my teaching (18% positive; 46% neutral; 36% negative). This result is aligned with results discussed in section 2.3, which also indicate that the majority of respondents feel reasonably neutral about the pedagogical benefits of Moodle. One possible explanation is related to respondents’ responses to the item: “Helps to save the teacher time”. While only 23% of respondents voted positively, it was the only item to generate a negative response by more than 50% of respondents. The time required to maximize the potential of Moodle was consistently reported to be a barrier, in the opinion of respondents. This was particularly said to be in the context of a research-centric environment, in which time spent on Moodle, “eats in to what the university really values – research”.

The lowest ranking benefit related to learning: Helps to keep students motivated and on track (16%); which was closely accompanied by ‘Promotes more active learning’ (27%) and ‘Increases student interaction with content’ (35%). It is unknown whether these results represent respondents’ perceptions of Moodle’s potential benefits for learning or whether responses were given in the context of current limitations facing effective teaching via Moodle. However, one respondent’s perception was that Moodle has been seen to promote passive learning:

> Students are given more and more material, given greater access to academic staff and this can lead to passive learning. I have had students asking me to put articles on Moodle. Accessing databases and finding articles is part of the learning process for academia.

Supports

More than three-quarters of respondents (77%) knew about the support available for implementing Moodle. Almost as many respondents provided positive feedback about the support at a College-level (73%) and a university-level (71%). The majority of comments provided by respondents were also very complementary, with College-level support being seen as particularly valuable. In addition, respondents acknowledged their colleagues who, having already implemented Moodle themselves, were approachable and readily available.

However, some respondents provided comments that described support arriving too little, too late, in their opinion. Reporting that the support people did not answer their questions (either due to lack of detailed knowledge or being unavailable), some respondents resented the time that they were obliged to invest in to teaching themselves. Moving forward, the consensus among respondents was that top quality consultants (e.g. Moodle Site Developers) would need to be available in a 'hands-on' capacity, on a permanent basis during the foreseeable future.

In other avenues of support, more than half had attended some form of Moodle-related professional development in the preceding 12 months. Some of these respondents made requests for further training related to online learning environments. However, other respondents expressed saturation, saying for example, "I've done enough (Moodle) courses to last a lifetime". Instead, these respondents reinforced the need for ongoing and available support services.

Table 4: Staff responses to questions relating to support

	Agree	Neutral	Disagree
I was well informed of the different types of support available in my efforts to implement Moodle	77%	8%	14%
I was well supported by central university services.	71%	14%	14%
I was well supported by my academic unit or college.	73%	14%	12%

Conclusion

The findings describe a successful implementation of an online learning environment at a system's compliance level, which was considered an outstanding achievement considering that implementation was above and beyond the existing pressure of teaching and research in Semester 1, and there was relatively short notice of the required innovation. Given this context, the majority of respondents acknowledged that their success could be largely attributed to some outstanding College-level support networks. With this support, respondents had been able to master some primary functions, such as uploading lecture notes / PowerPoint presentations. With these advances, it was widely appreciated that Moodle had begun to offer students more flexibility over their learning.

However, the current survey revealed greater scope for Moodle to influence teaching and curriculum design at a deep level. This would involve a shift in attitudes away from seeing Moodle as a 'pump and dump repository', towards becoming the frontier of innovation in teaching. However, consistent with the literature surrounding the uptake of e-learning (Salmon, 2005; Stein, 2011), respondents of the current survey reported that their dedication to Moodle was seriously limited by their lack of time. Respondents expressed that they were under pressure not only to teach but to publish prolifically and, as long as this was the case, their capacity for Moodle as a transformational teaching tool would remain limited. This tension suggests both academics and traditional distance education providers are in a transition period as they grapple to find the most appropriate blend of conventional and digital learning resources. And there is unlikely to be a one-size fits all model to digitalization, as Laurillard writes:

> I think blended learning will never go away... and for some courses, some contexts, a blend which is 90 per cent conventional and 10 per cent digital is probably right and you'd get the reverse for other kinds of course. So it's entirely up to the particular context what kind of blend you have and we've just got to get practised at being able to find the right blend for the right course and context" (cited in Joint Information Systems Committee, 2009, p.46).

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An integrated Faculty model for engaging staff with online and blended learning

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This paper reports on a faculty-wide implementation of an integrated model of professional development to enhance online teaching practice. A key aim was to draw on the thinking of key scholars, and to build on pockets of excellence already within some discipline groups, to develop a consistent level of good practice across the Faculty. The model incorporates four stages: informing staff of key research in the field, engaging staff in online practice, providing learning design teams to assist staff in implementing learning activities and the provision of ongoing support from colleagues through communities of practice. The paper describes the model and reports on progress to date.

Keywords: Online learning; Blended learning; Academic development; Communities of practice

Introduction

This paper describes the strategies employed by a multidisciplinary Faculty to ensure consistent good practice in their online teaching. The Faculty involved began as a primarily on-campus teaching faculty, at an outer-metropolitan campus of a medium-sized Australian university. Initially, most teaching staff regularly used the university's LMS (Learning Management System) to supplement their face-to-face teaching, but this was primarily as a repository for documents, rather than as an interactive teaching site. However, during the past decade, the Faculty has also been offering fully-online courses through Open Universities Australia (OUA). Student enrolments via OUA have undergone exponential growth, and now contribute over half the teaching load of the Faculty, with no signs of a slowdown in sight. More recently, the Faculty has expanded its teaching through off-shore partnerships. One of these is with Kaplan Singapore, where teaching is conducted in a mixed hybrid mode, involving four days of intensive face-to-face classes at the start of semester, followed by online teaching for the remainder of semester and a final invigilated exam.

As experience in online teaching has grown, pockets of good practice have developed across the faculty, including some truly innovative practice (for example, the early adoption of audio feedback to students, and the use of a virtual campus in Second Life), but the uptake on this has not been consistent, and awareness is often confined to small discipline-based groups. With the significant growth in online student enrolments, the Faculty has grappled with the challenges of enhancing the quality of online teaching across the entire faculty, to develop a consistently high standard, and also to encourage greater innovation and evaluation.

Online learning has become one of the biggest opportunities and challenges that universities are currently facing but, frequently, greater emphasis is placed on the development of content and on perceived administrative efficiencies than on the educational strategies being employed online. As Prendergast (2004) argues:

> "Too often considerations about information technology have become the dominant factors in many strategies adopted by academic institutions. This has resulted in a rich information technological environment that fails to capture, motivate or retain the learners" (Prendergast, 2004, p. 2).

Brabazon (2002) takes this further, stating that

> "teachers and teaching are being challenged and undermined through the internet. Learning is not technologically dependent. It is reliant on commitment, interest and passion" (p. 17).

Brabazon's comments could equally apply to teaching as well as to learning, and this is a key point that the Faculty management has focused on – if we can improve the commitment, interest and passion of our teachers, we can improve the quality of our teaching. The Faculty has therefore taken a strategic approach to involve all staff in the processes, to engender enthusiasm for change, and to publicly reward those who successfully take up the challenge. A concurrent Faculty objective was to also improve the research profile of the faculty, so ideally, approaches adopted should also include models that generated research and publishing opportunities for staff.

Faculty-wide model

Scott (2003), in his overview of change management processes in higher education, suggests a number of key lessons that need be understood in order for successful change to occur. He suggests that change is not a discrete event but a complex and subjective process of learning and unlearning, and needs to be identified as relevant, desirable and feasible by those involved with the change process (Scott, 2003). With this in mind, we sought a model that would provide an evidence-based rationale for change in online teaching practice and would support staff at multiple points as they reflected, experimented and implemented new or revised online practices.

A strategic model was designed, with four key facets:
1. Stage 1 (Inform): To ensure teaching developments were informed by key thinkers in the field, a program of visiting scholars was implemented
2. Stage 2 (Engage): To provide hands-on experience for academics an intensive workshop program, revisiting the basics of online teaching in light of current research in the field, was developed, tagged with a major upgrade of the institution's LMS
3. Stage 3 (Implement): To support implementation, a collaborative development model, comprising teams working on project-based development of online units and activities, was implemented
4. Stage 4 (Support): To support ongoing engagement, a Community of Practice model was designed.

International speakers

In 2010, senior faculty management undertook a study tour of key online institutions in UK and Western Europe. During the course of the visit, a number of invitations were extended to key innovators in online education to participate as part of a Visiting Professor Program scheduled over the next two years. In November 2010, the first of the visiting professors, Gilly **Salmon** visited the faculty for a week. Prof. Salmon is renowned for her research and practice in developing engaging and successful e-learning processes such as e-moderating (Salmon, 2004) and e-tivities (Salmon, 2002). During the week she presented workshops on: implementing innovation; team based designing of units for online learning; e-moderating; online activities (e-tivities) that foster active and interactive learning; and creating academic learning futures. In addition, a number of staff had the opportunity to discuss with her in small groups the challenges of their particular online experience.

Workshop program

For the next phase, a faculty-wide workshop program was implemented, targeted at both those new to online teaching, and those who have been predominantly teaching on-campus students, but may not have fully explored the options of online teaching. Staff who were more experienced in fully online teaching were also encouraged to participate – both in an attempt to ensure a consistently high standard of teaching across the Faculty, but also to enable sharing of practices that work well. The workshop program was scheduled to coincide with a major upgrade of the institution's LMS to encourage wider staff involvement.

Two workshops were developed: 'The basics of online teaching' and 'Learning activities and assessment online'. The first workshop revisited the accepted principles of good teaching practice (e.g. Chickering & Gamson, 1987) and covered aspects of online communication and community-building, including Salmon's 5-stage model (following on from her recent visit). The second workshop built on this, and focused on facilitating active learning in the online environment, and on efficiently providing quality feedback to students, and was based on the work of key thinkers in the fields of constructive alignment (e.g. Biggs, 2003), assessment (e.g. Ramsden, 2003) and feedback (e.g. Nicol, 2009; Nicol & MacFarlane-Dick, 2006).

Collaborative development model

Following on from the workshop program, teaching staff have been invited to participate in small 'Learning Design' groups to develop or redevelop their online units. Based on the Carpe Diem process (Armellini & Jones, 2008), the model applies a team approach to the design of units or programs. Each team is allocated a learning designer, subject librarian, language support staff, and technical support. Teams can be formed around a single academic teacher, or with small discipline-based groups.

Working in teams and seeking expertise from a range of people on matters related to their teaching is a major cultural change for many academic staff. The introduction of technology requires academic teachers to learn about not only the available technologies, but also project management, copyright laws, educational design, understanding of the students' learning experiences, student induction, and helpdesk support. While some of these demands and challenges are outside the control of the individual teacher, working as part of a team can help ease the transition in the changing teaching and learning environment (Kenny & McNaught, 2000).

The development teams are also encouraged and supported to evaluate their outcomes, and to contribute their findings back to the literature in the field. By facilitating this scholarship of teaching & learning approach, we hope that our developments will not only be informed by the latest thinking, but also become part of the ongoing discussions around best practice in online teaching.

Communities of Practice

For the final phase, ongoing support will be provided via a Community of Practice (CoP). Originally defined as an informal group of people who take a common interest in solving common problems (Lave and Wenger, 1991), CoPs have evolved to include three dimensions: a joint enterprise as understood and negotiated by the members; mutual engagement; and a shared repertoire of resources (routines, vocabulary, artifacts) that groups develop over time (Wenger, 1998). Interest in COPs as a model to support educational practice in University settings has gained traction in recent times as a model of support for first year unit convenors (McDonald & Starr, 2008), and around engaging in reflective practice (Murphy& McIver, 2010) .
Wenger suggests

> "COP... do not require much management but they can use leadership. They self organise but flourish when their learning fits with their organisational environment. The art is to help communities find resources and connections without overwhelming them with organisational meddling" (Wenger, 1998, p9).

In light of this, staff who have participated in the first three stages and would like to both support and be supported by other colleagues in the online environment will be invited to join a facilitated COP. The nature of each COP will be negotiated by the group, however the formation of groups has senior Faculty support and resources will be allocated to each group as needed.

Results and Conclusions

The strategies outlined above are currently work in progress. Stage 1 is an ongoing strategy, with visits from more world-renowned thinkers under negotiation. The attendance figures for the series of workshops presented by Prof Salmon were encouraging, with 62% of the academic teaching staff attending at least one session, and all 11 faculty disciplines represented. This level of engagement has provided the Faculty management with sufficient evidence to warrant funding further similar programs.

At the time of writing, the first rounds of the workshop program (stage 2) have been delivered, with four sessions of each workshop conducted. Enthusiasm for the program has been high, with all advertised sessions filling, and additional sessions being required. To date, 68% of the Faculty staff (50 of 73 academic teaching staff) have participated in at least one of the voluntary workshops. In addition, many staff recommended these workshops to their tutors (sessional or casual employees of the faculty). Anonymous feedback was collected from every session, via online surveys, and feedback has been highly positive. Participants particularly liked the mix of theory and literature with practical examples of how to implement these into their own teaching. Representative comments include:

- "Very good overview of online teaching and how to use this. For someone with little to no online teaching experience this was extremely valuable!"
- "Great content. I loved the fact that there were actual examples from real [local] staff about things like - chat room ground rules, welcome announcements etc - and that it was all very realistic about how students are (rather than theoretical)."
- "useful and helpful for reflecting on current teaching practice, importance of aligning assessment with objectives; and for reflecting on practical modifications necessary for on-line or blended delivery"

Most staff expressed satisfaction with the current workshop structure and wanted no change, whereas others requested more hands-on activities focused on the LMS, perhaps with smaller groups organized according to ability or familiarity with the software:

- "smaller group would be helpful so that we could work directly on our own project while expert assistance was available"
- "I'm not sure that it works to mix teaching and learning info/theory with mechanics of using a new system. Maybe it's about timing - at the moment I just want the latter."

The timing of the workshops was also an issue, with most sessions scheduled immediately prior to the start of semester for on-campus students, and when many of our teachers were inundated with large marking loads from the summer semester for online students. This was unfortunate, but unavoidable, as scheduling of the workshops was tied to the introduction of the new LMS, so could not be organized for more convenient times. At this stage, we expect to offer further sessions of these workshops throughout semester, to cater for more of our tutors, and at the start of all subsequent teaching periods. Some sessions will be offered in the evenings or weekends, to accommodate online tutors who may also be working full-time in other employment.

Stage 3 (collaborative development of online units) is in progress. The first team, from the Sociology discipline have completed their two-day Carpe Diem workshop (Armellini & Jones, 2008), facilitated by Dr. Alejandro Armellini (University of Leicester, UK), and a second group from the Psychology discipline have completed their Carpe Diem workshop with a local facilitator. Anecdotal feedback immediately following both workshops was that participants enjoyed them immensely, and are confident of developing a well-designed online unit in time for the next semester. The multi-disciplinary team appears to have been successful, with some activities being developed by librarians and language support staff (after settling on overall design by the combined team), taking some of the burden from the teaching staff. Minor changes to the sessions within the workshop are being trialed, particularly to increase the focus on alignment of learning objectives and assessment; however the general format and structure of the Carpe Diem model appear highly successful.

Stage 4 is still in the development phase, and will be implemented during the coming months.

The team approach is increasingly being viewed as a central tenet of the Faculty's model. Supporting our academic teachers with broad expertise from librarians, web developers and learning designers, will help take much of the stress from the online teaching, and may facilitate greater engagement and innovation from our teachers, thus following the recommendations of Bates (2000) and Brabazon (2002).

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Using insider research to study teacher engagement with video conferencing in first-year classes

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This paper describes the use of insider research in an ongoing project that aims to explore the complex relationships between teachers, pedagogy, and technology within large first-year courses. It outlines the design rationale for the project and describes the methods used to study the engagement of 17 academic staff with video conferencing technology over a five-month period in 2011. Three researchers have occupied the dual roles of research participants (being members of the teaching staff involved with the video conferencing) and researchers; thus, they have been 'insiders' or full participant-observers. After describing the context and methodology, the paper reflects on the use of insider research as an approach to study teacher engagement with e-learning initiatives.

Keywords: insider research, teacher engagement, first-year classes, video conferencing

Introduction

The first year (FY) of university study is often a challenging period marked by adjustment and transition. Students are faced with the dual challenges of social integration and academic development as they enter the university community (Tinto, 1993). This creates significant challenges for universities as they endeavour to meet the needs of a diverse and multicultural student body, including students from non-traditional and non-English speaking backgrounds (Harvey, Drew, & Smith, 2006). In addition, large class sizes, often typical in the FY, can lead to a sense of disconnection between staff and students (Nicol, 2010; Stephen, O'Connell, & Hall, 2008).

While information and communication technology (ICT) can enhance learning environments in the FY (Nicol, 2009), the engagement of academic staff with technology remains problematic (Blin & Munro, 2008; Selwyn, 2007). In her study of e-learning sustainability, Gunn (2010) noted that e-learning development may not be an "easy road to travel" for academics, observing that "[h]igh workload, difficulty in finding resources, lack of real incentives to be creative and limited tangible rewards are common experiences" (p. 94). Other factors affecting teacher uptake of technology include individual motivation to change, organisational structures that support change, and professional development opportunities for staff (Giardina, 2010). Teacher attitudes and responses to new technologies can be a major predictor of their success (Albirini, 2006). Given that ICT can improve FY classes, it is imperative to understand how teachers, as key stakeholders, respond to and engage with e-learning initiatives in these settings.

The research agenda

Despite the extensive literature on educational technology, there is scope to conduct fine-grained investigations of the 'backstage work' occurring in FY classrooms to provide detailed views of teacher engagement with technology. Significant conversations that shape teachers' understandings often occur backstage, out of sight of the public eye (Roxå & Mårtensson, 2009). These settings are similar to the concept of 'backstage' regions; namely, places "relative to a given performance, where the impression fostered by the performance is knowingly contradicted as a matter of course" (Goffman, 1971, p. 114). These backstage spaces are "situations where we are private, or at least feel that we know who is watching, and we behave in a more unrestricted way than when we are 'front stage'" (Goffman, 2000, as cited in Roxå & Mårtensson, 2009, p. 555). Away from the performance, people can behave in quite different ways (Goffman, 1971).

One way of accessing backstage spaces is through insider research where the researcher is a member of the social group under study. The insider is defined as "an individual who possesses intimate knowledge of the community and its members due to previous and ongoing association with that community and its members" (Labaree, 2002, p. 100). It has been argued that insiders have "epistemological privilege" or access to particular forms of knowledge (Griffith, 1998, p. 362); however, the insider/outsider dichotomy is simplistic (Merton, 1972) and insider research can be far from straightforward, raising ethical and methodological dilemmas (Labaree, 2002; Mercer, 2006).

The remainder of this paper describes and reflects upon the use of insider research to explore these backstage regions of teaching with video conferencing technology.

The context

Following Hannon and Bretag (2010, p. 107), the study's objective is to explore "authentic, situated practice" within typical mass-learning environments mediated by ICT. To achieve this goal, the project has studied the engagement of 17 academic staff with video conferencing technology within four large first-year courses at a New Zealand tertiary institution. As a recently introduced technology, the video conferencing was an initiative that had encountered mixed success since its introduction early in 2010. Previously, multiple lectures had been repeated several times during the week to a large student cohort (over 1000 students); the new format with the video conferencing enabled one expert lecturer to simultaneously connect with students in four different venues. In addition to numerous advantages, this new format allowed students the flexibility to attend a convenient venue rather than travel to a central location and also decreased the numbers of lectures presented by staff. However, the first year (2010) was a tumultuous time for many teachers as lecture sessions were frequently disrupted by various problems, affecting learning and teaching processes. As 2010 drew to a close, there was a sense that the video conferencing was not realising its full potential to support pedagogical objectives; hence, this study was proposed.

Methodology

While the study aims to understand how teachers engage with technological innovation, it also intends to use the findings to transform social (teaching) practice within a department; thus, the study combines aspects of both interpretivist and radical paradigms as defined by Grant and Giddings (2002). The enquiry is descriptive, but it is also informed by participatory approaches, specifically, co-operative inquiry (Reason, 1994). To varying degrees, the project has pursued a "collaborative form of inquiry, in which all involved engage together in democratic dialogue as co-researchers and as co-subjects" (Heron & Reason, 1997, p. 8). Two principles underpin co-operative inquiry: propositional knowledge is rooted in experiential knowledge and research participants should be fully engaged in the design of studies that obtain information about them. Thus, "research is done by people with each other, not by researchers on other people or about them" (Heron & Reason, 1997, p. 8). Reason (1994) recognises that individuals may not participate in identical ways, adopting varying roles and providing contributions that differ in quality and quantity. Similarly in this enquiry, three members of the participant group have driven the study and occupied the roles of researchers and participants; however, all participants have been united by a common concern to improve the use of the video conferencing technology. Reason's four phases of co-operative enquiry (Reason, 1994, p. 326) have been loosely followed: participants have been involved in identifying the research focus, contributing to the design of the study, and then providing data. Also, frequent focus group discussions and ongoing interactions between staff have provided all participants with other opportunities to shape the study. Preliminary findings, guidelines, and recommendations will be presented to the group for discussion later in 2011.

17 lecturers from four FY courses participated in the project over a 12-week period from February to June 2011 (one semester). A number of data collection methods that seemed best suited for a blended participatory/descriptive approach were used. Immediately after the weekly sessions with the video conferencing, the staff member teaching that day used prompts to record a ten-minute (maximum) post-lecture recording of her/his experience using the video conferencing. With an awareness of phenomenological approaches, it was anticipated that the prompts would elicit a 'stream of consciousness' from the teacher, obtaining their immediate responses to the teaching session in their own words and "evoking a comprehensive account of the person's experience of the phenomenon" (Moustakas, 1994, p. 114). These accounts were self recorded by the teacher without an interviewer being present; the prompts focused on teacher expectations about learning outcomes before the session and whether or not these expectations had been met. In addition, lecture sessions showing staff interacting with the video conferencing were discretely video recorded by a technician. The camera was placed in such a way as to record activity behind and around the lecture podium, capturing lecturer and technician interactions with various technologies including the video conferencing. These video recordings have provided an observable objective record that can be analysed parallel to the subjective post-session accounts. Silverman (2001) has highlighted the weakness of interviews for documenting lived experiences, arguing that qualitative research should use appropriate, sensitive, and systematic methodology to capture naturally occurring data distinct from interpretations. The analysis of accounts and video recordings may reveal similarities and differences between subjective and objective observations, and provide an additional source of data for triangulation. In total, 17 videos were obtained, several incorporating two or three lecture sessions with different teachers in the same course. Also, focus group interviews scheduled at regular intervals during the semester provided opportunities to pursue interesting leads in the data and check emerging interpretations with the teacher participants. These candid discussions provided backstage views on the benefits and challenges of using technology in large classes. Finally, differing perspectives were obtained through interviews with key informants involved with managerial or technical dimensions of the video conferencing. Specific details of the data set are provided in table one.

Table 1: The data set

Paper	Teacher participants	Weekly post-lecture accounts	Video recordings	Focus group interviews	Key informant interviews
A	3	10	5	14	5
B	3	5	2		
C	6	15	3		
D	5	13	7		
Totals	**17**	**43**	**17**	**14**	**5**

At the time of writing (September, 2011), data collection had concluded and the video analysis was underway. The following section will briefly reflect on conducting insider research in this study.

Reflecting on the use of insider research

To an extent, insider status has provided privileged access to backstage regions of teaching practice and it is unlikely that this degree of access would have been obtained by an outsider. There have been clear advantages working in close proximity to teachers on a daily basis and the three researcher/participants have drawn on their implicit knowledge of the workplace – or "preunderstandings" (Coghlan & Brannick, 2010, p. 114) – to inform the design and management of the study. In addition, there has been a degree of camaraderie between all participating teachers as they have shared their common experiences with the video conferencing; crucially, everyone has been invested in improving practices around the video conferencing (an outcome of the project). However, insider research does not guarantee access to hidden information or the formation of trust (Labaree, 2002). In this study, some areas were off-limits; for example, a few staff chose not to participate, distanced themselves after the first interview, declined to attend focus groups or be video recorded. One could speculate that these participants were uncomfortable with some aspect of the study, perhaps a concern that their work performance might be judged by others. The full participant group included technicians, managers, and lecturers with varying levels of influence and vulnerability and it would be naïve to ignore power relations within this workplace setting.

The blending of interpretivist and radical paradigms has had implications for the insider/outsider and researcher/researched relationship. On the one hand, the three researcher-participants have related to their colleagues as equals with shared interests in improving the video conferencing technology – conducting research *with* others (as insiders) to achieve a shared objective. On the other hand, as interpreters of the data who intend to publish from the findings, the researcher-participants have conducted research *about* their colleagues (and themselves). As interpreters, their analyses are ultimately centre stage, positioning them as more dominant than their colleagues; these unequal power relations sit uneasily in the radical paradigm where power sharing, reciprocity, and collaboration are central (Grant & Giddings, 2002). Additionally, participatory enquiry aims for a "democratisation of method, involving all participants in decisions about methodological processes" (Heron & Reason, 1997, p. 9). While collegial discussions took place before the study to allow consultation to occur, the three researcher-participants have designed and managed the enquiry process – exposing themselves to Heron and Reason's (1997, p. 9) critique that much qualitative research is "unilaterally shaped by the researchers". However, the notion that all participants can be co-researchers seems somewhat unrealistic in this context. The 17 participating teachers are a diverse group, representing multiple disciplines and having differing levels of interest in the video conferencing and varied levels of research activity. Within larger groups, it may be difficult to establish the high levels of focus, commitment, and collaboration that this type of research project requires. As Reason (1994) has noted, co-operative enquiry may be best suited for small and tightly-knit groups where it is feasible that all participants can be full co-researchers.

As the project moves into the analysis and dissemination phases, the researchers will be confronted with the ethical implications of sharing insider knowledge with outsiders. Insider knowledge is privileged information – should researchers bring it front stage to be examined by others, and if so, how? The introduction of technology into a learning environment can be disruptive, particularly if the technology breaks down, interrupting or distorting the innovation (Hannon, 2002). Alternate and sometimes conflicting discourses around technology-use can emerge (Hannon & Bretag, 2010), potentially harming certain individuals through negative portrayals of work performance. Intensifying these ethical concerns is that, even with identifying features removed from the data, confidentiality cannot be guaranteed in this study (a point made clear in the consent forms). As the teachers are known to each other, it is quite possible that data may be traced back to individuals. Tensions exist between the need to share the findings as comprehensively and usefully as possible, and yet to protect participants. Decisions around how to disseminate the findings will probably be context-specific (Mercer, 2006); disclosing more detailed information at an international conference may be less risky than disclosing the same information in the workplace where other colleagues and managerial staff might recognise data provided by others. These issues remain unresolved at this stage of the study.

Conclusion

This paper has described the use of insider research as one way to access hidden areas of teaching practice, far removed from the formal public life of tertiary institutions. Such 'coalface' depictions of teaching with technology are crucial to inform discussions of e-learning sustainability in authentic mass learning environments. The study has blended participatory and interpretivist approaches, employing multiple methods to obtain fine-grained depictions of how teachers engage with video conferencing technology. While useful, insider research is not straightforward (particularly within politically-charged e-learning environments), raising a number of methodological and ethical issues that must be considered at various stages of the research process.

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Building blended delivery capability in vocational educators: creating sustainability through scaffolding

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Abstract

Engaging vocational educators to take the lead in developing blended learning practices that are 'fit for purpose' within an educational and workplace context is challenging.

This paper explores literature in the areas of scaffolding; zone of proximal development, mentoring and coaching. It describes the initial experience of a blended learning project team in implementing scaffolding learning principles to engage vocational educators in order to create sustained change that links clearly to teaching, learning and assessment within an outcomes environment.

The paper also provides some insights into the implementation of the Blended Learning Project (BLP) through the initiation and execution stages of the student (peer) projects. Through this type of practice the novice is always becoming the expert and the expert is always somewhat a novice. The greatest gain for this project is the development of process capability which is the cornerstone to sustained development in practice and expertise.

Keywords: Inquiry based learning, scaffolding, blended delivery, vocational education, blended learning tools, sustained change, building capability

Introduction

The current teaching and learning environment is more complex than ever. Engaging vocational educators to take the lead in developing blended learning practices that are 'fit for purpose' within an educational and workplace context is challenging. Appropriate blended learning tools that wrap around teaching, learning and assessment, yet span across diverse subjects, outcome levels (entry to undergraduate) and graduate capabilities –

and meet industry's expectations around 'near or real world' learning experiences is best developed through sustained practice.

The nature of the Blended Learning Project (BLP) is to provide a scaffold for vocational educators to explore possibilities to develop 'fit for purpose' teaching, learning and assessment tools. The project is structured to build process knowledge for the educators much like the concept of an apprenticeship. The exploration and subsequent application of the learnt processes is intended to drive a sustained changed in technological and pedagogical knowledge. Underpinning the BLP is a philosophy which focuses on teachers being supported to make decisions about practices that help raise student outcomes.

This paper reflects on the experience of a blended learning project team in implementing scaffolding learning principles, zone of proximal development (ZPD), mentoring and coaching to engage vocational educators from a number of subject areas – carpentry, automotive, business, work skills, education and social sciences. The vocational educators' skills and knowledge from a computing technology and pedagogical standpoint is varied. This has been addressed within the project through individualised 'step change' outcomes to influence realistic and sustainable blended learning capabilities for the vocational educators.

Scaffolding, ZPD, Mentoring and Coaching – a bridge 'not' too far

There are distinct links between the concepts of scaffolding, ZPD, mentoring and coaching. This section provides some definitions and discussion related to these concepts as they are applied in the BLP.

According to Sharma & Hannafin (2007) 'Metaphorically, scaffolding refers to expert support for a novice's learning' and that 'The expert gradually fades support as learner competence increases' (pp. 27-28). The relationship between the expert and the learner evolves into something akin to a mentor/ mentee as the locus moves from the expert to the novice. 'Scaffolding provides a framework to change complex and difficult tasks in ways that make these tasks accessible, manageable and within students' zone of proximal development (ZPD)' (Vygotsky, 1978; Rogoff, 1990; Hmelo-Silver, Chinn, 2007). To build sustainable capabilities within a blended delivery context in a vocational education environment the learner needs to have a balance of pedagogical; technological; industry facing and blended delivery capabilities. The expert support cannot come from one person alone moreover a team approach is needed for real sustainability of competencies.

Vygotsky (1978) defines ZPD as 'the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers' (p. 86). According to Wertsch (as cited in Rowlands, 2000) we should not concentrate on the *product* of development but, on the very *process* by which higher development is established. The development of change is in the *process* capability which is more important than the end-product produced. The learning process becomes embedded as does the learner capability, through the understanding of the process.

Zachary (2005) suggests that a 'learning partnership' should be established that is congruent with the learner centred mentoring paradigm, which is a shift from the mentor-driven paradigm; the mentor has become a 'guide on the side' rather than a 'teacher of the student'. The concept of a guide or mediator of knowledge provides a link to the development of *process* rather than the production of an end-product – much like the link between outputs and outcomes.

Jones & Vincent (2010) stress the importance of collegial mentors in ICT skill improvement and adoption. This is echoed by Samarawickrema, Benson & Brack, (2009) who assert that peer learning and online communities are effective for professional development, and by Tynan et al (2008) who assert that individual and group professional development creates enthusiasm and debate about pedagogy and results in academic staff taking the lead with the introduction of ICT supported teaching and learning. Sturko & Gregson (2009) likewise found that peers' reflection, collaboration and sharing improves practice and fosters professional growth. The collegial approach is further reinforced by Collis et al (2005) who add that collaborative sharing through facilitated participant interaction is vital and that professional development must have application to the learner's workplace. The line between mentoring and peer coaching becomes blurred in the BLP environment as the 'guide on the side' fulfills the role of the coach linked to the output (the completed projects - product) and the mentor enhances the outcome (sustained practice – process).

Successful professional development focuses on how and what students learn, the underlying teacher beliefs about their practice, and incorporates active learning, and collaboration, (Desimone, 2009). The staff development approach adopted in the BLP is one of mentoring, coaching and enabling, in order to support staff to transform their educational practice and cope with the future which will become a "curriculum for super complexity" (Barnett cited in Hannon 2008). The supportive approach enables staff to adapt and use the technologies themselves, working around technological limitations and builds collegial online communities, rather than forcing staff to adapt to the technology.

To effect a step change in process there is no 'one size fits all' methodology, rather it is a 'fit for purpose' toolbox. Sharma and Hannafin (2007) link scaffolding and ZPD through the 'provision of conceptual and operational frames for design and study'. They state that scaffolding operationalises Vygotsky's relationship between instruction and psychological development. (p. 28). They indicate that one provides the conceptual framework (ZPD) and the other a strategic framework (scaffolding). Mentoring and coaching further enhance this link by reinforcing the learner centred approach.

The project method (also used by Doherty & Cooper, 2009, and Robbie & Weaver, 2009) is designed to improve pedagogical practice by a fourfold process – situating the endeavour in scholarly literature, designing and implementing a strategy to address an identified need or change in practice, evaluating and then sharing the outcome. In the BLP success comes from the individualised mentoring, encouragement and advice, and the collaborative partnership offered by the learning community or community of practice (Wenger, 1998) afforded by the cohort approach. This overcomes the barriers discussed by Jones (2008) and adopts a similar approach which culminates in recognition and reward. Participants of this project anticipate a formal output such as publication or an item suitable for promotion.

The BLP mixes faculty from a number of subject areas, is cohort based and uses ICT to facilitate social interaction beyond the face to face sessions, adopting a blended model of delivery which uses the technology to introduce the technology for use (Macdonald & Poniatowska, 2011). There is also a strong thread of industry relevance underpinning the fitness for purpose of the project and its outcomes.

Building Capability within the Blended Learning Project Context

Moving to blended delivery and use of ICT requires three levels of support: for the individual academic, faculty or discipline backing and cross institutional initiatives so that faculty know the context they are working in; the resources available to them and where the use of ICT fits in the teaching and learning goals of the institute (Applebee, Ellis & Sheely, 2004). This BLP has the sponsorship of the Director Academic and is in line with the strategic direction of the institute. It is a whole enterprise approach (Marshall 2004, Correia et al, 2008) involving faculty identification of likely programmes to move to blended delivery, staff development provided by the BLP team, technical support from the BLP team and leveraging on the institute's infrastructure developments and establishment of remote campuses. Although somewhat imposed on them by the environment, the participating academics are becoming drivers in the e-landscape while participating in this professional development opportunity.

The close relationship between the BLP staff members and the lecturer participants has been beneficial in developing capability and confidence. Lecturer engagement is high and although apprehensive at the beginning, all have expressed excitement at the prospect of generating new opportunities to engage with their own students when they implement their projects.

Laying the foundation

Thus far there are at least 100 projects either in the initiation or execution stages of their lifecycles with a further 20 or more reaching the review and closeout stage. The process adopted is proving effective in supporting the staff to consider and plan to adapt their practice. It has though, become apparent that scaffolding practices need to include the practical as well as pedagogical aspects.

Emerging Findings

- Basic technology skill gaps quickly become obvious and need to be addressed sensitively
- A focus on the desired outcome for the learner rather than the tool is important
- The "student" experience is a challenging yet, valuable learning method for lecturers
- Alignment with industry expectations should underpin the development
- A sound of understanding of valid assessment practice is important when moving to a blended learning environment
- Supporting individual projects in a collaborative and collegial environment is effective for initiating a step change in practice
- A clear link needs to be established for the participants between the programme document, the course outcomes, the strategic graduate capabilities and their plan for implementing blended learning practices – the whole as a sum of the parts.

The importance of a structured approach to building blended learning capabilities is real – pedagogical practices are evolving as are the changing needs of the workplace and the growing gap between the technology skills between the educator and the students. Technology is one of the tools of blended delivery for vocational educators and often their greatest challenge in terms of using it to add value to the learning environment. This blended learning project has developed delivery through the lens of scaffolding; mentoring and coaching as an intended replication of creating sustained capabilities. The greatest gain for this project is the development of process capability which is the cornerstone to sustained development in practice and expertise.

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Interactive white(board) elephants: A case of change mismanagement

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The introduction of interactive whiteboards (IWBs) in secondary schools around Australia is currently being heavily promoted for the purposes of transforming the delivery of education through innovation and technology (Gillard, 2010). In such a climate, the evaluation of case studies exploring the effectiveness of the implementation of new technologies for the purposes of teaching and learning can help guide others contemplating or embarking on this process. While much of the literature reports positive outcomes in the adoption of IWBs in the secondary classroom, this paper provides a balance by exploring a case of change mismanagement which has led to the existence of electronic white elephants. The paper also explores the potential of modified force field analysis (FFA) as a decision-making and evaluation instrument for the process of technological change within educational contexts.

Keywords: interactive whiteboards (IWBs), secondary schools, change management, modified force field analysis (FFA).

Introduction

> **white elephant** (noun): “a burdensome possession...whose cost (particularly cost of upkeep) is out of proportion to its usefulness or worth”. (Wikipedia, 2011, n.p.)

Undergirded by beliefs that secondary students should be educated in modern learning environments (DEECD, 2010), combined funding under the Victorian State Government’s $1.9 billion *Victorian Schools Plan* and the Federal Government’s *Building the Education Revolution* (*BER*) has enabled the placement of interactive whiteboards (IWBs) in the classrooms of both public and independent secondary school systems. As a former Federal Minister for Education has stated:

> Technology and innovation are transforming the way education is being delivered in our schools. In classrooms everywhere, the use of interactive whiteboards has become widespread and the importance of having access to technology in schools is growing. (Gillard, 2010, n.p.)

However, prior to this recent governmental push, some stakeholders in Victorian secondary schools had already embraced the implementation of IWBs in a whole scale manner. What lessons can be learned in terms of change management? This concise paper explores the case study of the implementation of IWBs in an independent secondary school in Victoria from 2005 onwards, through the use of a modified variant of force field analysis (attributed to Lewin, 1951). At a time when the employment of IWBs is being heavily promoted in the secondary education sector in Australia, this analysis provides a timely addition for those embarking on this process.

Interactive Whiteboards (IWBs)

Interactive whiteboards (IWBs) – also referred to in the literature as interactive electronic whiteboards (IEWs) – are defined as "large, touch-sensitive screens, which control a computer connected to a data projector" (Gillen et al., 2008, p. 243). In addition to the necessary hardware – the computer, the projector and (most usually) a Smartboard or 'tablet' – there are many types of software available for teaching interactively with IWBs, such as *ClickView* (http://www.clickview.com.au/home.php) and *ActivInspire* (http://www.prometheanworld.com). IWBs provide not only a surface to project Internet access, digital images, video, graphics and audio onto, but also a surface upon which the students and/or the teacher can interact using the whiteboard pens and pointers to alter the images and to work interactively.

In their review of the existing IWB literature, Higgins et al. (2007) discerned that publications on IWBs relate predominantly to three main areas: descriptive studies about the initial adoption and implementation of IWBs in classrooms, the pedagogical impacts of the IWB implementation on both teachers and students, and the empirical evidence relating to learning and achievement following this implementation. The majority of the literature falls into the first of these categories, relating to descriptive studies about the initial adoption and implementation of IWBs in classrooms.

From the learner's perspective, the benefits listed in the descriptive studies for the adoption of IWBs in classroom settings include the possibility for whole-class learning (Tanner et al., 2005); inspiring and motivating students (Hui-xian et al., 2009); increasing student task engagement (Hodge & Anderson, 2007); provides an ideal environment for visual learners (Lacina, 2009); develops thinking skills and assists interactions between students (Hodge & Anderson, 2007); and the big screen is easily visible for all (Slay, Siebörger & Hodgkinson-Williams, 2007). From the teaching perspective, IWBs are reported to reduce the burden on teachers (Hui-xian et al., 2009); and some specific subject areas such as ESL, science and maths have reported the increased benefit from the introduction of IWBs (Lacina, 2009). Lacina (2009), however, cautions that decisions to implement IWBs are often made based on descriptive studies which list such benefits, without the consideration of scientific studies, studies that focus on the drawbacks of implementing IWBs, or the school itself in terms of its collective ability to successfully adopt IWBs.

Drawbacks to the introduction and use of IWBs, on the other hand, relate to the lack of a critical perspective in the adoption (Moss et al., 2007; Lacina, 2009); the cost of the technology and installation (Slay, Siebörger & Hodgkinson-Williams, 2007); the keeping of IWB classrooms up-to-date (Debolt, 2008); lack of adoption by staff (Moss et al., 2007); ICT literacy and ICT competency for staff and students alike (Slay, Siebörger & Hodgkinson-Williams, 2007); teachers' own computer incompatibility with the IWB (Lacina, 2009); and questions over the true value of multimedia content for teaching and learning (Slay, Siebörger & Hodgkinson-Williams, 2007). Of this, Smith et al. (2005, p.91) note that "[t]here is insufficient evidence to identify the actual impact and the potentials of [IWBs] upon learning either in terms of classroom interaction or upon attainment and achievement".

Implementing, managing and evaluating technological change

Introducing technological change in educational institutions can be a challenging process and is made more so when key stakeholders – especially those required to enact the change – are not involved in the decision-making process and can lead to poor outcomes. In part this relates to power relations within an organisation (Robertson, 2008). Bovey and Hede (2001) argue that failure in the adoption of change is directly related to the resistance of employees. As Goolnik (2006, p.11) has noted, in order to overcome resistance to change in adopting new technologies for teaching and learning, teaching staff need to be fully involved and have ownership of the change, have a full understanding of their new roles in relation to the implementation of the technological change, and have a belief that the change implementation will produce ascertainable results.

One historically influential figure in terms of change management is Kurt Lewin (1951) who proposed the model of 'force field analysis' (FFA) to inform any change process, including the decision making process, implementation options, planning and evaluation. According to Lewin (1951) a field is defined as being "the totality of coexisting facts which are conceived of as mutually interdependent" (p. 240). Based on the Gestaltist principle of looking at the various and constituent aspects which make up a whole, force field analysis (FFA) evaluates the push and pull dynamics of fields and their weighted forces within in given situation. The model rates forces for and against a proposed change in terms of the strength of that force and thereby, the degree of control each force individually and cumulatively exerts over the proposed change. Equilibrium is the point at which forces for change equal forces against change. This model remains current to assessing the implementation of change in situations relating to new technology as it helps to focus discussions, assess progress, and provide a visual interpretation of the differing forces influencing any potential change issue in an organisation or institution.

Case study: Change mismanagement

In 2005, the senior management (leadership team) of an independent secondary school in rural Victoria decided that the implementation and installation of IWBs and the supportive technologies would provide an educational advantage to students enrolled in the school over others in the region. The decision for this technologically-modern learning environment was promoted as a key aspect in the school's marketing strategy. Teaching staff were not involved in this decision-making process. Following the decision to implement, and over a three-year time span from 2005 to 2008, every classroom in the school was fitted out with an IWB and accompanying technology. This equipment was purchased in an ad hoc basis, dependent on the flow of funds, product availability, and technician availability for the installation process. Though staff professional development on the use of IWBs was also initially provided by the school, staff attendance was not compulsory.

Since deployment, the uptake of the new technology has been minimal with there being only two IWB 'champions' amidst the 100+ staff who use the technology regularly plus a small number who view the IWBs as a teaching and learning opportunity. By contrast, the majority of staff view IWBs as an additional burden on their workloads. As part of this, there are a number of senior teaching staff who have expressed their reluctance to take up new technologies unless they are compelled to. This has been one of the largest of the factors against change. Second, over time the professional development and training processes for staff development has by and large fallen apart due to this disinterest. Third, there has also been a long history of technological problems in the school which, in turn, have greatly reduced the uptake of new technologies such as the IWBs because staff cannot use their existing technologies effectively. Fourth, added to personal technology problems of staff, as the projection systems used in the school have been implemented in an ad-hoc fashion, the result is that there is a different basic configuration in each room, leading to staff confusion. For example, in addition to the differing brands of overhead projectors, each room has different types of cable inputs, different places for cable input, different power switches to turn on various components, and different types of speaker systems. The result is that in the school, there are no two rooms which have the same hardware configurations. As an overlay, most staff have timetable allocations for different classrooms on different days and so cannot always count on being in the same room for the same subject. Growing frustrations from the staff using the IWBs did lead to a management decision process in 2010 to create a uniform interface in the school (the JED interface http://www.jedmicro.com.au/) between the staff laptops and the various hardware for more effectively managing projection in the classrooms. Yet this is but one solution to the growing number of challenges.

The outcome of this process has in turn brought about a situation in which the IWBs have in fact become ‘white elephants’ in the school. Now six years after the commencement of acquisition, the IWBs are, in the majority of cases, gathering dust in most classrooms, when they are not being used as glorified display boards or even a coat-rack. Further, the required financial cost over and above the initial outlay to now further update the technology is out of proportion to its current use within the school. This issue is found frequently in organisational change in cases where change has been compelled from above within the management structure and then effectively resisted from below. This case provides a classic example of change mismanagement in the uptake of educational technology. A much more effective change management strategy would have been to gain much greater support from the ground up from those at the teaching-learning interface – the teachers– and having them be a key part of the drive for change and the training process as well. As Goolnik (2006, p. 11) has written: the “[r]esistance to change is therefore likely to be overcome if...previous issues can be adequately addressed; academic staff are fully involved/have full ownership in the design, development and carrying out of these changes; they have to have an understanding of their new roles; and the results eventually produced are truly ascertainable”. In spite of the history of implementation of IWBs in this case study, management in the school are still keen to pursue the upgrade of the facilities.

Research methodology and results

A small group of concerned teaching staff within the school applied a modified force field analysis (FFA) (McLaren, 2004) to better understand the compounding factors (the forces for and against change) within the technological change process within the school. Under Lewin’s (1951) original FFA model, these forces would be balanced indicating a quasi-stationary point of equilibrium in the change continuum. McLaren’s (2004) modified FFA as used in this case study indicates that a change action is actually in motion and the negative direction this is taking. The teaching staff informants ranged from an IWB ‘champion’, through to those who were IWBs supporters, plus disinterested staff. The results of the modified FFA of the change in process (Table 1) reflect the imbalance between the forces for and against change in the ongoing decision to implement IWBs in the school. The modified FFA graphically emphasises the forces against change clearly outweigh those for change, highlighting the flawed basis for the continued drive for implementation and uptake of IWBs in daily teaching and learning. It also suggests that for positive change to occur from a management perspective, pressures against must be first decreased.

Table 1: Case study reanalysis (2010) using the modified FFA template

Should IWBs continue to be implemented as a whole school initiative?											
Forces *for* change	**Score**					**Score**					**Forces *against* change**
	1	2	3	4	5	5	4	3	2	1	
Management's desire to improve student learning outcomes											Existing staff workload
Management's desire to promote the school as technologically-savvy											Staff resistance
Staff 'champions' (early adopters)											Lack of staff training and on-going professional development system
											Technological problems in the school
											Ad hoc purchasing of non-compatible hardware
											Ageing IWB hardware and software requiring updating
											ICT support and resources
											Intellectual know-how and skills
Total (a) forces for change →	11					35					**← Total (b) forces against change**
Overall effect of change (a – b)	11 – 35 = -24										**Case for change = -24**

However, it is to be noted that the FFA approach is not without its critiques. While the instrument helped provide teaching staff with a greater understanding of why the push for implementation and uptake of IWBs in the school was failing, the senior management who had been responsible for decisions in and around the implementation of the IWBs were not involved in this process. The greatest criticism of FFA is the subjectivity of the instrument, as reflected in its use within this case study. For the research to provide a scientifically balanced picture, it would have needed to represent the opinions of all the key stakeholders involved in the school: students, teaching staff, parents, administrators, IT technicians and the school board. This small investigative study indicates that a full study could be of significant benefit to the school before any further decisions and expenditure are made regarding the integration of IWBs or any other new technologies.

Conclusion

The implementation of any technology requires the involvement of a representative of all stakeholders in the decision making processes, in addition to their commitment and engagement in the implementation of any such decisions. Particularly in cases for the implementation of widespread technological innovation within an organisation, a coordinated approach to managing change is likely to enhance educational outcomes, financial effectiveness, educational pedagogy, professional engagement and organisational health. Failure to embark upon a coordinated approach sets the scene for change mismanagement as reflected in the presented case study.

The use of the modified FFA within this case study suggests that for successful change management with the introduction of this new technology to occur, the existing pressures against change must first be decreased. Further, the authors propose that this model can be applied to analysing the organisational 'terrain', and assessing and managing the process of proposed technological change in all educational sectors.

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Equity: A key benchmark for students and staff in an era of changing demands, changing directions

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Educational equity is premised on the right of individuals to a higher education irrespective of their age, geographical location, gender, race, physical ability, or socio-economic background in order to improve their income generation and hence quality of life (Santiago et al., 2008). In the digital age, distance-, flexible-, mobile-, virtual- and e-learning are all being promoted as means by which disadvantaged learners from around the globe can access, participate in, and achieve the outcome of post-secondary qualifications. They are also promoted as the means by which staff can participate in commensurate employment irrespective of their personal circumstances. This paper examines equity as a key benchmark for both students and staff in an era of changing demands and changing directions in higher education. While grounded in the literature, the paper incorporates ethnographic (student voice) and autoethnographic (staff voice) exemplars to highlight ways that disadvantage is experienced in technologically-mediated education.

Keywords: equity; access; participation; outcomes; benchmarking; ethnography; autoethnography; student voice; staff voice

Introduction

In a climate of rapid technological changes and their application to educational contexts, there is often the accompanying hope that the educationally disadvantaged – those who are directly excluded by existing practices (Byrne, 1999) – will achieve equity in terms of access, participation and outcomes. The word equity stems from the Middle English 'equite', meaning to be equal, fair, or freed "from bias or favouritism" (Merriam-Webster Collegiate Dictionary, 2004, p. 423). Under the mantle of the federal government's social inclusion agenda, considerations of equity are now in the spotlight for the higher education sector and, in particular, the access, participation and outcomes of a number of specific equity (under-represented) groups (Bradley et al., 2008).

However, research in the field suggests that despite advances in technology, the gaps not only remain but are widening in some cases (Bates, 2005; Sanders, 2006; Gulati, 2008; Anderson, 2009; Zondiros, 2011). What can be done to factor equity into technologically-mediated higher education? Jordan (2010) has argued that as key stakeholders, the voices of the disadvantaged need to be heard in order to co-contribute and inform a richer understanding of equity. This paper considers equity as a key benchmark for both students and staff in an era of changing – and sometimes contradictory – demands and directions. Using ethnographic and autoethnographic methodology, the paper explores equity issues in technologically-mediated education in terms of access, participation and outcomes through both student and staff voice.

Equity in technologically-mediated education

Student Equity

Equity is a philosophical viewpoint concerning basic human rights. In its current usage, student equity relates to access, participation and outcomes (Coram, 2007) of different social groups (Vick, 2001) or individuals (Santiago et al., 2008) in higher education. Access and participation relate to educational opportunities irrespective of a student's age, geographical location, gender, race, physical ability, socio-economic background, or other circumstances. Outcomes relate to the successful progression or completion of studies in order to improve an individual's social mobility (Jordan, 2010), income generation and quality of life (Santiago et al., 2008). As such, student equity relates to *being in* higher education (ibid).

One mode of technologically-mediated education is distance education (DE). During the 1938 International Council for Distance Education (ICDE) conference, equity issues were listed as a suitable and necessary area for research in what was then known as correspondence instruction (Bunker, 2003). More recently, a Delphi Study on research areas in DE discerned that access, equity and ethics were considered one of the most important research areas in distance education (Zawacki-Richter, 2009). Despite this, of the 695 articles published in the top five DE journals published between 2000 and 2008 (Zawacki-Richter, Bäcker & Vogt, 2009), only 22.4% of these articles related to equity themes. Thus equity issues collectively remain a research gap in the DE literature, and possibly in the technologically-mediated education literature more broadly.

In the context of Australian higher education, this theme of equity in terms of access, participation and outcomes have been brought back into focus through the *Review of Australian Higher Education* (Bradley et al., 2008). In the report, the former 'equity' groups of students in higher education (Martin, 1994) have been relabelled as 'under-represented' groups and the focus of national concern narrowed to a close monitoring under the so-called 'social inclusion agenda' of Indigenous students, regional and remote students, and students from low socio-economic backgrounds. However, the remaining national equity categories previously noted– students who have disabilities, students from non-English speaking backgrounds, and women in non-traditional and postgraduate education – continue to be monitored (Bradley et al., 2008). While this monitoring of equity is useful, it still tends to be investigated as discrete homogenous units and measured quantitatively, rather than examining the qualitative experiences of those participating in higher education. To this end, Willems (2010a; 2010b) impresses that the educationally disadvantaged cannot be viewed – nor researched – in a simplistic manner. Instead equity (under-represented) groups are multidimensional and comprise gradients of disadvantage (Golding & Volkoff, 1998; Watson & Pope, 2000; Willems, 2004; Coram, 2007; Willems, 2010a; Willems, 2010b).

Between the Martin and Bradley Reports, the Nelson Report (Nelson, 2003) encouraged institutions of higher education in Australia to increase their responsiveness to national equity issues and improve educational quality. Quality and benchmarking seem to go hand in hand. Stella and Woodhouse (2007) define quality as "fitness for purpose" (p. 5). Vlãsceanu, Grünberg & Pârlea (2007, p. 33), representing UNESCO, define a benchmark as "a reference point, or a criterion against which the quality of something can be measured, judged, and evaluated, and against which outcomes of a specified activity can be measured". Garlic and Pryor (2004) argue that in the context of Australian higher education, benchmarking is often conceptualised in two ways: for the *assessment* of an organisation's accountability and "as an ongoing diagnostic management tool focused on learning, collaboration and leadership to achieve continuous *improvement* in the organisation over time" (p. 9, italics in original). This second aspect becomes the working definition of benchmarking adopted in this paper. Assessing the practices of an institution – its teaching and learning technology, library and support services, and so on – through an equity lens is, in this sense, a diagnostic tool akin to the proverbial canary in a mineshaft. Ergo, considering equity issues is an essential benchmark for quality in an era of the social inclusion agenda.

Staff Equity

By extension, equity is also the measure by which staff from these same disadvantaged backgrounds can have access to, participate in, and have the outcomes of, meaningful and paid employment opportunities. Ramsey (2005) reminds us that staff equity in higher education is an important issue, incorporating anti-discrimination legislation, equal opportunity legislation and employment standards, both at state and national levels. In an era when distance-, flexible-, mobile-, virtual- and e-learning are all being promoted as a means by which disadvantaged learners can achieve outcomes to improve income generation and hence quality of life through higher education (Zandiros, 2011). This relates to equity *through* higher education and the ability of these outcomes to not only affect social mobility or, more narrowly, intergenerational income mobility and the extent to which it can reduce income disparities across particular groups" (Santiago et al., 2008, p.15). However, the compounding of disadvantage appears to continue having impact. Following graduation, there is evidence that some groups of disadvantaged graduates transitioning to the workforce are more vulnerable to labour market inequalities – such as cycles of unemployment and underemployment – than others and also experience challenges in pursuing career opportunities (Formby, 2011). These sub-groups include women, mature-aged graduates, students from low SES backgrounds and ethnic minorities, although this list in not conclusive. Thus disadvantaged students who successfully navigate their way through higher education despite the odds can emerge to find that the playing field on the other side is still not level (Furlong & Cartmel, 2005). Those who have prepared for a career in academia and emerge with doctorates seem to face a worse plight.

While there are a number of institutions which embrace fully flexible off-campus working opportunities for staff who cannot work on-campus, the inability for disadvantaged staff to find work commensurate with their qualifications is generally problematic. Yet we live in an era when the Australian federal government is promoting tele-working and flexible activity-based employment opportunities to assist in overcoming employment disadvantage. From an equity perspective, Article 23 of the United Nations *Universal Declaration of Human Rights* argues that "everyone has the right to work, to free choice of employment, to just and favourable conditions of work and to protection against unemployment" and that "everyone who works has the right to just and favourable remuneration ensuring for himself and his family (sic) an existence worthy of human dignity, and supplemented, if necessary, by other means of social protection" (United Nations, 2011, n.p.). Yet staff who face disadvantage, especially those who are not able to work on-campus for a variety of reasons such as having a disability, financial considerations, living in rural, regional or remote areas, who have family or carer responsibilities, or who are disadvantaged in any other way, may struggle to gain access to employment, let alone the opportunity for career progression.

Shave (2011) reports that more businesses and industries are moving towards such alternative working arrangements as ‘activity-based working’. It is a model based on greater flexibility in the workplace, reportedly leading to enhanced engagement, collaboration, personal accountability and improved productivity within the organisation. At the same time, with the creation of the national broadband network (NBN) in Australia, the federal government is predicting a change in the future of work with 12% of Australian tele-working by 2020, thus giving the disadvantaged, such as those living in regional and remote locations, employment opportunities like their city counterparts (Hudson, 2011). In reality, however, while technologically-mediated education is being promoted as means to overcome equity issues in the digital age, there is a long way to travel to redress disadvantage for staff in higher education.

Equity, student voice and staff voice

Equity is a qualitative term concerning issues of justice for individuals (Secada, 1989). The notion of voice relates to the individual’s right to have their views and experiences heard and it brings subjective understandings to given situations. In educational contexts, West (2004) argues that the voice is not simply a means to express ideas and opinions, but can also be influential agents of change. This reflects Britzman’s (1989) definition of the voice as having three components: the literal (the thoughts and utterances of the individual), the metaphorical (feelings), and the political (the right to speak and be heard).

Research on student voice relates to what students express about a given situation. Owen and Moyle (2008, p. 3) argue that it is important to listen to the student voice as they are the “main stakeholders in education or training”. Further, Cook-Sather (2006) argues that students have their own unique perspectives on learning, teaching, and schooling, and that these insights warrant the attention of those guiding the teaching and learning process. Thus, attending to student voice is the way to ensure true student-centred learning is being achieved (Hargreaves, 2004). Yet Owen and Moyle (2008) argue that “there appears to be little research that has focused upon hearing students’ perspectives to learning with technologies” (p. 6). It is noted as a research gap.

By extension, staff (or employee) voice is another consideration in terms of equity in technologically-mediated learning environments. Dundon et al. (2004) argue that employee voice has four different but potentially overlapping purposes: to express individual dissatisfaction; the expression of collective organisation; to contribute to organisational decision-making; and to demonstrate co-operative relations. Yet listening to the voices of staff in academia who are disadvantaged – including those experiencing unemployment or underemployment as a consequence of these disadvantages – is also a research gap.

Methodology

As equity is a qualitative term (Secada, 1989), qualitative ethnographic and autoethnographic approaches are exceptionally useful to capture the lived experience of equity issues in technologically-mediated higher education. Ethnography – referred also to as ethnomethodology – relates to exploring and trying to understand this situated experience (Cohen & Manion, 1994). When ethnography incorporates mixed methods approaches, it can capture the ‘thick descriptions’ (Andrews & Tynan, 2010) of students’ voices to their learning experiences in authentic contexts (Mayes, 2006), so that the hype of new technology and/or modes of learning does not obliterate the perpetuation or widening of the gap for the disadvantaged.

Autoethnography – a contraction of the term autobiographical ethnography (Ellis & Bochner, 2000) – is an extension of ethnography. It allows for personal experiences to be told in the words and through the eyes of the participant researcher themselves (Smith, 2005). According to Ellis and Bochner (2000), the emphasis in autoethnography varies between participant researchers between the self (*auto*), the culture (*ethno*), or the research process itself (*graphy*). Irrespective of emphasis, autoethnography utilises this "data about self and its context to gain an understanding of the connectivity between self and others within the same context" (**Ngunjiri, Hernandez & Chang, 2010, n.p.)**. Further, Denzin (2003) argues that autoethnography has a crucial role to play in democratic societies, founded as they are on the set of basic principles of justice, equity, freedom, liberty, accountability, openness and transparency (Oluwole, 2003). For without such approaches, experiences surrounding equity in higher education may not be understood by individuals who have not experienced – or may not understand – the issues of marginalisation in academia. However, autoethnography is not without its critiques. One is the danger that the self-disclosure may cause the participant researcher harm and the maxim is to protect oneself as one would a research participant in any ethnographic approach (Chatham-Carpenter, 2010).

Through a combination of survey questionnaires and email or telephone interviews, mixed method research was used to capture the student's voice on their experiences in technologically-mediated distance learning environments (Willems, 2004; Willems, 2005). Over a five-year period, thirty-five distance learners were initially surveyed, then interviewed via telephone or email to gain feedback on their distance learning experiences via technology (Willems, 2004). All respondents were Australian residents. One was living off-shore at the time of the study. There were four male and thirty one female respondents who were enrolled through seven providers of higher education: five in Australia and two located off-shore. Of the research cohort, thirty-four of the thirty-five participants were investigated using an ethnographic approach. The remaining participant – the researcher – adopted an autoethnographic approach. The participant researcher from the initial study now works in academia and continues to represent the same equity groups as she did while being a student in the initial research.

While not initially a focal point of the research, it became evident that equity issues could not be overlooked in the analysis of the findings as technologically-mediated education was the means by which these disadvantaged students could access higher education. While two of the respondents did not identify with any of the six national equity groups (Martin, 1994) at the time of the study, the remaining 33 were members of at least one equity group. Of these, two were Indigenous students; two were from non-English speaking backgrounds (NESB); nine students had disabilities; there were twenty-nine rural and isolated students; sixteen students had a low socio-economic status (SES); and seventeen students were women studying in either non-traditional fields or in post-graduate study. This overlap of equity group membership was a significant finding of the research. In eleven cases, participants belonged to at least three or more equity groups, including the participant researcher. Where multiple equity groups were present, the most common combination was for 'rural and isolated students' or 'students with disabilities', coupled with 'low socio-economic status', plus a third or fourth equity group. However, all participants in the study – and not simply those from disadvantaged backgrounds – experienced disadvantage, prompting the re-evaluation of the concept of equity as a homogenous entity to one that is multidimensional and encompasses gradients of disadvantage (Golding & Volkoff, 1998; Watson & Pope, 2000; Willems, 2004; Coram, 2007; Willems, 2010a, 2010b).

Research findings

The qualitative data (survey questionnaire responses and interview material) was subjected to thematic analysis to identify major themes in the data. As equity in its current usage in the Australian context relates to access, participation and outcomes (Coram, 2007), these will be used as to help organise some of the participant responses. *Access* includes such considerations as flexible (and DE) learning opportunities for the disadvantaged; access to the required technology; access to a stable power supply; and the financial ability to enter into study. *Participation* includes such considerations as skills; the instructional design, including aspects of individual differences; and participation in social networks in higher education. Finally, *outcomes* relate to considerations such as the successful completion of studies and to the expectant improvement of income generation and job security.

The students' voices presented in the paper are presented as either direct quotes or paraphrased to tell the story and the respondent identified by an acronym to protect their identity. Following Chatham-Carpenter (2010), the autoethnographic comments will be presented in italics. Space precludes a larger number of personal vignettes on the experience of disadvantage but those provided are exemplars to support the point being raised. It is worth mentioning that the students' voices presented in the paper tend to be weighted to issues surrounding the administrative and organisational issues of the technologically-mediated learning experience (the macro and meso perspectives), with fewer concerning the pedagogical issues relating to teaching and learning in technologically-mediated education (the micro issues). This is of note, as according to Zawacki-Richter, Bäcker and Vogt (2009), the most researched areas in distance education (highest frequency) are those that lie at the micro level (instructional design, interaction and communication in learning communities, and learner characteristics) in contrast to those issues at the macro level (access, equity and ethics; globalisation of education and cross-cultural aspects; distance teaching systems and institutions; theories and models; and research methods in distance education and knowledge transfer) and the meso level (management and organisation of DE; costs and benefits; educational technology; innovation and change; professional development and faculty support; learner support services; and quality assurance) combined. Student voice and staff voice are means by which a more realistic understanding of the lived experiences of the disadvantage (theory-in-use) over the espoused rhetoric of a given situation may be possible. By listening to the voice, research might be better directed in examining the issues that are of the main concern to those who are the major stakeholders in technologically-mediated higher education.

Equity in terms of *access* to technologically-mediated education

Equity and flexible learning opportunities

Flexible learning opportunities enabled through such technologically-mediated environments as distance-, flexible-, mobile-, virtual- and e-learning are often argued as being the conduit via which educational equity can be achieved (Zondiros, 2011). Flexible learning is defined by its ability and adaptability to meet the individual needs and circumstances of learners (Bowles, 2004) and as such is often suggested to be student-centred. However, Goodyear (2008) argues that "some of the practical guidance provided in the literature would be more useful if it took a less romantic or naïve view of the charms of flexibility" (p. 253). Student and staff voice can help provide this.

- Angelina is a rural resident from a non-English speaking background (NESB). She says: "I needed flexible learning opportunities due to my family responsibilities, the distance our farm is from the closest university, and because of my part-time work responsibilities." However, communication issues are a continual challenge for Angelina, and not simply due to English being her second language. She says that sometimes there is a lack of clear information from her lecturers and markers. She would like to have all requirements of units and general information available online and up-front to help in the choice of subjects in order to make informed decisions about their study. Angelina also adds that despite the benefits of flexible learning in being able to access her materials over a 24-hour period that she still feels isolated from other students.
- Ken lives in a regional town. He says: "I needed to choose a distance education option as I am caring for elderly parents and they live too far from the nearest regional university. I am also on a carer's pension so don't have much money. Having studied on-campus before however, I feel 'deprived' not being on-campus."

- Vicki lives in the city but struggles with ill-health. She says: "With a chronic disability, flexible online learning made a tertiary education possible for me, but I found that it is not flexible." (Vicki)
- *There is a disjuncture between students accessing higher education via flexible learning opportunities and staff also trying to access employment in higher education via the same methods. There is a misnomer that if you really want work, you just simply move to the city, or interstate or off-shore. In our region, we do see a lot of drift to the city. Yet it is not always possible to up stakes and move due to one's life circumstances.*

Equity and technology
While enabling participation for many, the media and technology of instruction can continue to pose a great deal of challenges for the diverse student body. Implementing technological change needs to be a key consideration for the disadvantaged.

- Cindy, a low income mother with a young child, says that "my husband takes his computer to work – I only get it 2 weeks out of 4" and due to this, has to arrange computer and internet access to undertake her courses, through friends, family and the local library. Her study is disrupted as a consequence.
- Amanda, is enrolled in a non-traditional area of study. Between working in the local town for three days per week and helping her husband on the family property, she studies to become a teacher. Amanda says: "Just because universities have the technology available for [on-campus] students to complete these requirements, you cannot assume that all students will have the same capability to do so. People setting up such courses should consider the circumstances of the enrolling learners so as to consider what obstacles may exist for distance learners before setting up the course structure. Finances and living rurally do make access to, and acquisition of, the necessary technology not always possible despite the best attempts."
- *I love trying new technology whenever I can access it. However, I remember the challenges of finding out at the start of a new semester that new technology was required. For example, at one point in my undergraduate degree, some of the learning materials had arrived via video. At the time we had no television set, let alone a video player. At first I asked friends if I could view my learning materials in their homes. While they were gracious about it, I rushed to get through so as not to be an inconvenience. Eventually I was able to save to buy the television and video player, but within a semester, learning materials stopped being produced in video format. If I had known that the technology would change so swiftly, I would have held off on my purchase and put the money towards the next wave of technology. There does not seem to be enough recognition of this 'lag' time by the educationally disadvantaged for new technological acquisitions.*

Equity and access to a stable power supply
Even in developed nations such as Australia, stable power supplies cannot be taken-for-granted for students and this has implications for those providing technologically-mediated higher education.

- Kathy works off-shore. She says: "I am living in an under-developed country. Phone line and power failure are constant problems."
- Jodi is from a low-socio economic background and lives in a rural and isolated setting. She says: "Living rurally has many challenges as a distance learner. Power failure and phone-lines being out affect Internet access. We get lots of black-outs or brownouts here. Sometimes it takes weeks on end for the phone-line to be restored. Sometimes lecturers just don't understand. Some are good, though. We need extra assistance so as to be able to participate without being disadvantaged."
- *We live near a number of power stations yet we still tend to lose power frequently due to brownouts or blackouts. If you are in the midst of any online work at the time, you can lose the lot. My strategy – and what I pass on to any student – is that if there is a 'save' function in the form (such as email or an online job application) to save the work frequently. However, there is not always a 'save' function, and in these instances, though it may take a little more time at the outset, it is prudent to work and save items in the standard word processing format and then copy-and-paste this into the online activity. That way if the power is ever interrupted, you still have your material, plus this strategy can you save hours in having to retype what you had already commenced.*

Equity and financial ability to access higher education
Formal educational qualifications cost money – not only for initial access but also to progress through the course of studies. Financial ability to pay not only involves overt costs but covert ones as well.

- Margaret completed her secondary schooling many decades ago. While she lives in the city, she is debilitated by rheumatoid-arthritis which causes mobility and fine-motor impairments. Margaret says: "While I have a computer, affording fees are a problem."
- Carolyn has a low income, is a single parent, and resides in a rural area. She says: "My biggest hurdle is the

money. Finances cripple me. Universities don't understand that it takes months of saving to afford every piece of new materials or equipment. They should tell students up-front if a subject requires any additional materials and equipment. In some subjects, you don't know these additional requirements until well into a subject and past the withdrawal date. It is worse if the subject is a compulsory one for your degree. There is the assumption that you can just go out and buy it or have access to it. With little income and living rurally, how can you do that?"

- Diane travels a lot and has struggled with the shift from printed course guides to fully online material. She says: "I prefer all material as [a] hard copy. Portable. [I have] No internet connection on my laptop. On-line components need to be downloaded and printed at a huge cost to me."
- Katharine lives in rural Victoria. She has a disability and receives a small wage for her part-time work. She says that online education: "increases the costs of higher education by distance learners. For example, increased Internet costs in downloading materials; increased electricity, printer, ink and paper costs in printing out on-line materials; and the increased cost in time and labour to download and print, puts the costs back onto already disadvantaged learners."
- Susan is a mature-aged student and mother of two. Although her household has a moderate income "on paper", the household finances are always tight. She says: "I have a very old computer. With the cost of fees, texts, and ISP (internet service provider), there is no money to upgrade or buy the software I need. There is a need to constantly up-grade skills and equipment, which is challenging for me financially."

Equity in terms of *participation* through technologically-mediated education

Equity and skills

Assumptions over the baseline skills of enrolling or continuing students in the widening participation climate can be erroneous. With students coming into higher education from alternative pathways, cultural capital, technology skills, study skills, or even academic knowledge for students who are 'first in the family' to participate in higher education, cannot be assumed or taken for granted. Not all students will enter or continue through higher education with the requisite skills or cultural knowledge to participate freely, although the assumption that these skills exist can be inherent within a course.

- Susan, whose background has been described previously, says: "I had to take compulsory computer courses and a 2-day course on-campus for computers prior to commencing. It was too fast for mature-aged students. I almost 'died' first semester. Too pressed for time with kids and work to read how. What a shock."
- Sharon is lives in a coastal village with her two children and is both visually-impaired and has rheumatoid arthritis, both of which pose challenges to the successful participation in her online studies. She says: "I learnt my computer skills through trial and error and through my children doing it at school."
- Linda lives in rural Australia and juggles part-time work, part-time studies and a full-time family. She says: "We need clearer instructions, [like] a proper beginners manual. [There are] assumptions as to base knowledge of students."

Equity and instructional design

With the increasingly diverse student population in higher education, instructional design (ID) needs to consider inclusive practices in order to promote equity as students participate in higher education in different ways and for different purposes. One challenge, for example, is the association of technologically-mediated modes of learning with being predominantly text-based. While many educators now incorporate multimedia into their learning design, text can still predominate through online learning materials, emails, and forum participation, leading to a perception in some parts of the broader community of academia's lag with society at large. Willems (2009, p. 79) relates the voice of a rural-based student who stated: "I really want to study, I really do. But I could not do distance education. I am such a visual learner". For this purpose, the experiences of the educationally disadvantaged are particularly pertinent as a yardstick in the considerations of ID.

- Marianne is a relatively young off-campus learner who lives rurally. She is frustrated about her course's compulsory participation in forums. She feels that "they could be used more effectively", have a more active presence on the part of the lecturers, and she would like important or key information more clearly identified so that they do not get lost in long strings of other information and communication. She is also concerned that when the lecturers do not have an active presence on the forum, information generated within student discussions may in fact be erroneous and misleading, and subsequently affect assessment.

- Linda, whose background has been described previously, also has issues over the compulsory participation in the online forums. She says: "I don't like answering questions online for fear of looking stupid."
- *I learnt very early on how to structure a good essay. However, I struggled in any handwritten tasks such as the 2-3 hour exams due to my carpel tunnel syndrome. The units that I thrived in, however, were those which offered an alternative assessment option, such as using multimedia or taking part in an online role play. Indeed, it is these subjects which I still remember to this day. I take these experiences with me as an educator.*

Equity and participation in social networks in higher education

Social networks are described as enabling "communication among ever-widening circles of contacts [and] inviting convergence among the hitherto separate activities of email, messaging, website creation, diaries, photo albums and music or video uploading and downloading" (Livingston, 2008, p. 395). Social networks can help provide the student with social presence, the perception of belonging to a community within the technologically-mediated environment, and even a greater participatory role in their studies (Swan & Shin, 2005).

- Anne faces many challenges as a student. She is a single parent of three children (two of whom have disabilities) and subsists on a pension. She actively desires to be involved in social networks during her studies: "The biggest problem [is the] human factor. So close to quitting. Privacy laws prevent [my] uni giving out other students' contact details. I was trying to start up social group. It needs to feel part of my uni life."
- Susan, whose background has been described previously, says: "There was a forum requirement. There were only 8 regular contributors which was frustrating as others were watching on and copied us without contributing. We formed own study group who now support each other even when lecturers are non-communicative. We meet on-line but off the forum. I finally feel as if I have 'real' contact."
- *As a distance learner for 20 years, I was expected to develop social networks with my peers and lecturers. Yet in attempts to find off-campus technologically-mediated employment, one of the concerns given by potential employers is that I might not be able to develop and maintain social networks with my colleagues (or students) if I do not work on-campus with them. This is counter to my lived experience in which I use social media on a daily basis for activities ranging from the supervision of a student via Skype through to research collaboration with a colleague through Facebook.*

Equity in terms of *outcomes* from technologically-mediated education

Equity and the completion of assessments, units or courses

It is not easy for the educationally disadvantage to achieve successful outcomes. Individual assessment tasks, then subject units, and finally the course itself, all need to be successfully completed.

- Sarah lives geographically close to one university, but studies off-campus with another institution due to her chronic disability which requires hospitalisation from time to time (Willems, 2005). One particular incident serves to highlight the complexities of this situation. Sarah had an unexpected episode of illness which required hospitalisation. Despite supportive documentation to verify this fact, contact with the lecturer following her discharge from hospital, and her attempts to submit major assessment task that fell due whilst she was in hospital as soon as she was able to, Sarah received a 'Fail'. The grounds given were that she had not advised her lecturer in advance and arranged an alternative assessment task *prior* to her emergency hospitalisation. As a consequence of the subject assessment weightings, Sarah subsequently failed the entire subject unit.
- Angelina is a self-funded post-graduate student who lives on a farm. She is from a NESB and her undergraduate qualifications were attained in the country of her origin. She says: "I had a problem with an

assignment in one subject that could not be explained or laid out on-line. The lecturer was not satisfied. She said that I should have got help from a tutor who looks after students who have difficulties with assignments. I did not know that I needed help as I had passed the first two assessments but the third assessment was worth 40% of my mark. She should have told me that I needed this help before I failed. I have had to re-sit the subject again at the additional cost of $800."

- Carolyn, whose background has been described previously, says: "[The] Completion rate for women is much lower. We need support. Women worry about extended problems not just the task at hand."

Equity and finding work

- *I was working in academia as a tutor and marker when I was very strongly encouraged to complete my doctorate as the basis for job security in higher education and for career progression post completion. While this was sound advice, the reality has been quite different. Those same issues which identified me as educationally disadvantaged as a student still seem to be the barriers to secure employment post completion.*

Conclusions

The notion of equity is premised on the right of individuals to have the opportunity to access, participate in and achieve successful outcomes in higher education in order to improve their quality of life by being able to find paid work. In the digital age, distance-, flexible-, mobile-, virtual-, and e-learning are all being promoted as means by which this can take place. Yet as the student and staff voice exemplars in this paper serve to highlight, there can be a disjuncture between the espoused rhetoric and the personal experiences of the disadvantaged.

Further research on equity in technologically-mediated education is suggested through exploring both student voice and staff voice. First, and in relation to student voice, it is suggested that longitudinal case studies track the lived equity experiences of the educationally disadvantaged in terms of access, participation and outcomes. Second, and in relation to staff voice, barriers to pursuing flexible working options within higher education might be better understood if examined through an equity lens. I flag this issue as a research gap in technologically-mediated higher education and suggest the exploration of staff voice using a collaborative autoethnographic approach (see **Ngunjiri, Hernandez & Chang,** 2010). Third, the voices represented in this paper have tended to focus more on the macro and meso issues in technologically-mediated education and less on the micro issues of teaching and learning themselves. This warrants further investigation as it might indicate the need for a shifting of research foci.

This paper has explored equity as a diagnostic benchmark in higher education for students and staff in technologically-mediated education. Assessing the practices of an institution through such an equity lens is akin to the proverbial canary in a mineshaft. Ergo, considering equity issues is an essential benchmark for quality in an era of the social inclusion agenda. For without such considerations of equity, education will remain the enclave of an exclusionist agenda, and gaps for the disadvantaged will continue to grow.

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i-Survive Project: Investigating the use of Internet-enabled mobile phones and social networking in disasters and emergencies

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The aim of the forthcoming *i-Survive* project is to evaluate the use of messages, images and videos sent by participating representatives of key community stakeholders during recent Australian and New Zealand disaster and emergency situations from Internet-enabled mobile phones to Web 2.0 social networking websites to seek help or educate others. It is anticipated that the research findings will help guide and instruct the development of m-learning strategies, including applications and protocols, in order to help better plan and prepare for the use of these technologies in future disaster situations.

Keywords: disasters; emergencies; Internet-enabled mobile phones; social networking; m-learning

Introduction

In recent years, the effects of bushfires, floods, cyclones, and storms have endangered the lives of many, including civilians and those participating in emergency response teams. In such situations, simply surviving the emergency or disaster becomes the paramount consideration for those involved. Often, it can be difficult in obtaining up-to-date information in the height of such situations, especially in changeable and hazardous local conditions. For example, thick smoke can hamper visibility and disorient individuals. Understanding local conditions, knowing what to do, receiving warnings and guidance may help reduce fatalities.

In the face of such extraordinary events, Internet-enabled mobile phones (also referred to as Smart phones, iPhone or 3G phones) coupled with Web 2.0 social networking technologies are swiftly becoming not only a means to personally chronicle the events being witnessed and/or experienced, but are also being used to disseminate information, educate and inform the public and emergency services. Through such technologies, civilians, media personnel and emergency response teams have the ability through the viral capacity of the technology, to alert those in danger and educate them in informal and formal ways more swiftly than traditional broadcast media and telecommunications methods may be able to accomplish.

Formal and informal m-learning via social networking

In a recent press release, one global mobile phone company has claimed that by 2015, 80% of people will be accessing the Internet from their mobile devices (Ericsson, 2010) affording access to information anywhere, anytime. In disaster and emergency situations, hand-held portable devices are likely to be the only teaching and communication provision within a given situation. As such, a better implementation of this 'mobile' strategy has the potential to save lives, as well as to improve emergency services responses.

Two Australian emergency services – the Country Fire Authority (CFA) and State Emergency Services (SES) who actively respond to emergency and disaster situations at the state and national level – have already begun to respond to the potential of this technology by providing applications (apps) or creating a status on sites such as *Facebook.* Preliminary discussions indicate that knowing further information about the use of these technologies in the field, and how such technologies might be employed to an even greater effect in disaster and emergency situations, will be beneficial for strategic planning purposes.

The proposed research

Disaster sociologist, Russell Dynes (1998), observes that in examining events in and around emergencies and disasters, the community needs to be the locus of analysis as it is the community – wherever that community is – which has the capacity and resources to activate a response to the disaster. Further, such analysis has cross-national and cross-cultural applicability (Fischer, 2003).

The aim of this project is to characterise the current usage of Internet-enabled mobile phones and social networking in emergency and disaster situations. The project will draw upon ethnographic (Tedlock, 2000) and autoethnographic methodologies (Ellis & Bochner, 2000; Sparks, 2002) for the exploration of subjective use of Internet-enabled new media in the context of disaster situations. This methodology is ideal and appropriate for this research study as, from a sociological viewpoint, human behaviour stems from a social consciousness. Participants for the research will be recruited via a purposive sample of thirty representatives from the civilian population, disaster response teams, broadcast media personnel, emergency services personnel, and representative of key agencies such as a local Country Fire Authority (CFA) and State Emergency Services (SES) who have used these technologies in recent emergency and disaster situations.

Participants will undertake an initial survey and a subsequent interview in order to provide details of their use of these technologies during a particular recent emergency and/or disaster situation. The survey will ask key questions about what aspects of these technologies respondents have used in a disaster or emergency event, what they thought the benefits were, what the challenges/issues were, and what can be suggested for the future situations, including preferences for the design of new purpose-built application. Digital artefacts which the participants shared on social networking sites by the research participants during the emergency or disaster – such as images, videos, messages, and instant messages – will also be collected where able. Follow-up interviews will allow the researcher to further drill down on participant responses to the survey and allow participants an opportunity to further elaborate. Thematic analysis of the data and digital artefacts collected from the research cohort will be conducted in order to identify patterns and to reduce the qualitative data into themes for the facilitation of interpretation (Boyatzis, 1998).

Conclusion

Learning from past issues in and around saving lives, properties, resources and livestock is essential in preparing civilians and emergency response teams for future disasters. What contribution can Internet-enabled mobile phones and social-sharing technologies make to emergency and disaster responses? This project will evaluate the use of messages, images and videos sent during recent Australian and New Zealand disaster and emergency situations from Internet-enabled mobile phones to Web 2.0 social networking websites (for example, *Facebook* and *YouTube*) in order to help better plan and prepare for the use of these technologies in future situations. It will also suggest strategies and useful apps to educate and communicate during the height of such events. It is anticipated that this research will ultimately benefit all citizens in Australasia, for the purposes of saving lives in emergency and disaster situations through m-learning approaches.

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The potentials and pitfalls of social networking sites such as *Facebook* in higher education contexts

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Popular social networking sites such as *Facebook* demonstrate an emerging opportunity for students and educators within formal higher education contexts to share ideas, celebrate creativity and participate in an environment which offers immediate feedback from others who belong within a specific network. As this is an emerging use of the technology, an autoethnographic approach has helped capture the potentials and pitfalls of incorporating social networking within higher education. The findings highlight implications for the key stakeholders in higher education.

Keywords: *Facebook*; social networking; higher education; autoethnography

Introduction

There is an increasing social and cultural expectation that technology should be ubiquitous within peoples' daily lives (Bateman & Oakley, 2009). Such convictions undergird the application of technology within educational contexts, linking together two key trends identified in the *Horizon Report 2011* (Johnson, Smith, Levine, & Haywood, 2011). These include that we now expect flexibility in order to work, learn, and study whenever and wherever we wish to (Willems, 2005), and that the increasingly collaborative and socially-connected nature of our worlds is changing the way that work and study is being conceptualised. The incorporation of social networks is a relatively new addition to HE, involving the blending of formal and informal learning. Social networks are defined by the users' abilities to develop an online profile of themselves within a bounded system, indicate with whom they would like to share connections, and view the connections made by their friends (Boyd & Ellison, 2007). Livingston (2008, p. 395) notes that "while social networking is to some degree displacing other forms of online communication (email, chatrooms, website creation), it incorporates others (instant messaging, blogging, music downloading) and remediates yet more (most notably, face to face and telephone communication)". Thus, the typical features of a social network site include the ability to blog, share personal photos, documents, videos, and web resources, instant message (IM), plus integrate other add-in applications such as polls. The popular social networking sites that are becoming more common in higher education contexts include *Facebook, Flickr, MySpace, Twitter, YouTube, Yammer* and *LinkedIn*.

Facebook in higher education

Facebook (www.facebook.com) is self-described as a social utility which connects people with friends and others. Beyond simply connecting, social networking sites such as *Facebook* "not only attract people but also hold their attention, impel them to contribute, and bring them back time and again – all desirable qualities for educational materials" (Johnson, et al., 2011, p. 12) . According to a number of studies, between 78% (Fogel & Nehmad, 2009) and 95.5% (Lampe, Ellison, & Steinfeld, 2008) of all enrolled students in HE have indicated that they use *Facebook*. Concentrated memberships of students on *Facebook* is not surprising given that this social network site originated in 2004 as a means of informally connecting college students (Ellison, et al., 2006; Grossman, 2010). However, this social network is now accepted broadly. Lipka (2007) has reported that adults are a fast growing group on *Facebook*, identifying teaching staff from HE as amongst this group. More specifically, in research conducted for Pearson Education, Tinti-Kane, Seaman & Levy (2010) report that 80% of educators have at least one social network account, that *Facebook* is the most popular of these, and that 30% of the educators use these social networks to communicate with students. Finally, institutions themselves are establishing *Facebook* accounts for the purposes of marketing, such as to recruit students (Roblyer et al., 2010).

Research methodology

Johnson et al. (2011) caution that any discussion or investigation that relates to the adoption of new technology also needs to consider the important constraints and challenges that arise from the perspectives of numerous resources, such as the personal experiences of those at the 'coal face' of daily use. For this purpose, an autoethnographic methodology was used in this research. Autoethnography (Ellis & Bochner, 2000; Sparks, 2002) – an examination of the self, the social context and the research itself – enabled the authors the opportunity to explore their personal experiences as participant researchers on the use of *Facebook* in HE contexts in order to share not only the benefits, but also the pitfalls.

Findings

Through the examination of these personal experiences, the authors found that while there are a number of potentials in using the technology, there are also as many pitfalls that warrant consideration and evaluation. These findings, along with supporting case study exemplars, are detailed in Bateman and Willems (forthcoming). For the purposes of this brief publication, the findings are summarised below.

Potentials

The potentials found within this research of using *Facebook* in higher education include that it provides: an alternative learning management system (LMS) to the institutions formal system; a social community for a geographically dispersed cohort; an opportunity for peer teaching; and a resource sharing opportunity, especially when the existing institutional LMS block certain media.

Pitfalls

Similarly, a number of pitfalls for both staff and students were identified. These include: deliberations over whether to 'friend' or not to 'friend'; issues surrounding the provision of an electronic identity, including privacy issues; identity theft and impersonations; public domain challenges and the sharing of information; taking of things out of the particular context that they were meant and misusing this information for less than savoury purposes; stalking and cyberbullying; virtual integrity; and issues relating to intellectual property (IP) and copyright.

Conclusion

Should *Facebook* be used for formal teaching and learning experiences in HE? While we are strong advocates for the use of new technologies as pedagogical supports to enhance student learning; we are also cautious and critical consumers of emergent technologies in this advocacy. As a reflection of this, we have identified some of the potentials and pitfalls from our use of *Facebook* in the context of higher education which warrant serious consideration prior to adoption. Further, we note the dearth of policy to promote the responsible and critical uses of such emergent technologies in academia. This is a situation which requires rectification. We recommend further research into the use of *Facebook* and its application to higher education in order to help guide the establishment of such policy for the benefit of staff, students, and academia at large.

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Mobile Technologies in the Field: iPads – Rescuer or Rescuee?

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Abstract

Universities are being swamped by waves of emergent technologies and the emergence of iPads is the latest ‘state-of-the-art’ mobile device to receive attention. While a number of iPad trials and initiatives have been conducted within the confines of classrooms, for example, Bond University, University of Melbourne and Adelaide University (Brand & Kinash, 2010; Jennings et al 2010; Cross, 2010); far fewer have been conducted in the field, see Duke University’s use of iPad as a field research tool (Winograd, 2010). This study reports a faculty’s trial to explore how far iPads could be integrated into a field setting for training of paramedic students in Wilderness Medicine. As it turned out, the remote setting for the exercise presented a number of challenges for the coordinators. Questions that needed to be considered included how “mobile” is the iPad?, How can it be used to support and enhance students’ learning in the field?, How far could the iPad be extended where Internet connectivity is intermittent? The iPad trial highlighted a lack of a “common language” within the faculty as a basis to collaborate and design learning activities. It provided impetus for an ongoing series of conversations amongst the coordinators and others in the Faculty about design approaches and the need for a pedagogical framework to integrate technologies that support teaching and learning activities.

Introduction

Since its release in early 2010, iPads have been a phenomenal success for Apple and made significant inroads into consumer and business markets, and now the education sector. Articles with headlines like “Will iPads transform Med school?” (White, 2010) and statements such as “DOMINIC RISI was once reluctant to pick up a book, but in the two months since he started using an iPad in reading tutorials, his mother has noticed a "wonderful" change" (Arlington, 2011) continue to propel interest in the iPad phenomenon.

iPads, much like other educational technologies "have originally been created for other purposes, either military or business – even classroom technologies like over-head projectors and PowerPoint slides (Bates, 2003, p. 8). Amidst the increased growth in spending on and use of ICT in higher education institutions, there are increasing calls to 'rethink pedagogy' for a digital age (Beetham and Sharpe, 2007). The new object, the iPad, is being scrutinised for its affordances - on how it can be leveraged to enhance teaching and learning.

We have adopted Conole and Dyke's interpretation that views affordance as not just limited to the intended, prescribed or designed function of technology: "We are also interested in exploring the creative and innovative way people respond to technologies and perhaps adapt them for use in unforeseen circumstances. An affordance of the technology does not simply refer to the intended use, but also to the unintended consequences" (Conole and Dyke, 2004, p. 301).

In this paper, we will sketch how our Faculty approached an iPad trial for a field exercise to support learning activities designed for the training of paramedic students. We begin with a discussion on planning and design for the field exercise trial, followed by observations from the field and some lessons learnt. The paper concludes with some salient remarks for others considering a similar event using iPads.

Field Exercise Planning and Design

In October 2010, the Faculty started a series of planning meetings exploring the potential for integrating the use of iPads within the disciplines of nursing, midwifery, paramedicine and exercise science. The portability of the iPad, availability of location based services, and ease of consuming and generating content readily accessible through use of one touch apps (applications) that could be used to enhance teaching and learning were definitely attractive considerations to staff (see Laurillard, 2007, p. 157 on how mobile devices and technologies can support learning activities).

While a number of projects were suggested, the paramedic training camp was selected for the first trial as there was a window of opportunity for some 20 iPads that could be made available for a short duration. As the iPads would be repurposed once the trial was completed, we made a decision to only utilise free apps.

The Exercise Digger's Trail is an inaugural but non-compulsory exercise for third year Bachelor of Nursing/Bachelor of Paramedic students at ACU Ballarat campus. The setting for the exercise is the Wombat State Forrest Ballarat, Victoria. Forty-two students participated in the field exercise. The coordinators and other directing staff (including trained paramedics) also participated in the exercise on a voluntary basis.

The Faculty understands the importance of students' attaining competence that will prepare them to meet the challenges in professional practice and that competence can be translated into effective performance when students are in practice. The provision of an authentic learning environment whether in the classroom, virtual space or field setting is a key component in the design of learning activities to support the delivery of such outcomes (Herrington and Herrington, 2006; Lombardi, 2007).

The premise of the field exercise was to take the students into a bush-setting away from the classroom and undertake authentic learning tasks. Lombardi distils the key characteristics of authentic learning (2007, pp. 2):

- Instructors are encouraged to design activities for their students that match as nearly as possible the real-world tasks of professionals in the field.
- The challenges students are asked to undertake should be complex, ambiguous, and multifaceted in nature, requiring sustained investigation.
- Reflection, self-assessment, and performance review are fully integrated.

- Teamwork is as essential to the authentic learning experience as it is likely to be in modern workplace settings.

Through a series of structured activities and assessment tasks designed to be as close to real world tasks as possible, students were expected to work in groups to achieve specific learning outcomes using a participatory approach to knowledge building and collaborative learning. Even though these were group activities, each student was expected to complete an exercise evaluation and was encouraged to complete a journal as part of reflection for the exercise.

The three learning activities for the field exercise were: 1) Navigation and Location 2) Wilderness Medicine 3) Search and Rescue. Each learning activity was designed based on real world tasks expected of professional paramedics. On successful completion of the field exercise, students were expected to demonstrate skill and knowledge in principles of wilderness medicine, navigation and search and rescue; utilise critical thinking skills, knowledge and evidence based practice to inform paramedic clinical decision making in a remote wilderness setting; demonstrate communication and interpersonal skills relevant to their professional development within the field of paramedic practice; and work as a member of a team and as an individual to locate, manage and extricate persons with trauma or medical conditions in the wilderness environment. (Webb, 2011, p. 2-3.)

In the preliminary planning for the navigation and location exercise, it was thought the iPad could be used as a back-up compass to parallel the handheld compass and provide geolocation coordinates for both true and magnetic north. Ideally at a 'touch of an app' it would triangulate a location in seconds. This was a good study in the efficacy of equipment versus handheld and mapping charts. The next thing was to get the students to do a 'screengrab' of the 'geolocation' shown on the iPad. This could be retrieved later to be used for discussion and analysis i.e. how much the coordinates deviated in minutes and degrees using the iPads compared to using a printed map with a hand-held compass.

Two months before the field exercise, the iPad project coordinator briefed all of the students on the efficacy of using GPS in navigation: from the very expensive GPS's used in shipping to the very inexpensive iPhone apps. She emphasised to students that the free GPS and free compass apps for iPhones/iPads had the lowest rates of accuracy. The understanding of efficacies of different GPS systems/apps would assist students make the right judgement call for navigation i.e. when to use devices like iPhone and iPads and when not to rely on them. There are occasions when the apps can be effective: for example, firefighters in Oklahoma used the iPad to help ambulance save an elderly patient in the snow where local maps were not readily available - the iPad did come to the rescue!

We had considered the Evernote app as an excellent tool for reflection of both procedures for the exercise. The recording functionality in addition to text/image capabilities of Evernote could be used to record reflections and be sent to the activity coordinator when there was connectivity.

In the second activity, students had to locate an injured motor cycle rider in a wilderness. In the design of the exercise, the iPads were pre-loaded with Clinical Practice Guidelines (CPGs) and Clinical Work Instructions (CWIs) plus an electronic Patient Care Record, which students were expected to complete during the Wilderness Medicine activity. Students were expected to work in groups to problem-solve and make decisions on how to treat the "SimMan" in a situated learning style on site with scaffolding provided by a trained paramedic. Working in groups, students had to demonstrate knowledge and competence and work collaboratively to treat the "SimMan" using the array of medicines and equipment available to them. They would record the observations and treatment in the Patient Care Record using neu.Annotate. We had planned for students to take turns to treat /transport the "SimMan" and record observations/ treatment plan. Students could also use the Evernote.app to record verbally what they observed and so provide a verbal report to go along with the annotated Patient Care Report.

In the third activity, Search and Rescue, a "SimMan" has been placed at locations known only to the activity coordinator. The coordinates have been marked on the back of a puzzle set. Students were required to search an initial area to locate the puzzle pieces that would unlock the coordinates required for the next search area. The entire puzzle needed to be found in order to receive all of the grid reference/coordinates information. Once the coordinates had been retrieved, the students had to use map and compass skills to 'figure out' the new search area where the mannequin had been dumped. Upon locating the new search area, the group had to comb this area to locate the "SimMan", building on the techniques used in the first search. When the "SimMan" has been located, students then applied their knowledge and skills to treat, monitor and transport the "SimMan".

Observations from the Field and Lessons Learnt

We conducted a survey before the iPads were distributed and one after the field exercise. The preliminary data from our study confirms other Australian studies (Kennedy et al 2008; Kennedy et al 2007) that have demonstrated there are differences to Prensky's depiction of Digital Natives (Prensky 2001a; Prensky 2001b). One of the coordinators had thought that students, many who were avid users of iPhones, would have little problems transferring their adeptness on the iPhone to the iPads, and didn't think that students would have difficulty in using the iPads for the field exercise. However, based on the feedback and observations during the exercise, it became obvious we should have provided students more time to familiarise themselves with the iPad and the apps.

Our efforts to leverage mobile technologies in a paramedic training exercise in a remote location brought into sharp focus the use of mobile devices and technologies in remote settings where a number of the affordances are reliant on good Internet connectivity for example location based services and communication tools.

In relation to the iPad trial in the field, there were certainly a number of lessons learnt on how the iPad could be better integrated for future exercises. Getting students to fill out a patient record that they felt they could do far more effectively with pen and paper is not necessarily an effective use of technology. A re-design of the CPGs, CWIs, and PCR to leverage the affordance of the iPad is certainly required and that would involve some further development work. It would be appreciated if an app could be developed to record the observations and treatment plan that are provided verbatim, and those details then automatically transcribed to a Patient Care Record on the iPad. Saving a few precious minutes for efficient record-keeping could be vital to patient care and survival.

The trial in a remote setting tested the portability of the iPads and has made students aware of serious limitations of the iPads in certain extreme conditions where Internet connectivity may be intermittent which could result in loss of location based services. Instead of being totally reliant on the iPad for geolocation data in those conditions, the iPad could perhaps be used as a coarse navigational tool. Technologies such as 2-way radios, hand-held compasses, and physical maps are not subject to the vagaries of intermittent Internet connectivity and should still form an essential part of the training provided to paramedic students. In terms of accuracy of the GPS apps and concerns regarding durability of the iPad, if iPads could be made more robust and suitable for field usage such as at sea, the bush/outback and other rugged terrain, then the potential for far-reaching use would be enhanced.

Even though the coordinators involved in the exercise understood the aims of the iPad trial, other professional volunteers not involved in the preliminary planning of the trial expressed ambivalence towards their use in the field. However, one of the paramedics acknowledged that emerging technologies are inevitable in the paramedic field, and more could be done to explore the use of iPads compared to the system currently in use in Victorian ambulances to record patient care information, VACIS (Victorian Ambulance Case Information Systems) technology.

The trial has also provided an impetus for a series of conversations amongst the coordinators and other staff in the Faculty about design approaches and the need for pedagogical framework/s to integrate technologies that support teaching and learning activities. During those conversations, it became apparent to the coordinators there was a lack of a "common language" to assist in conceptualising and designing learning activities. We are planning to provide a follow-up report on exploring learning design in the Faculty's teaching and learning initiatives using the Alexandrian Pattern Language approach in readiness for our next iPad trial.(See Goodyear, 2005, for a detailed discussion of educational design and the Pattern Language approach).

Conclusion

This field exercise was designed to be an authentic learning activity and on that count was hugely successful. Students indicated they had learnt from the hands-on experiences of search and rescue, and benefited from the guidance provided by the trained paramedics. There will be further discussions in the Faculty on the continuation of this field exercise in the coming year.

On the other hand the integration of the iPads into such intense and fast-paced learning activities to support paramedic training in the field, yielded mixed results. Nevertheless, we will use the lessons learnt from the exercise for future iPad trials, in particular ones conducted in remote settings. It is worth noting that there are situations where mobile technologies in all of its state-of-the-art sophistication cannot be fully relied upon as has been demonstrated through this field exercise. In such circumstances, there is always a need to have other technologies, not as backup but as a core technology.

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Facebook in higher education promotes social but not academic engagement.

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Although there is evidence that academically successful students are engaged with their studies, it has proved difficult to define student engagement clearly. Student engagement is commonly construed as having two dimensions, social and academic. The rapid adoption of social media and digital technologies has ensured increasing interest in using them for improving student engagement. This paper examines Facebook usage among a first year psychology student cohort and reports that although the majority of students (94%) had Facebook accounts and spent an average of one hour per day on Facebook, usage was found to be predominantly social. Personality factors influenced usage patterns, with more conscientious students tending to use Facebook less than less conscientious students. This paper argues that, rather than promoting social engagement in a way that might increase academic engagement, it appears that Facebook is more likely to operate as a distracting influence.

Keywords: facebook, higher education, student engagement, social media

Introduction

Student engagement in the digital age

Student engagement has been identified as a significant predictor of academic performance (Astin, 1984/1999; Pascarella & Terenzini, 2005; Zhao & Kuh, 2004) and is considereddirectly relevant to implementing Chickering and Gamson’s principles underpinning good undergraduate learning (Chickering & Gamson, 1987, 1999). Measures of student engagement focus not only on academic factors, but also on social support, interaction between student peers and interaction with tutors and faculty members (Coates, 2007; NSSE, 2005).

In the context of more students entering the tertiary sector thus creating a more diverse student body (Dobson, 2010), less funding is available for student clubs and societies (NUS, 2011), and more students are combining work and study (Pike, Kuh & McKinley, 2008; Polidano & Zakirova, 2011), there is mounting pressure to find ways of keeping students engaged with academic life (Chickering & Gamson, 1999; Coates, 2006; Krause & Coates, 2008; Pike, Kuh & McCormick, 2011). Given that the majority of the incoming student cohort has grown up with digital technology and the internet, and many university services are delivered via the internet, there is increasing interest in engaging with students through new forms of digital communication media. The push towards use of social media often comes from marketing departments rather than academic staff, and many of the metrics associated with student engagement (discussed below) are more related to student experience than to student learning. It has not been clearly established how increased social interaction might lead to better academic learning, and what role student engagement through social media could play in the academic context. Coates (2007) notes that, since most universities now have student portals and use web-based learning management systems as a central part of course delivery, it is increasingly important to understand the effects of online learning practices. This includes use of social media on student engagement.

The concept of engagement

Although the concept of engagement is intuitive and appealing, engagement has proved a difficult concept to define with clarity. Various methods of assessing engagement run the risk of prematurely reifying concepts forming part of the engagement construct. For example, common survey instruments such as the AUSSE (ACER, n.d.) and NSSE (NSSE, n.d.) include items regarding use of specific tools or processes. Thus features of the institution and the structure, not function, of its services become an integral part of student engagement metric. This leads to confusion between engagement as an attribute of the student, the institution, or the interaction between them, although student engagement metrics are based on data from student surveys.

Early research tended to focus on issues like “time on task” (Brophy, 1983) in a manner aligned with the management and productivity ideas in vogue at the time. Academic views of engagement tend to focus on engagement with the academic discipline as a fundamental goal, whereas ownership of student engagement within the institution tends to be with the recruitment and marketing teams. Their focus is in on institutional course offerings and student attrition, rather than on the academic disciplines themselves. More nuanced views of student engagement recognize there are (at least) two broad meaning of the term (e.g., Nystrand &Gamoran, 1992). The first encompasses a student’s willingness to participate in learning activities and do what the institution asks (academic engagement), and second is an affective component which deals with the emotional and social regard the student has toward the institution and the act of studying (social engagement).

Without wanting to engage in a detailed review of this literature and debates over terminology, it makes sense to consider student engagement (whatever else it might be) as having cognitive, behavioural and affective aspects. Learning comprisea cognitive processes and outcomes that arise from, and are supported by, appropriate learning behaviours. These are likely to be mediated by affective experience (that is, the desire and motivation to learn) within the academic context. Affect may be the gateway to action (either through positive desire to learn, or through fear of sanction if learning does not occur) but because academic learning is ultimately cognitive in nature, it is not enough merely to activate the affective component by instilling a desire to learn, if it is not accompanied by the requisite cognitive skills to desired learning outcomes. Instructional designs aimed at creating affective engagement without sufficient attention to what behaviours are required for cognitive engagement may fail to promote the required behavioural and cognitive activities for learning to occur (Frederick, Blumenfeld & Paris, 2004). While it is hard to dispute that student engagement is important for student outcomes, it seems that much of the literature has put the cart before the horse. Undoubtedly there is good evidence to show that academically successful students are engaged with their studies, but it is somewhat less clear that increasing the metrics associated with student engagement serves to create good students. On this basis, it is argued that efforts to promote social engagement, for example through use of social media, may not on their own result in improved cognitive engagement required for learning.

Facebook

The rapid adoption of social media, particularly combined with the use of portable digital devices such as mobile phones and tablet PCs, has ensured that universities are becoming increasingly interested in the extent to which social media offer opportunities for improving student engagement. Social networking sites such as Facebook and Twitter (a site based on microblogging and information dissemination) have both been suggested as vehicles for promoting academic engagement with the digitally-proficient cohort of students.

Because Facebook is currently (in mid 2011) the preeminent social networking site, with more than 500 million active users at the time of writing, we focused our study on Facebook use. Typical Facebook users will spend from 10 minutes to more than two hours per day on Facebook (Ryan & Xenos, 2011). Individuals sign up for a Facebook account and create their own profile, in which they have the option to include a range of personal information including: basic identity and demographic information (e.g., name, residence, gender, date of birth), people with whom they have close relationships (e.g., formal relationship status, family members), educational and work history (e.g., linking to their school, university and places of employment), philosophy (e.g., religion, political views), information about their interests in the arts/entertainment, sports or other activities, and their contact details (e.g., address, phone number).

Users also have the option to request and accept friendships with other users, to join interest groups or networks, and to communicate with others by sending messages to their mailbox, utilising instant messaging, 'poking' other users (interacting with them without conveying any specific semantic content), and commenting on others' profiles. Until recently, there has been limited research on social networking sites such as Facebook. However, over the past five years there has been increase in the number of peer-reviewed articles appearing in the literature (ScienceDirect returned 65 hits for 2006 versus almost 900 for 2010, using the search term "Facebook"). These studies have examined a broad range of topics including how individuals use Facebook (Cheung, Chui & Lee, 2010; Ryan & Xenos, 2011), their motivations for engaging with others online (Ross, Orr, Sisic, Arsenault, Simmering & Orr, 2011), and what psychological factors influence their style of Facebook usage (Amichai-Hamburger & Vinitzky, 2010; Carpenter, Green & LaFlamm, 2011; Mehdizadeh, 2010; Ryan & Xenos, 2011; Wilson, Fornasier, & White, 2010; Zhong, Hardin & Sun, 2011).

Current study

Given the emphasis on social interaction rather than information sharing within the student engagement construct, we chose to investigate the use of Facebook (a medium favouring social interaction) rather than Twitter (a medium favouring information-sharing) in the first year cohort, in terms of its potential to enhance student engagement. The data reported in this paper come from a larger study looking at student use of Facebook and its relationship to a number of personality factors.

Method

Participants

The participants were first year undergraduate psychology students from a Melbourne metropolitan university. Five hundred and forty-eight students participated in the study. Of these, 94% had Facebook accounts. Participants' data were not included in the analyses if they had more than 10 percent missing data. The final sample comprised 396 participants with 302 women and an average age of 20.65 years. Almost the entire final sample (98.5%) had Facebook accounts.

Measures

The scales administered in the current research included measures of Facebook use and the Big Five personality traits delivered online via the Opinio software package (v6.4 available from http://www.objectplanet.com/opinio). These are described below.

The Facebook Questionnaire (FQ; Ross et al., 2009)
The FQ is a 28-item questionnaire developed by Ross et al. (2009) to measure basic Facebook use, attitudes towards Facebook and information relating to the posting of personal information. Basic use items were designed to collect information about the use of common functions on Facebook, such as time spent using Facebook, number of Facebook friends, preferred functions (e.g., wall, messages) and reasons for using Facebook (e.g., to communicate with friends). Multiple items were used to assess the different attitudes towards Facebook (e.g., 'I feel out of touch when I haven't logged on to Facebook for a while' and 'I would be sad if Facebook shut down'). Participants were also asked to indicate whether they had posted information on their profiles, including their phone number and mailing address. Response formats on this instrument ranged from dichotomous to five-point rating scales with a number of items requiring a numeric response.

Australian Personality Inventory (API; Murray, Judd, Jackson, Fraser, Komiti, Pattison, & Robbins, 2009)
The API comprises 50 items drawn from the International Personality Item Pool (IPIP) with ten items associated with each of the Big Five traits, namely neuroticism (e.g., 'Panic easily'), extraversion (e.g., 'Make friends easily'), openness (e.g., 'Have a vivid imagination'), agreeableness (e.g., 'Respect others') and conscientiousness (e.g., 'Am always prepared'). Participants were asked to indicate their responses on a five-point scale with responses ranging from 1 (*very inaccurate*) to 5 (*very accurate*). Scores were averaged for each trait (after necessary items were reverse scored), with higher scores indicating higher levels of a trait.

Procedure

Ethics approval for the current research was obtained from the University's Human Research Ethics Committee. Participants were invited to take part in the research during the first week of tutorials via an information sheet distributed in class by their tutor. The information sheet emphasised to students that (a) their participation in the survey was completely voluntary, (b) all processed data would be anonymous, (c) their decision to participate (or not) would not affect their academic evaluation / relationship with the university (d) they were free to discontinue participation at any time, and (e) they were free to omit any questions they did not wish to answer. Participants who agreed to be involved in the study were able to access the online questionnaire through their portal on the university learning management system, where they were directed to the web address for the research. Return of a completed online questionnaire was taken as consent to participate in the research. Participants completed the survey during the first week of semester at a location and time of their choosing. Data were downloaded at the end of the first week, and analysed using SPSS Version 19.0. The data reported in this paper are from the first wave of data from a larger study, which will examine Facebook use and personality over four time points.

Additional data regarding university-badged Facebook pages have been acquired on an *ad hoc* basis by the authors through publicly-accessible groups and pages on Facebook using the university's name as the search term. These additional data are discussed in terms of the role of Facebook in university life and the direction for future research on social media and student engagement, to see how students themselves use Facebook in an academic context.

Results

Facebook Usage

Table 1 shows basic descriptive statistics relating to Facebook usage in our sample. Students spent an average of an hour per day on Facebook, typical usage was 20 and 90 minutes per day with half the sample's usage falling between. There was one exceptionally high user who spent 500 minutes using Facebook per day. Students had an average of 352 Facebook friends. The distribution was positively skewed with 50 percent of students reporting having 300 Facebook friends or less. Typical number of Facebook friends was between 190 and 480 friends, with half of the sample falling within this range. One student had an exceptionally high number of 1600 friends.

Table 1. Descriptive statistics for Facebook usage

	Mean time spent using Facebook per day	*Mean number of logins per day*	*Mean number of Facebook "friends"*	*Mean number of Facebook Groups joined*	*Mean number of photos posted*
Overall (N=390)	65.72 mins (SD = 62.36)	4.83 times (SD = 5.99)	352.70 (SD = 229.68)	66.33 (SD = 212.41)	283.18 (SD = 368.86)

The most preferred function/application of Facebook was the Wall (35.1%), followed by messages (17.9%), photos (17.7%) and events (14.6%). In response to the question, "Why do you like Facebook?" the most common response was "It is how I communicate with my friends" (55.9%), followed by "It allows me to communicate with people from my past" (17.2%). Only 4.9% suggested it provides them with information.

Personality factors influencing Facebook usage

Patterns of Facebook usage based on psychological factors incorporated in the five factor model of personality (Costa & McCrae, 1992) were analysed for the larger study and data on three of the factors, conscientiousness, extraversion and neuroticism are presented in Table 2. As can be seen from Table 2, students scoring high on conscientiousness spent less time on Facebook, had fewer Facebook friends, belonged to fewer groups and posted fewer photos to Facebook than those scoring low on conscientiousness. That is to say, students who are more conscientious used Facebook less than those who were less so. Table 2 also reveals that students scoring high on extraversion or neuroticism had more Facebook friends and belonged to more groups than those scoring low on these traits. Those scoring high on neuroticism spent the most time on Facebook and belonged to more groups, but posted fewer photos than those low on neuroticism.

Table 2. Facebook use based on personality factors of conscientiousness, neuroticism and extraversion.

	Conscientiousness		Neuroticism		Extroversion	
	Low M (SD)	High M (SD)	Low M (SD)	High M (SD)	Low M (SD)	High M (SD)
Time spent using Facebook per day	82.17 (78.04)	55.42 (48.77)	59.13 (57.14)	82.20 (81.77)	67.57 (64.97)	73.05 (74.50)
Number of Facebook Friends	393.31 (261.46)	282.52 (182.14)	365.09 (238.40)	363.73 (241.95)	279.71 (242.37)	441.22 (227.34)
Number of Facebook Groups	105.55 (246.29)	36.93 (79.60)	24.32 (57.87)	111.59 (331.56)	42.43 (83.46)	118.49 (355.42)
Number of Photos	294.15 (327.24)	237.75 (384.74)	300.64 (425.03)	259.38 (273.17)	161.09 (215.55)	385.07 (362.27)

Students high on neuroticism actively block certain users viewing their Facebook content via a “block list” more so than those low on neuroticism (40.4% versus 27%) although similar numbers prefer the wall to messages (58.7% versus 51.3%) and listed the wall as their preferred function (31.7% versus 31.9%), followed by messages (18.3% versus 19.5%). Students high on extraversion prefer the wall to messages compared with those low on extraversion (62.6% versus 53.8%) and check the wall more than once daily (53.3% versus 27.4%). A more detailed analysis of the influence of personality on Facebook usage will be presented in a forthcoming paper.

University-badged Facebook groups

A number of University-badged Facebook groups were identified by searching Facebook using the university’s name as the search term. Two of these groups were student groups specific to the psychology discipline, one under the “Clubs and Societies” heading and one under the “Academic Groups” heading. Both groups seemed to have similar overlapping purpose and overlapping membership and almost all the wall posts were messages to recruit participants for Honours research projects. A number of pages for specific units of study were located, and students used these pages for both social and academic exchanges. Academic exchanges were in the form of requests to share notes, procedural and administrative information relevant to assignments and assessments and to share their feelings of stress about workloads or marks, but rarely included academic discussion of psychological concepts.

One University-badged Facebook entity was named after a specific university campus (identified under “People” rather than “groups”). The role of the entity was to answer student questions (e.g., “hey guys, when/how do i find out my timetable for next semester?”), to publicise information (e.g., “If anyone is interested in Studying Abroad or Exchange there will be an information desk down in the atrium tomorrow between 12pm - 2pm!”) and to advertise campus events (e.g., “free tea, coffee, biscuits in the Library today in the new room near the library entrance”). The page was fairly active and seemed to provide a useful interaction with students.

Another style of Facebook page, a Community page called <University Name> Stalkerspace was identified, along with similarly styled pages for the majority of Australian universities and many well-known international universities. These “stalkerspaces” are sites for people to make humorous observations about the people around them (e.g., “major lol @ guy snoring on level 3 at library!”, or to invite people they have seen in passing to interact with them (e.g., “To the hot asian in the black, hello ;)”). This is an excerpt from the official description of one such Community page: “<University Name> StalkerSpace is a group that aims to connect <University Name> students that may have otherwise lost each other in the sea of faces of your lecture theatre (or simply around the traps).” With over 2000 “likes”, the site is well-utilised.

Discussion

Summary of findings

Nearly all students have a Facebook account. The majority of those who do not use Facebook appear to have made a conscious choice not to. The main use for Facebook as identified from the survey data seems to be social interaction. The focus of student-initiated university-badged Facebook sites was also predominantly social, or for the recruiting of participants for student research projects. Very few students use it to seek information, however, this finding should be interpreted with some caution. Given that Facebook is predominantly used for social interaction and relatively few survey items asked specific questions about obtaining information, respondents may not have given much thought to this aspect of Facebook usage.

Different personality factors appeared to influence patterns of usage of Facebook. Of most relevance to this paper, students who scored high on conscientiousness did not use Facebook as much as those who scored lower on this attribute, suggesting that they were less likely to be distracted from their studies by Facebook use. That is to say, conscientious students stayed away from Facebook, rather than using Facebook as a means to engage more with their studies, supporting the characterisation of Facebook as a social medium rather than a medium for academic interaction. Students who scored higher on neuroticism spent more time on Facebook and belonged to more groups than those who scored low on this factor. Although they had a similar number of friends, they posted fewer photos of themselves and used block lists more than students scoring low on neuroticism. Facebook as a medium supports the ability to find out about the social and personal life of Facebook friends without actively engaging with them – as noted by Postman (1985/2005) with respect to television, the so-called 'social' engagement promoted by Facebook is engagement with the medium through which the external world is being viewed (Facebook), rather than with the external world itself. Insofar as high levels of neuroticism are related to less satisfying social relationships (e.g., Denissen & Penke, 2008), it would seem that the use of Facebook does not actively promote social engagement with people through its interface (e.g., using the chat tool as a proxy for speaking), but rather, allows engagement with the Facebook site to be a proxy for social engagement with real people. Thus Facebook as a tool to promote social engagement for students who are below the norm on this factor may not be effective, but worse still, may serve to draw attention to a readily available source of distraction from academic engagement.

Students scoring high on extraversion had more friends, belonged to more groups, posted more photos of themselves and were more likely to check their Wall more than once daily, none of which is in the least bit surprising - Facebook offers a medium through which they could express the extraversion factor of their personality. Students scoring lower on extraversion did not interact with as many people or share as much personal information.

The snapshot of data presented here suggests that personality factors influence patterns of usage of Facebook, so that Facebook use reflects personality rather than providing an unbiased avenue for improving social interactions across the board. The relationship between Facebook usage and personality revealed by our data will be discussed at greater length elsewhere. However the implication of the effect of personality factors on Facebook usage for people planning to use Facebook to promote social engagement within their student cohort is that Facebook provides a medium through which students can exhibit their personality traits and engage socially in their own individual style, but does not enforce or encourage any particular form of social behaviour, such social behaviour that might result in increased academic engagement. Indeed, Facebook may act as a distractor, seducing the less conscientious students from their studies, and providing a platform for people to express their personality and relationships with others in the Facebook world.

Facebook as a distractor

In the course of the study, we had much anecdotal evidence to support the notion that many students find Facebook distracting and intrusive in class. This is in accordance with previous literature (Madge, Meek, Wellens & Hooley, 2009) that, although students can use Facebook to work on assignments with fellow students (e.g., using chat to facilitate direct engagement with academic work), students mostly use Facebook to set up times for face-to-face meetings to work on assignments (facilitating social engagement around future academic engagement).

We also had anecdotal evidence to suggest that many students turn to Facebook when they are "bored" or to provide a mental break when they feel overly-challenged. In either case, Facebook offers an easy option to avoid dealing with the academic issue (of boredom or challenge), which ties in with the finding of Zhong et al. (2011) that students scoring low on the need for cognition (Cacioppo & Petty, 1982) use social media more than those scoring high on this attribute. If this pattern of usage is typical, then Facebook may act as a preferred form of distraction through its ready availability, and the association of Facebook with distraction may serve to reduce its potential as a tool for promoting academic engagement. The design of Facebook makes this particularly likely since it is specifically designed to promote interaction with people and products, and to entertain – it aims to capture attention and keep people engaged with their world through its interface. It does not currently have any interface controls that could be used to focus students on study-relevant forms of interaction. While the familiarity of Facebook may be useful for new students to engage socially within the unfamiliar academic learning environment, Facebook usage may better be construed an indicator of the problem of disengagement (distraction) from study, rather than a potential solution to the problem. It is important to note that the solution to the problem of disengagement due to boredom is likely to be quite different from the solution to the problem of disengagement due to overly-challenging academic content, despite one of the symptoms of disengagement (Facebook usage as displacement activity) being the same. The next phase of our study includes additional questions on boredom with respect to Facebook use and a recent report suggests that boredom is a significant factor in university attrition rates (Coates & Ransome, 2011).

University-badged pages

Facebook community pages (e.g., Stalkerspace) show that students can and do use Facebook to increase social engagement, but this form of social engagement is not likely to result in direct academic benefit, and we argue that it is not the role of the institution to invade that space academically. On the other hand, the Campus "person" is a good interface to engage with students on non-academic matters, but anecdotal evidence from this study and data from elsewhere (Madge, Meek, Wellens & Hooley, 2009; Mazer, Murphy & Simonds, 2007) suggests that students (especially undergraduate students) do not want to interact with academic staff through their personal pages on Facebook. It may simply be that the interface is not conducive to conducting academic conversations. It is also possible that students find engaging with instructors and mentors in a forum they construe as part of their social world creates a sense of unease. Traditional roles and "social distance" may still need to be maintained in cyberspace, but the means for doing so are still emerging. In this light, the possibility of using other role-based "entities" such as Unit pages for individual units of study (modelled on the Campus "person") might provide an opportunity to give academic support to students in an quasi-anonymous, less threatening environment than the formal LMS environment.

Student engagement typologies

As discussed earlier, student engagement is multi-faceted and has proved difficult to define. In an attempt to address this complexity, Coates and colleagues (Coates, 2007; Krause & Coates, 2008) have modelled social engagement and academic engagement as two orthogonal dimensions of the engagement space. Using this framework, student engagement can then be classified into four types based on scores along each dimension (see Figure 1). According to this typology, students who are high on academic engagement and high on social engagement are intensely engaged with their studies, whereas those who are high on academic engagement but low on social engagement are a more independent study type. Students who are low on academic engagement and low on social engagement have a passive approach to study whereas those who are low on academic engagement but high on social engagement have a collaborative approach to study. Coates proposes that the engagement typology is a state rather than trait construct, and students may show different types of engagement at different phases of their study. The advantage of this typology is that it allows the possibility for different strategies to target different types of student engagement.

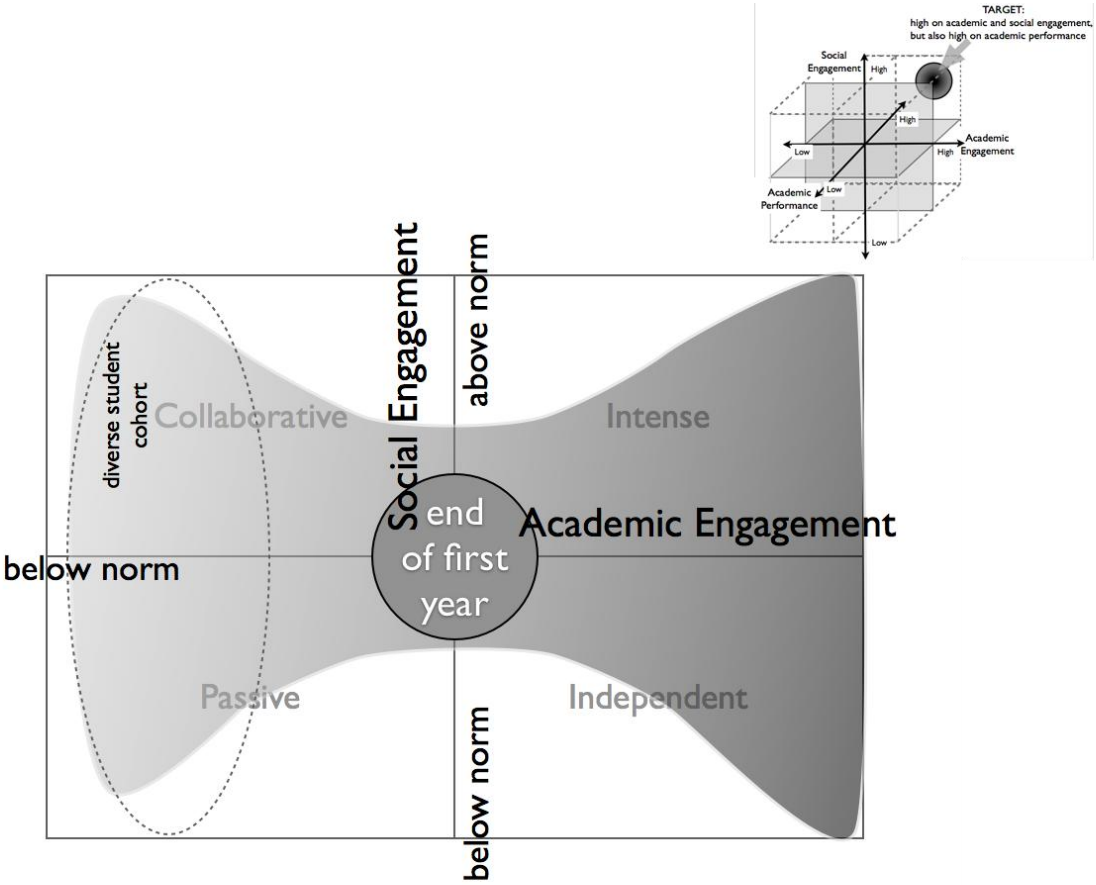

Figure 1. Typology of student engagement adapted from Coates (2007) and described further in the text.

Figure 1 shows the diverse student cohort entering the university (dotted oval) as being generally low on academic engagement but covering the whole spectrum of social engagement. The shaded background serves as a funnel aiming to bring people to a common level on both social and academic engagement by the end of first year (middle circle), and aiming to move them to the higher end of the academic engagement scale in later years (dark end of shaded gradient). While it is quite clear that a low level of academic engagement is not desirable for a university, it is not clear whether there should be a preference for very intense or very independent engagement types.

Of particular interest with respect to this study is that social engagement may operate differently for different types of students at the low end of the academic engagement scale. For example, passive students (students who are low on both academic and social engagement) may improve academic engagement by increasing their level of social engagement, for example through use of the familiar medium of Facebook. However, if passive students are also high on neuroticism and personality affects Facebook usage, media such as Facebook may provide a distractor which is a proxy for engagement, rather than providing real engagement, and as such, may reduce rather than increase academic engagement. In contrast, collaborative students may improve their academic engagement by *decreasing* their level of social engagement and becoming more independent in their learning. Data from this study showed that more conscientious students used Facebook less than others, suggesting that collaborative students may want to avoid using Facebook to increase their academic engagement. One thing missing from the Coates typology is a third dimension reflecting academic performance. The inset three dimensional space in Figure 1 includes a performance domain. The target zone identifies a high level of academic performance motivated by academic engagement and supported by social engagement. The data from this study suggest that using social network sites such as Facebook may aid more passive students in becoming socially engaged, but may serve as a serious distractor for more collaborative students, and on this basis, we urge caution in adopting Facebook for use within academic learning contexts.

Social Media and Learning Management Systems

An important issue concerning Facebook in an academic context is that the lack of control an instructor has over the interface severely limits its usefulness as a tool for direct education. While instructors can contribute content, they have no control over the structure or appearance of pages and no means of editing or moderating student interactions with content once posted. With such limited scope for academics to contribute to the instructional design, there is consequently limited scope to promote the behaviours and cognitions that contribute to engagement and learning.

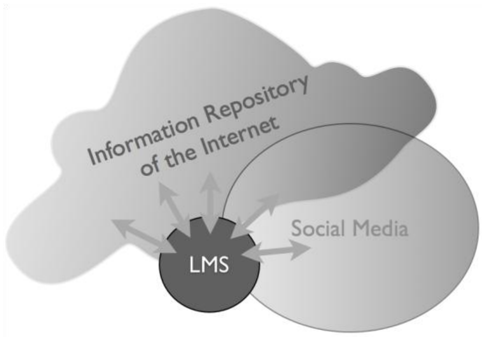

Figure 2. Learning Management Systems as the interface between the University and the Internet.

While Web 2.0 technologies including Facebook have been touted as offering untapped potential for innovative teaching and learning, institutionally-based Learning Management Systems (LMS) with their conservatively structured interfaces and corporate ownership, serve to recreate institutional boundaries to ensure that formal learning is contained within its own “space”. Although the inherent philosophy of ownership of content and the lack of flexibility of institutionally-controlled LMSes has been an ongoing issue for many academics, perhaps the time has come where these constraining layers of control have advantages. From an institutional perspective, the LMS defines the institutional boundaries with as much clarity as is possible in cyberspace, and defines institutional roles by what they are permitted to do. Importantly, it clearly it leaves the dangers of Stalkerspace sites and uncontrolled interpersonal interactions on Facebook beyond the campus boundary.

Given that most LMSes can replicate many of the interaction functions of Facebook, the value of social media tools in an academic environment may by solely psychological, e.g., promoting positive affect, and norming experiences. Use of social media may not directly create academic engagement, but may make successful engagement more likely for a subset of students. However there are many issues to resolve before pursuing such a path. As depicted in Figure 2, a university LMS acts as the institutional gateway to the world of the internet, both as a vast information repository and as a vast social network, and it may be prudent to maintain such gateways until the governance of cyberspace and the boundaries of educational responsibility are more clearly defined.

Conclusions and Future Research

In this paper, we consider the role of social media in increasing student engagement. We argue that the aim of first year university is to moderate academic and social engagement to a common level to ensure that students become sufficiently engaged with their studies to want to continue at university. To achieve this outcome, students exhibiting different types of engagement may need different interventions, to foster collaboration for some students and to foster independence for others. As students progress to later years, the target engagement zone will be skewed more to the high end of the academic engagement scale.

We have argued that Facebook, a medium for social interaction, has only a limited role, if any, to play in promoting student engagement from an academic or institutional perspective. As noted earlier, Twitter is by design more of an information-sharing service than a site for social interaction. Therefore, it may be that Twitter has more potential for improving academic engagement. Twitter, a microblogging service, offers a different type of social network service from Facebook sitting somewhere between a social network and a news service (Kwak, Kee, Park & Moon, 2010). Twitter posts (tweets) are designed to be brief and topical, and people can follow other people (have their tweets sent to them) or can interact via the Twitter website. The short format of tweets (140 characters) encourages conciseness, and the ability to tag themes requires meta-awareness of content and audience, so that tweeting uses cognitive skills also valued in academia. The concept of microblogging (pushing out small amounts of information with transient temporal relevance) uses the social network as a vehicle for information flow, rather than as a vehicle for strengthening interpersonal bonds. This apparently simpler technology is possibly better suited to creating interactions which are more clearly cognitively and behaviourally relevant to successful learning.

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EBooks as teaching strategy – preliminary investigation

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Besides serving as tools for leisure-reading and self-learning, eBooks can be effective in the facilitation of teaching and learning. Teachers can proactively make use of eBooks to facilitate teaching and learning. The Mobile Learning Project at The Chinese University of Hong Kong was exploring the use of eBooks from teachers' perspective. This paper was about two cases in which teachers created the eBooks themselves rather than using commercially prepared materials. In one case, the eBooks became reference materials for students to freely refer to when they were in need of more information. In the second case the eBooks created were tightly integrated with curriculum such they were required weekly readings that matched the weekly topics of the course. Much care had also been paid to make the eBooks viewable on the majority of students' handheld devices. Surveys and download statistics of the eBooks were used for evaluation. The findings pointed us to both promises and challenges.

Keywords: Mobile learning, eBooks, mobile devices

EBooks as teaching strategy

EBooks bring a great deal of convenience to its users. Lucia (2001) once said eBooks would never go out of print, and new editions can be easily created. EBooks take up little space and the technology allows students to store several chapters of one or more books at once in one portable reader. That is, 'tons' of reading materials that take up the space of a tall bookcase can now rest effortlessly in one mobile device as if it was a personal library that could be retrieved regardless of time and space. On the other hand, the software that enables eBooks to be readable on personal devices usually provides features such as full text searching, customizable font size, mark-up, or even note taking (Lucia, 2001). Moreover, the content of an eBook may be supplemented with multimedia, which assures a greater variety of information to be displayed simultaneously. "Hyperlinks can be used to bring the student, while reading the text, to a number of educational resources that cannot be included in the text of the course, such as multimedia materials, interactive exercises, quizzes, discussions, etc" (Mazza, 2008, p. 2). Therefore, eBooks may serve as learning tools especially among students who are comfortable with the technology.

Despite the fact that eBooks can be used for leisure-reading and self-learning among students themselves, we regard that teachers should proactively make use of eBooks in facilitating teaching and learning. The usage of such, from the perspective of teachers, involves in the preparation or even the development of eBooks for students. However, the willingness of students to adopt the use of eBooks in this scenario can be more challenging –limitations of the technology can seriously affect the degree of acceptance towards it especially if the technology is expected to be used by not only the most technology-prone students but all students. Past research by Anuradha and Usha (2006, p. 2) mentioned some of the challenges that hinder the acceptance of eBooks, including: high cost of hardware readers, users' unwillingness to change, a general lack of awareness in eBooks, and particularly, in the academic setting, the fact that the number of printed books are more readily available than that of eBooks in libraries. Furthermore, the success of eBook relies heavily on the ease of the whole reading process. Malama, Landoni, and Wilson (2004) noted that the layout of the eBook on screen was a significant factor that affected the quality of reading experience among users substantially. A successful layout of such involves in the ease of navigation through a clear user interface, and a clear and logical structure that supports readers' sense of place in the eBook.

Empirical data is thus in demand to understand whether eBooks can be effectively used by teachers to facilitate teaching and learning in the present tertiary institutions. The present paper reports two cases in which teachers adopted eBooks as innovative teaching strategies. The study was carried out by the Mobile Learning Project at The Chinese University of Hong Kong (CUHK) (http://www.cuhk.edu.hk/mlearning), which focused on providing teachers and students the following: practical guidelines, resources and sustainable technical solutions to various mobile learning strategies.

There are many possible ways a teacher can approach to adopt eBooks as a teaching strategy. We regard that the approaches involves the consideration of the three major parameters, which vary across a continuum. The following model (graphically represented in Figure 1) depicts a perceptual map of these three parameters. The cases that our project investigated belong to the parameters as indicated below.

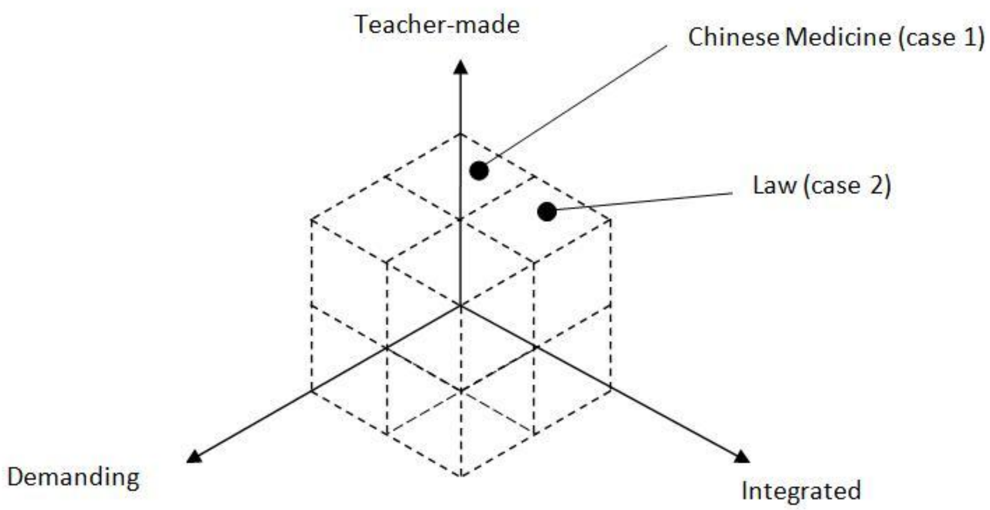

Figure 1: Model explaining various designs of eBook teaching strategies

Teacher-made vs. commercially-prepared materials (vertical component of the diagram)

Teachers often choose to adopt commercially-prepared materials or teacher-made materials. The former is available at big eBooks stores (e.g. Amazon, Barnes & Noble, etc) that can be readily incorporated into a particular course at university. Whereas the latter, with the availability of open-source eBook standards such as ePUB and the prevalence of software that allow the creation of eBooks, is now feasible for teachers to develop tailor-made eBooks specified for their own courses of teaching and learning.

Each of these types has its own advantages and disadvantages. Commercial eBooks require less effort to be adopted by teachers and yet as a result of Digital Rights Management (DRM) restrictions, commercial eBooks have been blamed to cause a great deal of inconvenience to its users (Turner, 2005). Moreover, it is very difficult to find a commercial eBook, which fulfill the exact requirements of a course. In contrast, teacher-made eBooks can be customized easily by teachers. For example, the eBook chapters can be separated into different files and released in respective sequence and timing that best suit curriculum and learning activity design. The construction of tailor-made eBooks represents substantial effort from teachers. Nevertheless, they can be made available to students free of charge, which serves as another advantage over commercially made eBooks. Besides, past research by Putney (2004) suggested that teacher-created eBooks led to higher degree of motivation among students in using the technology.

Hardware demanding vs. less-demanding designs (bottom left component of the diagram)

The design of eBook can be on one hand, heavily relied on expensive and up-to-date devices and on the other, based on technology that poses minimum requirements on hardware and software. That is, the pressure exerted on teachers or students in purchasing additional devices is downplayed.

The first solution to impose less pressure on the requirement hardware is the adoption of JAVA-based eBooks. Most mobile devices (even low-priced models) that were produced in last couple of years supported JAVA ME and allowed the execution of MIDlet applications. mjBookMaker is a piece of software that allows the conversion of MS Word, FB2 and plain text into MIDlet applications, which can be executed on JAVA-enabled phones. JAVA-based eBooks (MIDlet) are in-built with a simple eBook reader, which is coupled with basic and yet comprehensive eBook functions such as search, bookmark and tables of content. By taking advantage of the in-built function, together with mjBookMaker, which provides a convenient solution in making eBooks, academic eBooks can be made available rather easily. However, because JAVA-based eBooks are designed for low-end mobile phones which do not have high processing power to perform complicated tasks, JAVA-based eBooks are usually limited in functionalities. For example, eBooks of such do not contain tables nor support large images. Users of these eBooks cannot make their own notes as they read along the text of each page. Last but not least, the screens of these mobile devices are usually too small to be read comfortably by users.
In comparison with the first solution which is more compatible with low-end devices, ePUB may be a better choice for higher-end mobile devices such as smartphones. The ePUB (short-term for electronic publication) is a free and open eBook standard developed by the International Digital Publishing Forum (IDPF). The format of ePUB is designed for reflowable content. That is, text display can be optimized for a particular device. Moreover, while the first solution is less interactive and incompatible with non-text elements, the ePUB supports URLs in addition to images.

However, ePUB eBooks do not have the eBook reader software built into eBook files as that in JAVA-based books. Instead, in order to read these eBooks, users are required to install an ePUB compatible reader application into their mobile devices. Since high-end hardware is mostly used in this case, ePUB readers are designed with a lot of features, which allow personalization. According to Gupta and Gullett-Scaggs (2010), these personalized functions often permit users to take notes on the margins of an eBooks, to quickly adjust the size of display, and to fill up screensavers with photos from the users. The market of mobile devices evolves with a tendency of higher processing speed (e.g. Apple iPhone, iPad and Android tablets), and higher capability to accommodate richer content on top of text. The latest ePUB eBook is a better choice of format in embedding multimedia for playback during reading. The latest format of ePUB provides a channel for users to listen to audios, to watch streaming or non-streaming videos, and to gain access to other online information as they flip over the pages of an eBook.

Integrated vs. non-integrated approaches (bottom right hand component of the diagram)

The third component of the diagram measures how much an eBook should be integrated as an essential part of a course. On the far side of the continuum, eBooks are adopted in as textbooks, which are expected to be brought to class by students whenever reading is required. Towards the other extreme on the continuum, eBooks serve as additional readings or reference materials, which allow students to review them flexibly at their own pace of time, irrespective of geographical location.

The use of eBooks reported in Morton, Foreman, Goede, Bezzant and Albertine (2007) was an example of an integrated design in which the content of dermatology course was incorporated into the eBooks in the School of Medicine at University of Utah. These eBooks required relatively advanced hardware in couple with dedicated eBook reader software. The eBook reader supported functions such as bookmarking pages, keyword search, and note-taking, etc. Students of the course regarded that the eBooks were effective in delivering course content.

The iPad programme in Briar Cliff University, on the other hand, was an example of using eBooks in an non-integrated manner. Thompson (2010) reported that the University bought a few iPads, which were allowed to be checked out by students from the library. These iPads were preinstalled with reference eBooks on top of other useful software. The purpose of these devices was to provide an alternative mean for students to access to rich information. When a student returned the iPad, a reset and re-sync process were used to remove all personal information as created by previous users. While the iPad is not as affordable as other tablet computers in the market, Larson (2010), an assistant professor of elementary education at Kansas State University, suggested that Kindle eReaders might be used as another non-integrated approach to broaden and enhance students' reading experiences – a rich source of extended reading materials.

The study

The paper reports two cases in which there were adoptions of eBooks in both teaching and learning in two very different disciplines (Chinese Medicine and Law) at CUHK. The purpose of our study was to determine whether it was feasible to use eBooks as a tool for both teaching and learning. The Mobile Learning Project at CUHK supported the teachers in the creation, implementation and evaluation of the adoption of the eBooks.

As indicated on Figure 1, the two cases had the following specific designs. First of all, instead of using commercial eBooks, we created tailor-made eBooks for the teachers based on teacher-provided text. Secondly, in both cases, the teachers and developers paid attention to the issue of equity - to ensure as much as possible all students receive an equitable learning experience such that students were not discriminated against whether they have had the expensive mobile devices or not. Students were not told to buy any dedicated devices; instead eBooks were developed to be used on the existing mobile phones' platforms they owned. Therefore, firstly, instead of using commercial eBooks, we created tailor-made eBooks for teachers based on text that they provided. The two cases, however, differed in the extent the eBooks were integrated into the curriculum. The details of these two cases are elaborated below.

Case 1: Chinese Medicine

In Case 1, a teacher at the School of Chinese Medicine at CUHK developed eBooks as reference resources for students to refer to at times of their self-studies or at times when they are conducting medical consultations. Because most of them did not use smartphones but standard phones, which support JAVA, therefore, JAVA-based eBooks were used in this project. In order to avoid students from becoming over-frustrated in using the technology, eBooks were not required components of the curriculum but supplementary reference materials. These eBooks represented quick reference materials that enabled students to search terminology and to read through information in relation to a particular term. They covered a number of the essential topics in 3 fields: 'Internal Medicine', 'Chinese Materia and Herbal Formulary' and 'Acupuncture'.

Referring to the framework portrayed in Figure.1, the project involved a design that was non-hardware demanding and the materials not integrated into curriculum. In order to familiarize students with these eBooks, workshops were conducted internally to introduce this mobile learning tool. All together, 34 students came to these workshops. They were introduced briefly to the technology and the procedure involved in installing eBooks into their mobile phone, and the techniques to maneuver with functions such as searching, navigating and bookmark. Feedback was collected two times through surveys during the study: the first questionnaire was administered immediately after the completion of workshops, which solicited their first impression towards the technology, and the second one was administered to 34 students through emails after a period of three months to check whether they had used them and whether their perceptions towards eBooks had changed upon using the technology. A total of 31 responses were collected in the first questionnaire, which led to a response rate of 91.18%. The response rate of the second questionnaire was 70.6%, which was represented by 24 responses.

Case 2: Law

In Case 2, a professor from the Faculty of Law at The Chinese University of Hong Kong created a set of 12 Land Law seminar guides to accompany the Principles of Land Law course over the period of one semester. These guides were derived from each topic in the course syllabus and served as good weekly reading materials. Students were asked to review these materials on mobile devices that they currently used. 12 eBooks were created and disseminated to students one after another corresponding to lecture topics.

These eBooks were available in multiple formats so as to assure easy access. In particular, ePUB and JAVA-based eBooks were created to serve students who had smartphones and those who had not respectively. Furthermore, teachers took effort to make these materials available in other channels as well. The same set of reading materials were converted into Word documents and PDFs respectively so that students could view them on desktop computers in addition to their handheld devices. With reference to the model in Figure 1, the usage of eBooks in this case can be regarded as non-hardware demanding and yet highly integrated with the curriculum.

208 students enrolled into the course. These files were uploaded to the course website hosted on the learning management systems (LMSs) – Word documents and PDFs could be downloaded from Moodle while eBooks could be preview via Mobile Moodle. The internal logging system of the LMSs was responsible for tracking the number of accesses to the website and the frequency of downloading (each of the eBooks as mentioned above) that happened within the platform.

Findings

Case 1

Table 1 shows the feedback of students on the two questionnaires administered in Case 1. There were a few patterns of usage that could be identified in this case. Firstly, while many of our students reported to have experiences in reading eBooks on larger screens in less portable devices such as desktop and notebook computers (the score being 3), they had relatively less experience in reading eBooks via mobile phones (the score being 2.2). In other words, it was a relatively novel idea for students to view eBooks via mobile devices when they were first introduced to using eBooks on mobile phones in the workshops.

Table 1: Students' feedbacks on eBooks (Case 1)

	First impression		Actual usage (After three months)	
	Mean	Number of responses	Mean	Number of responses
	1 being 'Never' and 5 being 'Always'.			
Do you read eBooks on desktop/ notebook computers?	3.00	31	-	-
Do you read eBooks on mobile phones?	2.17	30	-	-
How often did you read the Chinese Medicine eBooks on mobile phones?	-	-	3.13	24
	1 being 'Strongly disagree' and 5 being 'Strongly agree'.			
I think the Chinese Medicine eBooks are convenient.	4.06	31	-	-
I will like to use the eBooks introduced in the workshop.	4.03	31	-	-
I think the eBooks introduced in the workshop will be useful to me.	4.13	31	-	-
I think I already have the mobile phone on which I can comfortably read eBooks.	3.48	31	-	-
The Chinese Medicine eBooks were easy to operate.	-	-	3.88	24
I think the Chinese Medicine eBooks are important learning tools.	4.00	31	3.79	24
I feel comfortable reading the Chinese Medicine eBooks on a mobile phone screen.	3.71	31	3.25	24

Results from our first survey concluded that students in general, when they were first introduced with eBooks, perceived positively towards the adoption of eBooks. Students thought that eBooks were convenient (mean = 4.06). They claimed they would use the eBooks, which were introduced in the workshop (mean = 4.03). Besides, students reported these eBooks to be useful to them (mean = 4.13). They believed that eBooks would be important learning tools (mean = 4.00). Students were uncertain about how comfortable it would be reading eBooks on small screens (means 3.48 and 3.71 in two related items), nevertheless, students held high expectation towards these eBooks in other criteria. That is, even if they had to read JAVA-based eBooks in small mobile phones, they preferred eBooks to traditional paper books for the reason of convenience.

Students perceived less positively towards the adoption of eBooks upon 3 months of usage. It seemed that the limitation of eBooks in its display had overridden the effect of novelty, which gave rise to a decrease in the following two criteria. The mean score, which shows the degree of comfort experienced while reading eBooks on a mobile phone screen had reduced from 3.71 (first survey) to 3.25. A decrease was observed concerning whether eBooks were important learning tools (3.79 vs. 4.00 in the first survey). Despite its limitations, students reported to have read eBooks from time to time (mean=3.13). Moreover, they perceived that those eBooks were easy to operate with (mean=3.88).

The last question of our questionnaires consisted of an open-ended question. From the open-ended question of the first questionnaire, students perceived eBooks to be portable and convenient (exact wordings: “eBooks are portable” and “the mobile phone is convenient, no need to physically bring the ordinary books.” respectively). In addition, some of them reported that “it (eBooks) is good when we cannot get access to the computer/textbook”.

From the open-ended question of the second questionnaire, similarly positive comments were recorded. For example, they wrote “eBooks are more convenient and handy compare with ordinary books”, “eBooks can contain a wide range of content related to Chinese Medicine topics”, “using the search function, the information can be searched very quickly”, and “the eBooks can be used frequently during transportation”. Despite all of these positive comments, one student noted that “viewing the eBooks on the mobile phone screen for a long time will make the eyes tired”, which has to addressed in future design if eBooks were adopted to be used repetitively for long hours.

Case 2

Table 2 illustrates the average number of download per student as recorded in the LMSs in Case 2. Each row of result consists of 3 numbers: 1) the total number of students who downloaded a particular eBook from the LMS, 2) the total number of download performed by students in LMS number (as one students might have downloaded the same file for many times, and 3) the average number of download performed by one student respectively.

For the purpose of presentation, ePUB and JAVA-based were grouped as eBooks whereas WORD and PDF were grouped as eDocuments.

Table 2: Access logs from LMSs (Case 2)
(Number of students / Number of download / Number of download per student)

		eBooks		eDocuments	
Week	Seminar guide topic names	ePUB	JAVA-based	WORD	PDF
1	Fundamental principles	60 / 89 / 1.48	74 /119/ 1.61	184 / 483 / 2.63	5 / 8 / 1.6
2	Leases	46 / 65 / 1.41	51 / 63 / 1.24	174 / 600 / 3.45	1 / 1 / 1
3	Formalities	31 / 36 / 1.16	27 / 30 / 1.11	164 / 457 / 2.79	1 / 1 / 1
4	Priorities	31 / 45 / 1.45	18 / 22 / 1.22	174 / 462 / 2.66	1 / 1 / 1
5	Licences	17 / 22 / 1.29	13 / 15 / 1.15	163 / 402 / 2.47	1 / 1 / 1
6	Informal trusts and Chinese customary trusts	15 / 16 / 1.07	9 / 14 / 1.56	141 / 230 / 1.63	0 / 0 / 0
7	Adverse possession	18 / 21 / 1.17	19 / 21 / 1.11	164 / 380 / 2.32	0 / 0 / 0
8	Co-ownership	16 / 19 / 1.19	11 / 12 / 1.09	157 / 317 / 2.02	0 / 0 / 0
9	Easements	16 / 21 / 1.31	13 / 13 / 1	155 / 327 / 2.11	0 / 0 / 0
10	Land covenants	14 / 17 / 1.21	10 / 14 / 1.4	152 / 311 / 2.05	1 / 1 / 1
11	Leasehold covenants	11 / 13 / 1.18	6 / 7 / 1.17	150 / 307 / 2.05	0 / 0 / 0
12	Mortgages	9 / 9 / 1	7 / 7 / 1	147 / 305 / 2.07	1 / 2 / 2

Results showed that eBooks had generated a great deal of attention at the beginning of the semester when they were first introduced. The effect of novelty seemed to dominate and have attracted about 50 to 60 students (out of 208) to access to these eBooks in first two weeks. Both ePUB and JAVA were used by students. However, the number of download per student in both categories fell quickly to about 10% of students in total in the following weeks even though many of them remained core users of eBooks until the end of semester. In comparison with the results from eDocuments, the number of download per student in WORD and PDF is significantly greater than that in ePUB and JAVA-based eBooks. Therefore, it is reasonable to conclude that students favoured eDocuments than eBooks during the semester. In contrast with the number of download per students in eBooks, which decreased rapidly soon after they were introduced, the nuimber of download per student in eDocuments remained stable over the semester in which over 75% of the students regularly downloaded them every week. To a certain extent, the statistics above seemed to suggest that students preferred materials to be available on desktop rather than on mobile particularly when the content of that piece of material is essential to the curriculum. Although some of these students might want these materials to be always available on their personalized mobile devices, for most of them desktop computers seemed to be more important as they allow them to make notes and to print files.

The format of Word document was by far the most popular whereas the format of PDF was least popular in terms of usage (even if we compare the results with that obtained in ePUB and JAVA eBooks). Even though PDFs can be easily viewed in desktop computers, it is less editable. It is understandable that students preferred to work on formats that provided diverse choice of options, which in turn enabled flexibility in usage.

Lastly, it was interesting to note that the average number of downloads per student for eBooks and eDocuments were roughly 1.3 and 2.4 respectively. The difference might be attributed to the fact that students who downloaded eBooks onto their mobile devices did not need to do the download again as eBooks on mobile devices was presented at all times once they were downloaded and incorporated into personal devices. However, students who downloaded files in one computer might find it necessary to download it again if he/she wanted to work on those files with another computer.

Discussion

As suggested in Figure 1, any particular use of eBooks involves many considerations on the part of the teachers. We would like to revisit these design decisions in this discussion section based on the new understanding we had because of the two cases.

Firstly, teacher-creation of eBooks seemed to be worthwhile strategies to further investigate. The technical skills behind the development of teacher-made eBooks were minimal but its potential benefits can be great. In comparison with commercial eBooks, which come in rigid forms and styles of content, teachers have more control over the content of their own eBook. Furthermore, tailor-made materials are often a better fit to the curriculum as they can be customized heavily corresponding to various requirement requested by teachers. In addition, as a result of its originality, tailor-made eBooks, in comparison with commercial eBooks are a lot more transferrable as there is less restriction on the distribution of these eBooks. Nevertheless, the success of tailor-made eBooks lies in whether teachers have ready-made materials that can be converted into eBooks and whether they are willing to spend additional time and effort in making their own eBooks. Despite the use of eBook-creation software is deemed simple and easy by our research team, we failed to train a single teacher who can (or are willing to) use the software on their own in the construction of DIY eBooks. Most of our teachers preferred one-stop shop services to an opportunity in learning this piece of technology subsequent to inadequacy in technical support, which should be taken into account if eBooks were to be introduced in the future.

Secondly, the strategy that our project adopted to reduce the reliance in technology-demanding hardware so as to assure access to eBooks, resulted in both advantages and disadvantages. In terms of advantages, hardware-lenient eBooks (e.g. the JAVA-based eBooks) did effectively allow more students in accessing eBooks via mobile devices that they had been using. The adoption of hardware-lenient eBooks served as an immediate strategy in relieving the stress to purchase additional equipment for viewing these eBooks. However, eBooks that work in less-advanced equipment are normally limited in functions. Results from Case 1 revealed that students experienced discomfort as they had to read long paragraphs via small screens installed in lower-end hardware. Nevertheless, the initiative to explore and to develop eBooks in the future should focus on dealing with reading experiences in higher-end rather than lower-end hardware as it is expected that ownership of higher-end devices with large screens will be substantially prevalent due to the rapid advancement in technology recently.

Thirdly, results from the cases above seemed to suggest that eBooks as references is a preferred strategy to eBooks as tools for disseminating notes and/or curriculum-central materials. Reference materials are often too thick to be printed out or carried around. The fact that these reference materials were made available for viewing on mobile devices allowed students to carry and to read important information regardless of time and geographical locations – our finding in Case 2 in which the average number of download per student in eBooks was lower than that of Word documents to a certain extent confirmed such characteristic. In terms of eBooks that are tightly integrated with a curriculum, students from our studies had a tendency to print them out or to work on them via a desktop computer.

In short, the study confirmed eBooks to possess great potential in becoming a teaching strategy. The experience in the Chinese Medicine eBooks was particularly promising. Despite the limitations in the lower-end hardware, students in general, perceived eBooks to be beneficial in various aspects. They perceived eBooks to be convenient and portable, which aroused their intention in using them regularly. Most importantly, they were positive about the ease of use of the technology and the benefits that it has towards learning.

Conclusion

The study explores the design of eBooks in two respective courses at The Chinese University of Hong Kong in which teachers adopted eBooks proactively in the facilitation of teaching and learning throughout the course of a semester. Teachers created eBooks by themselves in both cases rather than using commercially prepared materials. In Case 1, eBooks were adopted as reference materials for students to refer to when they were in need of more information whereas in the other case, eBooks were created and integrated tightly with the curriculum in a way that students were required to perform weekly readings corresponding the topic to be delivered in a particular week of the course. Teachers in both cases took substantial steps in assuring eBooks to be viewable in majority of the handheld devices owned by students.

There were both promises and challenges in our findings. EBooks were good learning tools but students' willing adoption could be challenging. The study revealed that limitations in eBooks (especially in situations related to older technology and hardware) could seriously affect the experience in learning with the technology among students. In addition, results from Case 2 showed that the nature of the content had an impact on the choice of medium in viewing the same set of materials. That is, students chose to view some materials in ePUB or Java via mobile devices and some in WORD or PDF via desktop computers depending on the nature of materials that they were reading about. In general, eBooks seem to be a good format for rich referencing materials.

The study also showed that teacher-creation of eBooks is technically and pedagogically feasible. Therefore, there are good reasons for teachers to adopt their own materials into his or her teaching strategies in complete or partial replacement of commercial resources. There is a wide variety of software available in converting text into eBooks. The time and skills required to develop an eBook is less substantial whereas the time required to write the content in the very beginning is more demanding.

Lastly, we should bear in mind that the two cases reported in this study only showcased two of the many ways in adopting eBooks as a strategy of learning at university. While the implementation of eBooks in both cases was novel to the teachers, results as recorded in our questionnaires might vary significantly if teachers were able to revise upon reviewing the comments and limitations. Therefore, it is necessary to explore the use of eBooks in other subjects and in varied designs in order to get a wider picture of the feasibility and effectiveness of eBooks in tertiary education. Nonetheless, the paper represents the starting point of continuous effort in supporting and investigating the use of eBooks as means for teaching and learning by teachers at tertiary institutions.

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Global English Corner: International conversations through Elluminate and WordPress

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This paper reports on a pilot project undertaken by Victoria University (VU) with three partner universities in China (Sichuan University, Henan University and Liaoning University). The *Global English Corner* project uses online technologies to both encourage interactions between students in China and Melbourne and enhance the English language proficiency of international students for whom English is not a first language. The *Global English Corner* project also explores how technologies might achieve a greater comparability of the student experience on- and offshore in supporting the language development of international students. The *Global English Corner* pilot uses the online conferencing tool Elluminate together with a WordPress blog to conduct and support English conversations between business students in China and two student peers in Melbourne, Australia.

This paper presents findings extrapolated from weekly evaluations of the *Global English Corner* project provided by English teachers in China via email as well as data from an online survey completed by student participants in the project at the end of the project. The end-of-project survey provides important feedback from students about the value of conducting frequent online conversations and covers the popularity of various functions of Elluminate. Student and teacher views of the project, including the value of the project for developing language skills and cultural competencies, are extremely high with nearly 90% of students claiming they were more confident to speak English having been involved in the project and most of the students self-reporting an improvement in English proficiency. Beyond this small project, it is clear that other teaching and administrative uses of Elluminate could be supporting offshore teaching programs. Certainly, the project acknowledges that a more widespread *Global English Corner* program could aid the transition of international students to Australia and achieve a greater comparability of language support options and student engagement activities on- and offshore.

Introduction

This paper reports on a project, *Global English Corner,* which was funded in a 2010 round of International Teaching and Learning Grants at Victoria University (VU) in Melbourne. These grants specifically intend to support collaborative projects between VU teaching and support staff and VU partner institute staff in China, Malaysia and Hong Kong in the scholarship of learning and teaching. These projects require teaching and support staff on- and offshore to collaborate to improve the curriculum and pedagogy of international programs and to enhance the overall quality of the student experience.

International Teaching and Learning Grants try to achieve multiple outcomes: improvement of the student learning experience, professional development for teaching staff involved in the project, enhanced capacity to participate in the scholarship of learning and teaching for teaching staff and an enhanced relationship between VU staff in Melbourne and teaching staff in partner universities offshore. There has been much talk of developing an internationalised pedagogy at VU (Woodley & Pearce, 2007; Woodley, Simmons & Licciardi, 2010). An internationalised pedagogy is fundamentally a teaching approach in which the teacher is explicitly aware of both their own educational assumptions and students' learning preferences and educational traditions. Internationalised teaching approaches aim of not disadvantaging any student. VU's International Teaching and Learning projects offer a significant means to encourage a more internationalised teaching approach with a greater awareness of varying educational traditions and an increased appreciation of how cultural issues might impact on the learning experience.

In 2010, the International Teaching and Learning Grants stressed the importance of two themes: the collaboration between VU and VU partner institute teachers and the scholarship of learning and teaching. The *Global English Corner* has proven to be a highly collaborative and reciprocal project that has provided a model of support for a range of other collaborative activities between VU in Melbourne and partners offshore. It has also presented considerable information about cross-cultural interactions and using technology to support language learning.

Background: Global English Corner

The *Global English Corner* project encourages the uptake of technologies to improve the student experience for students in China who are both learning English and undertaking VU degrees in English. The project uses technology to emphasise the societal aspects of learning – especially language learning. The *Global English Corner* pilot has explored how business students in Melbourne can provide peer support to business students in China. The principal aim of the project is to support international students to develop spoken English language skills in extracurricular activities. Students in Melbourne conducted semi-structured conversations with students in three different partner universities in China using the closed space of the Elluminate online classroom, 'an integrated set of online presentation tools' (Stevens, 2007: 2), together with the public space of a WordPress *Global English Corner* blog. These two programs together create a combination of private classroom and public discussion area that supports independent learners and speakers and writers of English wherever they are. Because *Global English Corner* combines synchronous and asynchronous communication, a particularly rich asynchronous learning experience can be achieved (Hrastinski, 2008) and students have great flexibility to access and contribute to the conversations in different ways and at different times.

The *Global English Corner*, albeit in a small way, begins important interactions between domestic and international interactions. Through Elluminate and the *Global English Corner* blog, a pair of student peers in Melbourne conducts semi-structured conversations with groups of students offshore. In Elluminate, students can both hear and see each other – and they can simultaneously txt chat, share documents, images and websites and use the collaborative whiteboard function of Elluminate. Every week for 8 weeks in semester 1, 2011, the two students in Melbourne spoke to three separate groups of students in China at Sichuan University, Henan University and Liaoning University. Each week, there was a scheduled time in which these different groups met in Elluminate to discuss a range of themes that had been partially determined by student requests either the week before or as noted on the *Global English Corner* blog. This project, then, was keen to explore how online technologies might encourage student-driven interactions between students in China and Melbourne, enhance English language proficiency for international students for whom English is not a first language and suggest other creative ways that technologies might be used to teach, evaluate teaching, support and connect learners. The project also supported all participants – students and staff – in developing communication skills, including intercultural communication skills and technological skills, to enable global conversations.

Learning English in China

English proficiency is vital for Chinese students who intend to study an English-language degree either in China or in an English-speaking country. English proficiency is also important to enhance these students' employability prospects, especially if they intend to work globally or for a global company in China. Given the lack of English speaking opportunities for most Chinese students of English in China, the phenomenon of the English Corner has emerged to provide a forum for speaking, listening and using English. The English Corner is 'a characteristically Chinese approach to informal practice' (Jin & Cortazzi, 2002: 60) that helps students learning English in a foreign context to develop and extend their aural and oral English language proficiency. English Corners can be student- or teacher-driven English conversation sessions. They are usually informal and extra-curricular and they might be conducted in a park, a university library or other public space. English Corners are a cheap, grassroots means of providing practice to English as a Second Language (ESL) learners in China (Gao, 2009). The capacity of Elluminate to capture the social language learning so evident in the English Corner phenomena makes this technological approach a sustainable and affordable language support option for Australian universities with educational programs offshore. Furthermore, Elluminate sessions can be recorded and conversations can be used by learners as an additional resource. Research in English examining the English Corner and its eLearning variations is emerging (Bull, McCarten & Beck, 2009) and the *Global English Corner* project provides a small but positive contribution to this growing online phenomenon.

The English language proficiency of international students both in Melbourne and offshore has been identified as a key quality concern for Australian educational programs (Birrell, 2006). Poor English literacy is also both an equity issue and student welfare concern (Sawir, Marginson, Deumert, Nyland, & Ramia, 2007). Poor English damages students' chances of transitioning effectively and negatively impacts on academic performance (Bretag, 2007). Socially, too, problems with students' English proficiency – either self-perceived or actual – can serve to isolate. Ethically, universities must do more to support language learning and there is certainly a range of support units, programs and curriculum approaches that attempt to address students' literacy needs (Arkoudis, 2006). It is clear that language learning ideally 'requires the types of interactivity dialogue generates' (Lehmann & Chamberlin, 2009: 11). It is this capacity for interaction that makes Elluminate and other similarly dynamic programs such a positive medium for international students offshore. The synchronous nature of the exercise ensures that students are pressured to communicate in real time. The chaos of real conversations in real time might prove distracting for students – but Elluminate has texting as well as drawing and emoticon options that serve to support language learners. Images can be shown so that visual texts can aid aural and oral activities and students can ask questions without interrupting the flow of conversation.

Ironically, international students offshore tend not to have the same range of language support opportunities offered to international students onshore such as individual appointments with academic learning support staff, conversation sessions or group workshops. Additional resources are developed for offshore students and learning support staff use email, Skype and Blackboard to better support students in a range of locations. Teachers also try to embed language and learning support into offshore curriculum. Even so, many students arrive in Melbourne from China and are shocked at their inability to make themselves understood or to understand others. This rather poignant comment from a student reflection (used with permission) succinctly notes: '*I found it was quite difficult to communicate and catch up with the local students though I had learned English for nearly 10 years. What a big joke! I always remained mute when the group members spoke to me with perfect LOCAL accent*' (Woodley, 2010). Students' unpreparedness for living, studying and possibly working in an English-speaking context cannot be overstated and comprehensive research has noted the impact of English proficiency on students' ability to participate and enjoy university life (Sawir *et al*., 2007).

Internationalising the Curriculum and Transnational Quality

The internationalisation of Australian universities has been achieved primarily through the delivery of Australian educational programs offshore and increased numbers of international students onshore. Internationalisation in education includes global movements of teachers, researchers and students, offshore teaching programs, offshore campuses, international students onshore, study tours for students and teachers, student exchanges and international benchmarking of programs. The assurance of quality in international teaching activities has been a particular focus of Australian Education International as well as quality agencies since 2005 (AEI, 2005). An apparent lack of English competence of international students has been singled out as perhaps the greatest quality concern in the education sector. Certainly, English language proficiency of international students has been an ongoing issue in Australian higher education with 'discrepancies between [students'] expectations and the experience of university study contribut[ing] to student dissatisfaction' (Ransom, Larcombe & Baik, 2008). A further concern for international students has been social and involves the lack of interaction between international and domestic students – whether they are offshore or in Australia. *Global English Corner* provides a way to 'promote interaction between students from diverse cultural and linguistic backgrounds' (Arkoudis et al., 2010). Such dynamic interactions offer one way of achieving an internationalised curriculum. Distinct from an internationalised university, an internationalised curriculum, aims to develop students with an international focus, an awareness of culture as well as an appreciation of their own cultural values. An internationalised curriculum requires a conceptual rather than a geographic shift. An internationalised curriculum does not necessarily involve international students, global student exchanges or international study or work placements, although certainly in the case of the Global English Corner, it does centre on international students.

An internationalised curriculum is internationally orientated in terms of content and resources. It aims to prepare students for life in a globalised world. A commonly cited OECD discussion of internationalised curriculum includes curriculum that prepares students 'for defined international professions' (cited in Rivzi & Walsh, 1998). An internationalised curriculum aims to develop students with intercultural skills and international perspectives. VU's Toolkit for Internationalising the Curriculum defines an internationalised curriculum as including both local contexts and students. VU's Principles for Internationalisation of the Curriculum were developed in collaboration with offshore partner staff and include the idea that an internationalised curriculum aims to prepare students to perform professionally and socially in global and multicultural contexts, develops and assesses intercultural communications skills and critical thinking and is achieved through collaboration (Woodley & Pearce, 2007).

VU's vision of an internationalised curriculum is that which develops international perspectives, fosters intercultural communication skills and increases a knowledge and awareness of a range of cultures and geographic regions, including indigenous cultures. However, the communicative teaching approach adopted in many classes in Australian universities poses a challenge to many international students and English proficiency can impact on the development of internationalised perspectives and intercultural skills. There is a general acceptance that the IELTS 6 required to enter many Australian undergraduate degree programs is insufficient to successfully participate in academic discourse: 'IELTS six is competent English. It is not a high professional level' (Andrews, 2006; see also Lewthwaite, 2006). Many students studying in VU programs in China may not have attempted IELTS; so, although they would have undertaken some language testing, the language levels are far from consistent.

All students at VU in Melbourne have access to a range of language and learning support services. Students can attend individual appointments with Learning Support academics or attend academic skills workshops. They can also attend peer support sessions for some subjects. International students in the Faculty of Business and Law can participate in centrally-delivered conversation classes to practise English and develop confidence to speak English in class discussions and for assessment tasks such as oral presentations. Students can also participate in the Faculty initiative, 'Have a Chat' (see Woodley & Meredith, 2011) which involves domestic students engaging with international and Non-English Speaking Background (NESB) students in weekly two-hour sessions that aim to introduce international students to aspects of Australian culture and offer them a safe environment to practise English. Offshore students, ironically, have fewer dynamic language support options.

The Australian Universities Quality Agency (AUQA) project, *Good Practice Principles for English language proficiency for international students in Australian universities*, recognises that: 'it can no longer be assumed that students enter their university study with the level of academic language proficiency required to participate effectively in their studies' (AUQA, 2009: 2). The *Good Practice Principles* project emphasises that both students and universities are responsible for evaluating, monitoring and further developing English language competencies. The *Good Practice Principles* were developed from considerable research on the levels of English competency in Australian degrees (AUQA, 2009). Universities' methods of developing English language competencies are many and varied but they often smack of remedialism, not fun (Higbee, Lundell, Durancyzk & Banerjee-Stevens, 2001; Smidt, 2005). Alongside the need to implement a range of programs, resources and curriculum initiatives to enhance the English proficiency of international students undertaking Australian degrees, a further quality requisite of Australian education demands comparability between on- and offshore programs. The *Transnational Quality Strategy* requires that educational programs on- and offshore provide students with a comparable learning experience (AEI, 2005). Given the relative lack of English speaking opportunities available to students undertaking VU programs offshore, VU must provide a richer English language context for our offshore cohort. The *Global English Corner* project has begun to explore how online conferencing technologies, like Elluminate, might help achieve this end.

The Global Context

Elluminate conversations are supported by the *Global English Corner* blog. This blog has a space for each participating university and students post comments before and after Elluminate sessions. The blog uses the polling feature available in WordPress to gauge what students in China would like to discuss so student peers in Melbourne can prepare – though suggestions in postings have worked just as well for this. The purpose of the *Global English Corner* project is not to merely support students in China in their English language learning, although that is a key aspect of the activity. Nor does the project aim to only tell students in China about Australia in 'broadcast' mode (Arena & Jefferson, 2008). What has been attempted, especially through the involvement of a Chinese student in Australia and an English 'foreign' teacher based in China, is to develop a 'contrapuntal' understanding of the whole learning activity. This approach requires a simultaneous awareness both of metropolitan histories and of those subjected and concealed histories (Said 1993: 59); so the project requires an awareness of both Western and Chinese discourses. It also requires an awareness of how each of these cultures is represented – by and to each other. In short, a contrapuntal reading involves a mutual consideration of what could be quite disparate social, cultural and political groups. This juxtaposition of students in Melbourne and students in China demands a contrapuntal reading if it is to be mutually sensitive of the powers inherent in the relationship, especially in terms of language , ownership of the technology and the fact that students in Melbourne are paid to conduct the sessions. Through these developing sensitivities, it is expected that an internationalised curriculum will be encouraged.

Methodology

The funding *Global English Corner* pilot began with 3 partner universities in China (Sichuan University, Chengdu; Henan University, Kaifeng; Liaoning University, Shenyang) in March 2011. A pair of student peers with some mentoring training and experience in Melbourne (one international student from China and one domestic student) was selected to conduct 4 different one-hour, semi-structured conversations with groups of 8 students offshore that would be supervised by a teacher in China over an 8-week period. The numbers of students in China increased due to demand for the program. While numbers each week changed, a total of 30 offshore students were involved in the program. The Chinese English teachers involved provided constructive and detailed feedback after each weekly Elluminate session via email. The discussion also draws on comments from the blog and data available through WordPress to gauge the usage of the site. An online survey was administered via the WordPress site and email. Twenty respondents from 3 universities in China completed the online survey; so 66% of student participants in the entire project of 30 contributed to the survey. Most of those students were from Henan University. Online questions ranged from closed questions asking if respondents participated in the project through Elluminate, the blog or both and 4-point Likert-type questions asking students to rank their self-perceptions of improved confidence to speak English or their self-perceptions of improved English proficiency (No improvement; Neutral; Some improvement; Much improvement). There were also open-ended questions asking respondents "What did you like about Elluminate?" and "What did you not like about Elluminate?" Students were asked to indicate from a list of Elluminate tools (chat, whiteboard, audio, video) what they had used. Student and teacher comments from the online survey, weekly feedback or blog have been used with permission. Any quotations from staff or students that are verbatim are in italics and quotation marks.

Findings

The project team expected that online interactions via Elluminate and the *Global English Corner* blog would aid the transition of international students to Australia should they choose that option for further study. Certainly, many discussions covered living, working and studying in Melbourne. It was also expected that the project would demonstrate an easy, cost effective means of how technologies like Elluminate can increase opportunities for international students to dynamically practise English in real time with those mythical beings, so-called 'native speakers' (Davies, 2003). Some technological challenges were anticipated – such as noise problems and inconsistent internet connections – and in the first couple of weeks this was the case. It was also expected that time would be a difficulty as students and teaching staff in China have very full timetables in addition to a 2-hour time difference – or even a 3-hour difference with daylight savings. Student peers also needed to be briefed on what sites hosting user-generated content, such as YouTube and Flickr, will not permeate the Great Firewall of China (Branigan, 2010). Our student peers in Melbourne and e-learning staff were willing to work late, Chinese students and staff were prepared to make time, and this issue of timing was overcome.

Even after just a week, a comment that one student left on the blog was encouraging: '*I think this program is interesting; it can improve my English speaking skill*' – which is precisely what was hoped for. Blogging between student peers in Melbourne and students in China was popular both to anticipate the Elluminate sessions and to debrief and clarify points raised in the conversations. Given that the blog was not part of the initial project plan, this has been a vital finding in terms of using Elluminate in future activities. Synchronous platforms like Elluminate must be supported by asynchronous communication – whether it is a blog, a discussion board or group emails. The blog offers a useful statistics function. In just 3 weeks, with 30 students in the program, there were over 1200 visits to the site, 79 comments made and Henan University students were the most active users of the offshore cohort. In addition to blogging, Elluminate provided participants with a range of means on participating – from using icons and emoticons, text, images, audio and video (Stevens, 2007) and it was reported that students in China particularly enjoyed the whiteboard and they clearly made good use of the ability to upload PowerPoint for more formal presentations.

Some 20 respondents from 3 universities in China completed an online survey after the 8-week program had finished. 83% of student participants in the entire project of 30 completed the survey. 65% of those students were from Henan University. Overwhelmingly, the majority of respondents felt that they had improved their confidence to speak English over the course of the project and explicitly attributed their increased confidence to speak English to their participation in the project.

All students (100%) participated in the project using Elluminate through speaking, texting, using the whiteboard, listening to others speak and showing documents or pictures, including PowerPoint. Asked what they liked about Elluminate in open-ended responses, students wrote primarily about Elluminate's capacity to improve English through providing opportunities and reasons to practise speaking and learning English. They also mentioned making friends and learning about other cultures:

- *It can improve our English speaking and also help...to establish friendship.*
- *It's a platform for me to speak English. It also broadens my eyesight and makes me know much about different culture and different lives.*
- *It has improved my English speaking and... I learned about many different cultures in Australia.*
- *You can chat with people from the globe wherever they are.*
- *[It is]a new way to practise English and learn western culture*
- *When i prepare for a new topic, i can learn a lot of new words. And this communication provides us who come from different grades and countries an opportunity to share our life each week. We not only learn a lot, but also strengthen our friendship through it, so I like it.*

Asked what they did not like about Elluminate, respondents focused on technical issues rather than the learning experience. They commented, then, on difficulties encountered with slow internet speed, with audio dropping, feedback and background noise. Asked if students would like to use Elluminate more to speak to students in Australia, there was an overwhelming response of 100% of students responding in the affirmative.

Fewer students participated in the project by participating in the blog. The blog was mainly used to read information provided by the student peers. Compared to 100% of respondents participating via Elluminate, only 65% used the blog. 40% of students posted questions, commented on other postings and used the polling feature to vote on weekly topics. Mostly students participated by reading information provided by others; arguably, quite a passive means of participation.

When asked to comment on what they learnt from being involved in the project, the following key themes can be identified in students' responses: cultural knowledge, confidence, communication skills, including listening skills and knowledge about university life in Australia. Some student comments include:

- *We learnt how to communicate with people by trying to understand.*
- *I learn more about foreign culture...This is a good way to give me...opportunities to speak English and make me know much about how to organise sentences in a short time to express myself.*
- *I spoke a lot. I think I have gained a lot of self confidence.*

Students added to the 'further comments' question that they would like to continue participating in the program next semester and would like to see the use of Elluminate expanded into other areas of their study.

- *Everything is quite good. I really want to have chances to join this next semester.*

Views from Sichuan

The teacher facilitating the sessions from Sichuan University is a 'foreign teacher'. Although she has lived in China for 10 years and speaks Mandarin, her first language is English. Her contrapuntal vision (Said, 2003) of the project has provided a valuable insight. In the first session with student peers in Melbourne, the teacher noted that her students '*had their first culture shock - that not all Australians are blonde-haired, blue-eyed - they carried on asking me about hair colour for 5 minutes afterwards*'. This teacher also reports that '*the students really seem to like*' the Elluminate sessions. Her evaluation of the first Elluminate session predictably includes technical issues (sound delay, volume and echo problems and Java issues). Specifically, she observed that students '*liked the idea of having pictures, chat and talk*', that pictures were especially useful in motivating chat and that students' demonstrated the ability to multitask: while '*listening* [students] *were learning how to paste pictures etc (hence the cat and its new makeup)*'. Students also had too many questions and the blog was essential to supplement limited Elluminate sessions. It was also reported that students liked the icons and emoticons. The teacher was surprised at the levels of excitement of the students: '*They were actually more excited than I thought as they are used to computers and chat - but* [with the first conversation] *they were...so excited*'. She also reported that some students said: '*It was the first time* [they got] *to talk to another country and would never forget it*'.

Views from Henan

After three sessions of Elluminate, Henan reported no more problems logging into the room and any problems, such as PowerPoints in China not displaying, were '*effectively tackled by sending those files to* [student peers in Melbourne] *and being given...moderator privileges*'. Overwhelmingly, teachers in China report that students' attitudes to the project are positive and that topics of discussion are relevant: '*Our students liked the debate about whether it is good to go abroad to study*'. Despite problems with headsets, one teacher in Henan reported: '*I did enjoy every minute of the students' ppt presentation and the two mentors' comment. Students' topics centred around cultural issues, ranging from Henan University, Henan Cuisine, Henan Opera to Hometowns (Zhengzhou, Xinyang, Yichang)*'. This comment highlights a shift from student peers doing most of the talking to students in China taking a key role during Elluminate sessions.

One of the students in Melbourne anticipated the change of direction and wrote on the blog:

> *We are aware that we have done too much talking during the sessions, so from next week, we will give you much more opportunities to talk! I like Zita's idea on talking about practical things and real life events. Therefore, I would love to suggest you work together as a team to give us a vivid lecture on the culture of Henan next Thursday. I come from Shen Yang, so I am not too familiar with...customs and traditions in Henan and I would love to hear you give me some knowledge. I am sure that Cassie would be very interested, as she has never been to China.*

After students in Henan presented via Elluminate, the teacher asked if they liked the program and if it helped them learn English: '*They like today's debate and other conversations and acknowledged that they are more interested in the programme... There is a gradual increase in their speaking although not a big one. I could see that they are more confident now, and they are more at ease when they talk in English*'.

Views from Liaoning

Teaching staff in Liaoning reported increasingly improved interactions with each session as technological issues were ironed out and as staff and students became used to the technology: '*The second session is better than the first one*'. More importantly, after concerns that student peers in Melbourne were doing most of the talking in the early sessions, after the third week a massive shift was reported: '*students changed their roles, they prepared some topics...[one student] introduced the LU campus and showed some pictures of buildings and the different functions, [another] talked about how to become an interpreter...[and] all of the students are interested in talking about the differences between Australian Uni and Chinese Uni*'. It was clear that an increasingly reciprocity was emerging.

Challenges

The Faculty's Web-based Learning Officer was initially involved in some of the Elluminate sessions but the tone of the conversation and the behaviour of students seemed to be slightly guarded with the presence of a non-peer at the Melbourne end. Even so, a technologically savvy person is crucial to the success of the project in the initial phase although reports from teachers in China suggest that, after a couple of sessions, students troubleshoot and work problems out. After one or two sessions, all partners reported, as Stevens (2007) may have predicted, that 'Once connected, [Elluminate] generally works pretty well' (2). Elluminate is reasonably intuitive and other than one session where the internet was down, all sessions went ahead as scheduled. During one session that had severe internet problems, one student peer in Melbourne reported: '*there was not a big opportunity to have very in depth discussions; however, the conversations we did have were filled with laughter*'.

It was clear after one week that students in Melbourne needed more explicit instruction concerning the politics of language (Phillipson 1988 cited in Pennycook 1994). There was an assumed power evident in the role of peer conferred by a perceived English language proficiency as well as geographic location that was the result of an uncritical and naive approach to language teaching and a lack of induction from the project team. The dominant role occasionally adopted may have also stemmed from students in Melbourne simply feeling responsible for the session – technologically, socially and pedagogically. Whatever the cause, students in Melbourne sometimes took the lead in conversations in a way that limited the voices of students in China and which served to contain the talk mostly to VU and Melbourne. The students in Melbourne quickly realised the problem and wrote on their report: '*Near the end of the session* [we] *reminded students that next week we would like them to give us a small presentation on their local culture. We hope that this will enable them to speak more as* [we] *tend to dominate each of the conversations*'. Subsequent conversations were far more reciprocal with Chinese students taking a more equal responsibility for the sessions. Evenso, at the end of the project, a student in China complained that one of the students in Melbourne talked too much. Future work with students in Melbourne will better prepare them for their peer role.

Another point about students in Melbourne concerns the blog. The original *Global English Corner* project intended to use only Elluminate. While Elluminate can record sessions, the project did not use that function as the conversations were not initially appreciated as a learning resource. Future Elluminate sessions will consider recording but student permission will be required and training around confidentiality and other ethical considerations will be needed. Blogs automatically create a more permanent artefact. The ephemera of chat are secured in print – and not just other students read the material. Casual comments like 'Hey you guys...' and even spelling errors from students in Melbourne were noted and deemed inappropriate. Melbourne bloggers were asked to write more formally and carefully. They were advised that senior people in the universities in China may read the posts. Arena and Jefferson (2008) are positive about the fact that blogs promote a relationship with a broader audience and note: 'This can motivate more carefully written texts, including an expansion of new vocabulary to convey the ideas of the student bloggers precisely' (4). The *Global English Corner* project team hopes that well written blogs will improve all students' written English.

Conclusion

For students learning English as a second language in a Foreign Context who may be contemplating travel and further study in English speaking countries, self-directed, synchronous learning could be vital to their success – especially in regards to transition to a new culture and a new learning environment. With the combination of both synchronous (Elluminate chat, audio and video communication) and asynchronous communication (blogging entries and replies), students experience both the pressure of real time discussion and the social benefits of a conversation that includes text, image and audio. The combination of blogging and Elluminate neatly sidesteps the oppositional debate of synchronous versus asynchronous teaching approaches **(**Hrastinski, 2008) because it combines the best of both approaches. Furthermore, the asynchronous aspects of the blog supports learners who are competing for time to speak during the Elluminate session as well as those who cannot make the specified chat time of Elluminate.

Global English Corner offers a rich and generally reliable forum for students to develop language skills, global awareness and intercultural skills. *Global English Corner* needs to sit alongside other resources and programs that that aim to provide students in China with opportunities to improve their English language proficiency. *Global English Corner* can support the transition of students intending to study in Australia. This is interesting as the need to develop 'a responsive social environment, active orientation and transition programs' (Long, Ferrier & Heagney, 2006) for international students onshore has been recognised for some time but effort in creating social situations for our offshore students has not been explored with the same energy. Whether Elluminate continues to be the platform for *Global English Corner* or whether other products will be trialled to ascertain if they offer fewer or similar glitches for free is yet to be determined. The trial has begun important conversations between eLearning Support Staff, teaching staff and students in Melbourne and China. *Global English Corner* offers ways to create small scale and highly social programs that may be important in improving students' English proficiency, confidence and intercultural communication skills.

Elluminate and similar programs have the capacity to profoundly impact on students learning and confidence. Responses from students surveyed at the end of the project clearly suggest that the internet, at its broadest, can stimulate connections and learning between students in Melbourne and China (Haythornthwaite, 2005). Despite some technical glitches and the perennial issue of slow internet at some offshore locations, *Global English Corner* participants – staff and students – have regarded the pilot as a great success. While some of the sessions were occasionally chaotic and the audio was not always of the best quality, students in China overall enjoyed both the technology and the chance to interact with students in Melbourne. Students in Melbourne learnt about China, about different Chinese universities, about communicating with Elluminate and using English in a way that helped others learn. As the teacher in Sichuan observed, the ability of students to see, hear, talk and simply interact is '*great for breaking down cultural barriers and* [students'] *preconceptions*' – both in China and Melbourne. A key issue, given that the blog and the Elluminate sessions are extra-curricular, is sustainability. Arena and Jefferson (2008) are right to remind us that online conversations do not 'Simply Happen'. Without funding or a more strategic pedagogical reason to engage – such as assessment - they may not continue.

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A rationalised curriculum of computer education for university students in natural sciences in China

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Computer education to non-computer science disciplines in Chinese universities has been under the guidance of the Chinese Ministry of Education (CME) since 1997. The "1 + X" structure proposed by CME in 2007 for computer education to non-computer science disciplines in Chinese universities offers a higher flexibility for institutions to choose X courses for their non-computer science disciplines, but it does not adequately address a few important issues in providing students with equitable experience in computer foundation education and meeting the specific needs for those students who want to advance their knowledge and skills in computer/IT. Based on a comparative study with the similar curricula used in other national and international institutions, a new framework of "2 + D + X" structure of computer education to non-computer science disciplines was proposed at IMAU to address those weaknesses in the CME "1 + X" structure. Trials of this rationalised framework have shown that students in different disciplines in natural sciences at IMAU strongly supported this new curriculum.

Keywords: Computer education, non-computer science disciplines, Chinese universities.

Background

Computer education for students in non-computer science disciplines in Chinese universities is an integral part of tertiary education curriculum. Computer science schools/colleges/departments in Chinese universities take responsibilities on curriculum design and delivery for both computer science disciplines and other non-computer science disciplines. For example, at Inner Mongolia Agricultural University (IMAU), the College of Computer & Information Engineering (CCIE) is responsible for not only producing graduates majoring in IT, computer science, and information systems, but also delivering common core courses in computers to students in other natural sciences, such as plant science, animal science, food and food processing, forestry, environment engineering, biology, chemistry and so forth. The curriculum for computer science majors has a well defined guideline set by the Chinese Computer Society whereas there is no similar guideline for computer education of tertiary students in non-computer science disciplines.

However, standardisation of computer education to non-computer science disciplines in Chinese universities has been on the agenda of the Chinese Ministry of Education (CME) since 1997. In 1997, CME circulated a commentary document that proposed a three-tiered computer education structure to non-computer science disciplines in Chinese universities (CME, 1997), including the subjects on introduction to computers, foundation of computer software, and fundamentals of computer hardware. There were no details on how these courses should be designed and implemented in this document. The Internet, multimedia, and wireless technologies have brought significant changes to almost every aspect in the world since 2000, which also added new dimensions into computer education. Three guidelines were released successively by CME (2004, 2005, 2006) to set up a framework of computer education to non-computer science disciplines in Chinese universities. This framework is summarised as "1 + X" structure, in which the 1 represents the common core course on introduction to computers and the X refers to more than 2 discipline-specific core courses in computer/IT.

Since 2007, all Chinese universities have tried to implement this "1 + X" structure into the computer education curriculum to non-computer science disciplines. A variety of schemes have been adopted in different institutions for the same discipline, or different disciplines within the same university. The "1 + X" structure offers a higher flexibility for institutions to choose X courses for their non-computer science disciplines but fails addressing: a) the common needs for all university students to gain fundamental knowledge in computer so as to understand the computing processes and their working environment involving computers, and b) the specific needs for those students who have a desire in advancing their knowledge and skills in computer/IT so as to apply the gained knowledge and skills in their disciplines.

To address both the common and specific needs of students mainly in natural sciences on computer education at IMAU, CCIE has initiated a project aiming at creating a rationalised curriculum of computer education for students in natural sciences at IMAU based on a comparative study with the similar curricula used in other national and international institutions since 2007. This paper reports the outcomes of this comparative study.

Data collection and analysis

A questionnaire was sent to 30 Chinese universities with programs in similar natural sciences to IMAU to collect information about their curriculum of computer education in natural sciences. Statistics of the 18 universities retuned the questionnaire are shown in Table 1. It is evident that all 18 universities have the common core course "Introduction to computers" required by CME. A surprise finding is that all the 18 universities also offer "Programming principles" either as a core or an elective to their students in natural sciences. Given the fact that students interact with computers through software which is a product of programming, it is understandable and reasonable for students to know the fundamentals of programming, no matter which programming language is used. Database is also offered in 5 universities. One or more courses in other subjects, such as the Internet, Web, Multimedia, and software design, are provided in a few universities as well.

Table 1: Statistics of the questionnaire from 18 Chinese universities

Course		Introduction to computers	Programming principles	Database	Internet/ multimedia/ Web/software design
Number of institutions offering the course	Core	18	10	1	1
	Elective		8	4	4

Comparisons are also made with computer courses for students of agricultural and environmental sciences at the University of California, Davis (UCD) and that of agricultural sciences at The Pennsylvania State University. Their curricula consist of three tiers of common cores, disciplinary cores, and advanced electives, in which the common cores have 3 fundamental courses that cover contents of both "Introduction to computers" and "Programming principles" in Chinese universities.

A rationalised curriculum of computer education to natural sciences

The results of data analysis support a new framework of "2 + D + X" structure for computer education to non-computer science disciplines. In this structure, the 2 represents the common core course of "Introduction to computers" and "Programming principles"; the D refers to at least 2 core courses selected from a list of computer/IT subjects required by a specific discipline; the X refers to a list of electives for those students who have a desire in gaining systematic knowledge and skills in a computer/IT specialisation. Courses in both D and X can be chosen either individually or as an approved sequence by the student. If an approved sequence of courses is completed, the student is entitled to have a minor in computer/IT added to the major in natural sciences. A trial scheme of courses implementing this framework has been offered to students in different disciplines in natural sciences at IMAU since 2008 (Figure 1). For the first offerings of four D and X courses in Semester 2 of 2008, “Web design and development”, “Java programming”, “Database and applications”, and “Computer networks” , each attracted far more students than the specified capacity of 1000 places. This trial encouraged the continuous effort on bringing a full range of proposed D and X courses for students in natural sciences.

Conclusion

The “1 + X” structure proposed by CME in 2007 for computer education to non-computer science disciplines in Chinese universities offers a higher flexibility for institutions to choose X courses for their non-computer science disciplines, but it fails in both providing all university students an equitable opportunity in gain fundamental knowledge in computers and meeting the specific needs for those students who have a desire in advancing their knowledge and skills in computer/IT. Based on the results a comparative study with the similar curricula used in other national and international institutions, a new framework of “2 + D + X” structure for computer education to non-computer science disciplines was proposed at IMAU in 2008 to address those weaknesses of the CME “1 + X” structure. This rationalised framework has received a strongly support from students in different disciplines in natural sciences at IMAU since 2008.

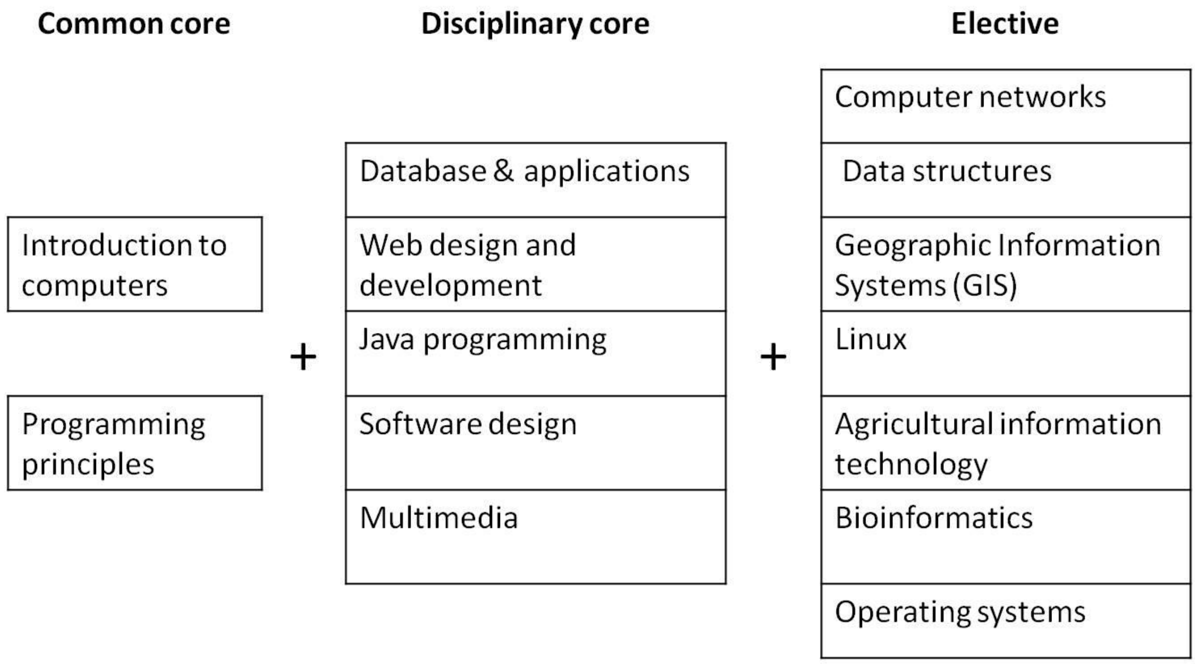

Figure 1: The 2 + D + X” structure of computer education to natural sciences at IMAU

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Recommendations for enhancing the quality of flexible online support for online teachers

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Flexible online support of teaching and learning at university is increasingly used in preference to face-to-face and blended formats to provide self-directed and just-in-time resources for teaching staff. Few have been evaluated to date. This paper outlines a pilot evaluation framework using the University of Newcastle's online resource, "Teaching in the Online Environment". The framework utilises web analytics (keyword search data) combined with data mining to evaluate this online staff development resource. In this paper we discuss the methodological challenges and benefits associated with our approach and make recommendations applying our findings to improve the Teaching in the Online Environment resource.

Keywords: evaluation, staff development, support, text mining, analytics

Introduction

Many universities today invest significant effort in developing staff development programs in a flexible online format in an attempt to increase their appeal and accessibility to an increasingly diverse academic workforce (Salas & Cannon-Bowers, 2001; Taylor, 2003). Examples of these approaches range from formal facilitated online or blended courses and self-directed web-based learning packages, informational websites to tip sheets, and resource directories (O'Reilly, Ellis, & Newton, 2000). Of these approaches, most universities have developed elaborate web-based support websites to deliver and or support more formal professional development programs and to enable the academic development unit to provide staff to leverage the immediacy of access to just-in-time support electronic information (Wilson & Stacey, 2004).

The effectiveness of staff development website hinges on the extent to which they can effectively address the learning needs of staff. (Boud, 1999) This issue is particularly important to the success of self-directed learning resources. Differing from facilitated professional development activities, designers of flexible support resources are provided with fewer opportunities to gauge the ongoing usefulness of their resources. We argue that these circumstances have resulted in a situation in many institutions where the quality improvement activities associated with flexible online resources are too often driven by external factors such as upgrades to major technology rather than the real-word need of staff in front line teaching roles.

In contrast, we argue for a more responsive, staff centred approach to the development of flexible staff support resources. With the advancement of web analytics combined with data mining technology we will show that designers of flexible staff support resource have a greater opportunity to identify the learning needs of staff and in turn to ensure their learning materials are personalised to the individual needs of learners (Romero & Ventura, 2007).

Background

In September 2009, the University of Newcastle (UoN) launched the professional development resource, Teaching in The Online Environment (TOE). This online resource was developed in order to improve the quality of online learning provided at UoN. Specifically, TOE aimed to increase staff capacity in the areas of online course design and preparation, facilitation and communication, and evaluation and assessment. The resource targeted staff commencing teaching in an online course. TOE was organised in six interconnected modules, each of which provide staff with practical suggestions, tips and instructions for using a range of learning technologies supported by the UoN.

In August 2009, before, TOE was launched CTL staff undertook a formative evaluation of TOE. In this process a total of 23 academic and general staff were asked to use and explore the resource for 10 - 15 minutes. During this time, CTL staff documented participants' behaviour and any verbal feedback participants provided. After using the resource, participants provided more detailed feedback about their experience via a modified version of questionnaire developed by (Reeves, 2003, p. 146).

This evaluation design was effective in gauging the participants' reactions to specific design elements of the resource. For example, the quality of: graphics, images, navigation and information design. Critical issues identified in this process were used to refine the resource before being launched in September 2009. However, as many of the participants were experienced with online teaching we had little evidence if the resource would be effective for a wider university audience once it was implemented. Consequently this pilot aimed to trial a more naturalistic approach to evaluating TOE. Specifically, it aimed to identify:

7. What types of support users seek about online teaching and learning?
8. How can search-query data be used to improve the TOE resource?

In this paper we discuss a pilot evaluation methodology that utilizes web analytics (keyword search data) combined with data mining to evaluate an online staff development resource. We begin by providing the background and context for the project. Then we discuss the methodological challenges and benefits associated with our approach. We conclude our discussion by providing two recommendations for using search query data to improve a resource developed at the UoN.

Methods

The design team implemented two mechanisms to identify the information needs of TOE users. First, several online surveys were strategically placed within six frequently used pages of the resource. These surveys aimed to gauge what impact the use of TOE had on respondents' online teaching skills and practice. Second, a web analytics service (Google Analytics) was used to collect TOE user -tracking statistics. Similar to other web tracking systems, Google Analytics (GA) collects qualitative and quantitative data that provides designers with insights into real-world user behaviour and their interaction with a website (Ledford & Tyler, 2009).

In this study we aimed to utilise one dimension of web analytic data recoded by GA, the individual search queries users employed to access the TOE resource. The premise of this study is that search queries represent the underlying learning needs of web users (Rose & Levinson, 2004). User search queries are collected unobtrusively from authentic real-world situations and under these conditions are more likely to provide an accurate account of user needs than the questionnaires and structured interviews most common with traditional instructional design systems (Yardy unpublished data). By developing effective and efficient techniques to interpret these data designers can respond more rapidly to trends user feedback.

For the purposes of this study each unique search query collected by GA was used as an evaluation case. First, each case was analysed using a text mining process combined with content analysis as per (Broder, 2002). Next, features of common cases were identified. Finally, these findings were used to establish recommendations for using search query data to inform the ongoing quality improvement of web based staff support resources. \

Preliminary Findings and Discussion

5,665 unique keyword searches were recorded during the period between September 2009 and September 2010. During our initial work, we identified several challenges in analysing the keyword search data. For example, a preliminary analysis of the initial 5,665 cases showed a high proportion of search queries unrelated to online teaching. After removal of these search queries, a random selection of 500 from the remaining 4,233 queries was stratified by month to avoid potential bias between peak and low periods of usage. We qualitatively analysed these 500 search queries employed by users of the TOE resource using text mining software.

To automate the removal of unrelated terms present in the sample, an automatic text classification process was created using Rapidminer. The results of this trial were mixed. For example, the text classification model correctly classified 99% of irrelevant cases; however, it also incorrectly classified 40% of relevant cases. In addition, we also used "association rule analysis" in Rapidminer, to identify content themes, topics and their associated relationships. This provided us with an interactive content map identifying topic themes, their frequency of occurrence and terms commonly used in the same search query. For example, the diagram below shows the association rules found for the term "feedback". When the term feedback was present in a search query, the terms "online" or "informal" or "formal" or "giving" were also used in the same query.

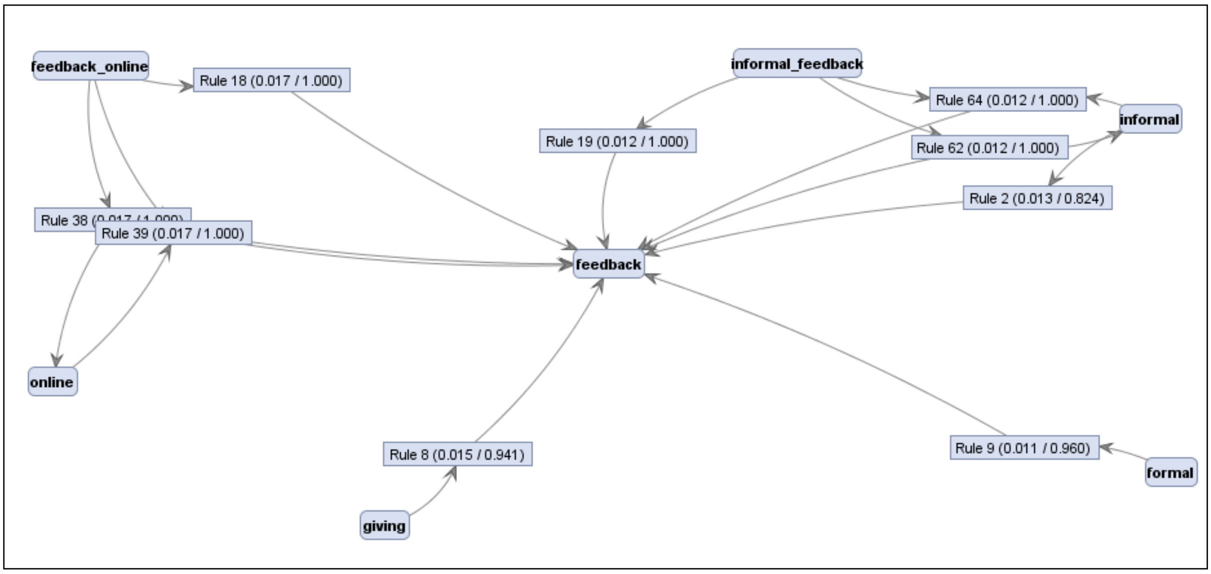

Figure 1: Association rules identified for the term 'feedback'

Using this process, broad content themes were initially identified from the search query sample. As shown in Table 1, subcategory themes were manually identified by two content experts.

Table 1. Categories and sub-categories of search queries submitted by users of TOE, identified using text mining and qualitative content analysis.

Search Category Name	Subcategory
Tools	Campus Pack, Adaptive Release, Early Warning System, Groups and Lectopia
Blackboard Assessment	Quiz, Grademark, Grade center, Turnitin
Assessment	Peer assessment, Rubrics,
Communication	Discussion, email, Chat
Online teaching	
Course Management	
Behaviour	Netiquette, difficult
Feedback	Examples, Giving / providing, formal and informal

We identified 8 major support topics and a further 27 sub – categories (Table 1). The nature of support queries differed across the 8 support categories identified. General informational queries were most prevalent representing 40% of the cases sampled. These queries included a single object of focus. For example, 'online communication tools', 'blackboard course banner size', 'copyright for students in an online environment' and 'blackboard staff guide'. These queries contained on average 2.3 terms. Further, our findings echoed those of (Barr, Jones, & Regelson, 2008) in that many of these cases were commonly grammatically incomplete as many cases omitted common parts of speech, eg., "is lectopia. As a consequence, inferring users' needs from these types of queries proved to be problematic. For example, consider the following case "lectopia book". The information needs of the user who made this query could be interpreted in two ways. First, it could suggest that the user was seeking to find a book about Lectopia. Second, and perhaps more probably, the user was seeking information about book[ing] a Lectopia recording.

In contrast to general information queries we also observed cases where users were more explicit in expressing their support needs, i.e., "transactional" as per (Broder, 2002). These cases represented occasions where staff sought assistance to complete a specific action. For example, 'How to make a membership rule', 'engaging and motivating practices in online learning', 'giving grades in online course', 'using online discussion as a course activity', 'conversion of student work from face to face courses to online courses' and 'convert your on campus to online'. We also observed that 20% of cases represent occasions where users sought assistance to decide on a range of possible action to adopt. For many of these cases the terms, 'benefits', 'best', 'advantages', 'disadvantages and implications' were used. For example, 'benefits of using on-line resources in teaching', 'implications for evaluating students in an online environment'.

Irrespective of their specificity, linguistic structure or subject focus this procedure also provided important insights into the natural language usage of online educators. By comparing the language (terms) used in keyword samples with those used by the TOE designer we were efficiently able to identify the commonalities and differences in ways users "talk" about online learning. Overall, our analysis revealed that users tended to use conversational language in their search queries. For example, while designers used the term pedagogy in the TOE resource, on no occasion was this term used in the query sample. Similarly, the term 'course design" was used frequently in TOE, while our results suggest that users preferred the term course conversion.

This analysis procedure also revealed cases where the terminology used to name concepts, and objects associated with specific online technologies could be made more accessible to staff beginning to develop online teaching practices. In these instances, terminology was used from the LMS not the user's background. For example, TOE designers frequently used the term 'grades' in topics relating to assessment. However, we suggest that, while this term is used in the LMS, using the term 'marks' would increase the readability of these topics. This of critical importance as it is common for users to have an incomplete understanding of a domain's terminology (Rinaldi F, Hess M, Dowdall J, Moll´a D, & Schwitter R, 2004).

Conclusions and Recommendations

By analysing 500 user search queries we have identified: the areas staff seek support in; the types of information they seek; and the common terms staff use in their search queries. Users of TOE mostly seek general information about online learning and teaching through their search terms. A smaller group (30%) are seeking more specific information about how to and the best ways to use online technologies. Through the use of text mining we have identified several opportunities to streamline the analysis process.

Our work to date has leads us to make following recommendations for using keyword search data to improve the TOE resource:

1. Use selected terms from informational search queries to refine the language usage within TOE. In particular, use these terms to refine the names of page titles, modules and topics
2. Use transactional search queries to identify opportunities to increase the content relevance of TOE.

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Use of Asynchronous Online Discussion for 9 year-old pupils in A Science Classroom

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Young pupils are generally very enthusiastic about Science and always want to share with their classmates what they know. However, there is no enough time for class room discussion for all to participate during curriculum time. The use of Web-based forum can possibly help solve this problem by extending the classroom time. They can participate and view the postings in the forum at home or at school so long there is Internet Connection. This paper describes how a primary school teacher used asynchronous online discussion in teaching of Science for 9 year-old pupils.

Keywords: Asynchronous Online Discussion, Forum , Science, AOD

Introduction

Asynchronous online discussion (AOD) provides a platform where all pupils are given equal chance to participate in discussion, without the need to meet face to face. This will help to encourage the shy pupils to participate (Bali & Ramadan, 2007). Unlike classroom discussion, AOD enables the instructors and pupils to keep a record of their discussion (Salmon, 2002). Hence, they can review and reflect their progress from time to time. In taking part in such discussion, pupils are externalizing what they have known and this will engage them in higher order thinking like critical thinking and analytical reasoning (Jonassen, Carr & Yeuh, 1998).

A review of the literature on AOD shows that most research studies are conducted in higher institutions. (Bali & Ramadan, 2007; Hew & Cheung, 2003) as this group of learners are likely to more independent and are capable of meaningful and intellectual discussion. However, there is paucity of research on the use of AOD for younger pupils. From the review, only Wong, Hew and Cheung (2008) conducted a study for the use of AOD among high ability pupils in primary school. But, such setting is atypical and hence, there is a need to conduct a similar study in a typical classroom to validate the findings.

The purpose of this study was, thus, to explore the use of AOD for a group of thirty-four 9 year-old mixed ability pupils in a Science Class. In this study, the teacher only had limited class time with her class and had little chance of conducting classroom discussion about Science in which the pupils were keen to participate. Other than the benefits outlined previously, the web-based nature of AOD could possibly extend the limited classroom time and bring Science discussion out of the physical classroom.

In this study, a case study approach was adopted as this would offer an in-depth analysis of the case. Although this case study may not be able to provide generalization for future practice, the learning points and insights would still be invaluable to other primary teachers who have plans to implement AOD in their classes as this case "is still similar to other persons in many ways and unique in many ways" (Stake, 1995, p. 1). This research study was specifically guided by following questions: (1) how can the teacher encourage the pupils to participate in the AOD? (2) how does the AOD enhance the pupils' learning experience?

Participants

The participants in this study were thirty-four 9 year-old pupils (mixed ability) of an elementary school in Singapore. As the classrooms were technology-enabled with wireless connection and one-to-one computing, there had been pervasive use of technology for them since Primary 1. They would not face much problem in using AOD. Moreover, most of the pupils had Internet Access at home and could access AOD at home.

Implementation

The AOD was created by using the Forum in the school learning management system, powered by the open source Moodle. Moodle was used in this study as both the pupils and the teacher were familiar with the system. This would shorten the time needed to learn how to use and implement the AOD. Pupils would use the AOD to discuss on topics on plants and animals.

In the study of Wong et al. (2008), the pupils were grouped into groups of 3 or 4 and the teacher established the ground rules. Similarly, in this study, the implementation would model closely after the framework proposed by Wong et al. (2008) with slight modification to suit the participants. The measures taken were:

- Pupils were briefed about the expectation of online forum. They were told to be nice and polite and keep the discussion on the questions posted
- The teacher demonstrated on how to use the AOD in the school. Pupils would try in class and surface any possible technical problems.
- Pupils were broken up into groups of 5 and each pupil was to contribute to his Group Forum instead of a Class Forum. In a Class Forum, the pupils might be put off by the sheer number of postings that he needed to read.
- Inform the parents of the AOD so that they would encourage their child to access it at home.
- A question would be posted fortnightly. The question would be ill-structured or could be a starter to a new topic. Such starter questions would inform the teacher the pupils' prior knowledge or alternative concepts.
- The teacher constantly facilitated and promoted the use of AOD. She would praise the pupils who accessed the AOD at home or highlight outstanding posts. Alternative concepts surfaced during the online discussion were also discussed and care was taken not to make the pupils who made the mistake embarrassed.

Data Collection Instruments

Multiple data collection instruments were used as these data sources would complement one another and would provide a thick description of what was being studied (Kervin, Vialled, Herrington & O'Kelly, 2008). The data collection instruments were:

- Teacher's observation
  A reflection journal was kept to document the author's observation and reflection.
- Forum postings
  Forum posting of selected high-ability, middle-ability and low-ability pupils were analyzed. Such maximal variation sampling of the posts was adopted to gain multiple perspectives of pupils' experience in AOD. For the understanding of the teachers' role in AOD, her postings were also analyzed.
- Perception Survey and Focus Group Discussion
  A perception survey on the use of AOD was conducted for the pupils during class time. Out of the possible 32 respondents, 27 respondents replied. 4 selected pupils were also involved in the focus group discussion
- Statistics Logs in Moodle
  Such logs would contain information like the pupil's activity in the forum (adding or viewing the post) and the location (home or school) where they were accessing the AOD.

Results and Discussion

Teacher's Role

In this study, the teacher modeled the behavior in the AOD by contributing to the AOD regularly. Over the period of 15 weeks, she had contributed a total of 159 posts which worked out to about 11 posts per week. From the analysis, she posted to : initiate new discussion, ask probing questions to guide the pupils in their learning, praise the pupils and provide information. Such posts aimed to "provide administrative, pedagogic, and affective or pastoral support" (Hammond, 2005, p.34) for the pupils. In the AOD, the teacher mainly provided the role of a facilitator by asking questions or giving encouraging comments. Such online teaching presence was important especially for the younger pupils who needed the guidance. Other than active online presence in the AOD, the teacher also offered positive reinforcement to those pupils who were active participants. They would be praised in class or a private message would be sent to them using Moodle. Such positive reinforcement worked as this group of pupils felt happy to be acknowledged by their teachers and were, thus, more likely to continue to participate actively in AOD. On the other hand, the whole class (not singling out any pupil) would be scolded for not participating actively in the AOD. Such punishment will decrease the likelihood of the pupils not participating in the forum.

Contribution Pattern

From the teacher's observation, the pupils were not participating actively in the AOD at home despite letters being sent out to the parents. This was supported by the statistical logs in Moodle which showed that majority of the posting (60%) was contributed in school.

During the focus group discussion, the diligent pupils indicated that they needed to juggle both the school and parents' homework, leaving them no time to access the AOD at home. One pupil stated that "My mother told me to do assessment all the time". They were also not allowed to use the computer frequently as the parents were afraid that they would be playing games instead of studying. Moreover, the parents did not view such online work as "serious work" thus did not actively support their child to contribute.

To overcome this problem, the teacher decided to structure such AOD-based lessons in class. She had to drop the idea of using AOD to extend classroom time but rather use AOD as an even platform for all to participate. As the pupils had been using computers regularly since Primary 1, they had no problem logging in and accessing the Internet. Even within a 45 min Science lesson, it was possible to conduct such IT-based lessons as little time was wasted on the technical issues.

Pupils' Learning Experience

From the perception survey, more than 70% either agreed or strongly agreed that they enjoyed both reading and viewing their friends' post. The statistical logs revealed that pupils were more active in viewing the posts (60%) than adding the posts (40%). Pupils might be too shy to views online or were not willing to willing to critique others' posts (Hemmi, Bayne & Land, 2009; Otter , Whittaker & Spriggs, 2009).

70% pupils surveyed cited being able to learn from their friends as one of the factors that motivated them to view the postings. One pupil commented "I read the Forum posts because some things my friend know I might not know thus if I read the Forum posts I can learn more". The AOD thus provided an avenue for pupils to construct their knowledge together (Hew & Cheung, 2003). Checking if their friends had answered to the posting was another reason for viewing the posts. One pupil stated that he enjoyed reading the post because "my friend always responds to me". It was observed that during class time, the pupils would always read the topics, which they have contributed, and checked if anyone had answered to their posts.

The analysis of the posts showed that most posts (92%) were learning-related while the remaining posts (8%) were for interaction. It was indeed encouraging to see the pupils were using AOD mainly for learning purpose. They provided information (answering their friends or the teachers' question), asked questions to clarify their doubts, corrected their friend if they were wrong and posted new topics to initiate new discussion. Some of the topics initiated included Black Hole, Cells and Atoms. One pupil reflected "it is fun and good to tell people about what you had learned." With AOD providing an even platform for all to contribute, even the low ability were sharing their view with 16% of the posting contributed by this group of pupils. Like viewing posts, most pupils(70%) contributing posts felt they were learning as this allowed for dialogic discourse to take place. Scott

(1998) suggested that learning will be improved if the learners have a well-mixed of both authoritative and dialogic discourse. In authoritative discourse, the teacher talks, with minimal participation from learners. On the other hand, in dialogic discourse, the teacher will seek the learners' opinion and learners can ask questions. A typical classroom setting will favor authoritative discourse as it saves time. The AOD can help to complement the classroom teaching by supporting dialogic discourse as more pupils can participate. Such discourse encourages learners to think and uncover any possible alternative concepts .

Proposed Implementation Model

Due to the "asynchronous" nature of the AOD, the pupils should ideally access the AOD at home. However, from the results of the study, the pupils were not participating actively AOD at home as parents prefer the traditional learning sheet to online work. In order to encourage participation , there is a need to conduct AOD-based lessons in class. Such intervention is necessary to heighten the pupils' interest in AOD. Thus, in the model proposed (see Figure 1) , the pupils are accessing the AOD both at home and in school. The teacher would prefer the necessary support like facilitating the discussion and encouraging the pupils to participate Hopefully, the pupils would be "hooked" and would "pester" their parents to allow them to access AOD at home.

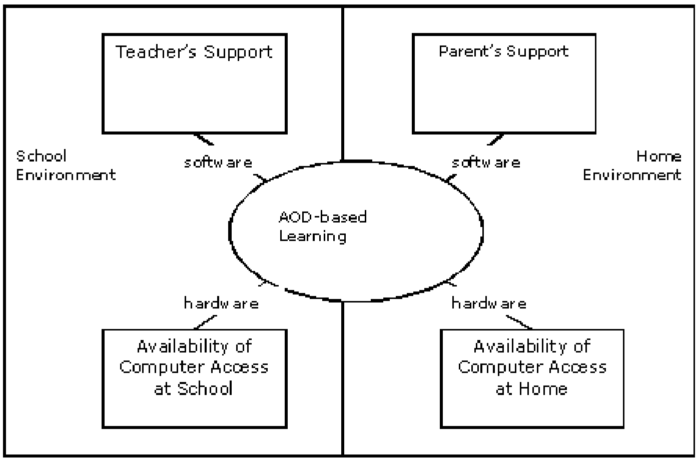

Figure 1 : Proposed Model

Conclusion

In this exploratory study of the use of Forum for 9 year old pupils, it was found out that the young pupils were ready for such learning. They were able to contribute constructive posts and had a positive learning experience in the AOD. The teacher played an important role and had to constantly think of ways to "entice" the pupils with the use of positive reinforcement and punishment. The main challenge facing this implementation was the support from the parents. The parents were not encouraging their pupils to participate as they did not view such online work as "serious work". However, in this paper, the parents' perception on AOD was not studied. Information about parents' perception would provide useful insights on how best to promote the usage of AOD at home.

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Augmented Reality for Learning Anatomy

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Learning anatomy requires students to memorise a great deal of information and contextualize this within the range of body functions. Visualising the relationships in three dimensions of various organs and their interdependent functions is a major difficulty in this task. The system described in this paper is a development to assist students by providing an augmented reality version of the anatomical details under investigation that provides a structured learning approach to the material. This is a research project to investigate whether augmented reality (AR) with haptics is an effective tool to learn anatomy while providing equitable access to more engaging experiences.

Keywords: Anatomy, three dimensions, learning, interactive, computer, engagement.

Introduction

This research project is to investigate how effective learning experiences can be improved with a technology, called Augmented Reality (AR) with haptics. Generally speaking technology-aided learning provides flexible accessibility. An intuitive interactive method like AR with haptics is expected to provide more engaging and effective learning experiences.

Research background

Difficulty in Learning Anatomy

Anatomy can be a very important subject as fundamental towards many relevant fields, such as health science. (Dominguese, 2011; Sakellariou et. al., 2009). Contemporary educational methods for teaching complex anatomical regions are considered inadequate as they typically lack the depiction of a 3D spatial tissue in a three dimensional manner. As such, the majority of explanatory illustrations are diagrammatic, 2D representations of pre-determined angles of depiction (Sakellariou et. al., 2009). This usually requires a number of images to provide full description of 3D objects in a 2D way. Unfortunately it has made anatomy a difficult area to gain the necessary knowledge.

It is well known that people learn in different modes. Some people might learn better in, for example, a kinaesthetic way. However, this mode is usually restricted because of the current limits of the conventional learning environment including online learning with multi-media resources even with interaction. Due to these restrictions, learners have to adapt their way of learning to fit the circumstances of provision. However as technology advances, we can give access to new modes of learning. Also learners' acceptance and usage of technology has grown in a dramatic way.

One of the prominent problems in learning anatomy is that it is impossible for the trainee to investigate in depth the layered structures, their spatial relations and visit these complex structures from different angles that might enlighten their perception and understanding (Sakellariou et. al., 2009). There can't be a perfect teaching alternative to current education. All the efforts are to improve a limited area or two with the assistance of technology. One way to overcome current limitations would be through Augmented Reality (AR). Sakellariou et. al. (2009) pointed out that a virtual reality system with haptic feedback was found more engaging, interesting, easy to use and more efficient in elucidating spatial inter-relationships of structures.

Augmented Reality with Haptics in Anatomy

3D DVDs and interactive online learning systems are very common as auxiliary learning tools nowadays. The technology has advanced to augmented reality with an extra enhancement of haptic feedback. Many researchers (Liao et al., 2010; Nicolson et al., 2006; Temkin et al., 2006) have experimented with the use of augmented reality systems in different parts of anatomy. Sugand et al. (2010) noted that virtual simulations can be effective for university students to visualize and interact with internal organs. Moreover haptic feedback with kinesthesia and tactility provides palpatory training. Virtual Haptic Back (Howell et al., 2008) and the Haptic Cow (Kinnison et al., 2009) are unusual examples where haptic systems were evaluated for teaching. Both systems are highly accepted by students.

As Billinghurst (2002) noted, AR technology is suitable for application in education where this technology is a valuable and interactive tool in the academic process. A principal value of educational experiences in AR is the ability to support a smooth transition between two environments that are reality and virtuality.

Rosli et al. (2010) mentioned that AR was accepted as a tool to be more interesting and to develop learners' understanding of human organs further than the textbook from a survey of primary school students. Rosli et al. (2010) quotes "other science experiences also enhance the students to construct their intellect, thinking skill (Martin et al. 2009) and make them more confident to manipulate the machine". Likewise, the AR system will help the students gain enough practice with a close look and feel of the target anatomical part as a stepping-stone. The system may not a perfect method of learning; however it is a tool to minimize the gap between reality and the virtual world.

In summary, it is evident that educational effects (Nischelwitzer et al., 2007; Marshall, 2007; Chien et al., 2010) encourage AR with haptics to be a medium to deliver training in 3D-oriented topic areas, but it has been neither widely experimented with nor evaluated. Although Augmented Reality haptic interfaces provide very intuitive methods for viewing three dimensional information, it has been less used in AR applications (Billinghurst et al., 2009) such as anatomy.

Research aims

The main purpose of the current project is to investigate the use of interactive 3D anatomy pictures with haptic feedback to teach and test anatomy knowledge, of the abdomen in particular, and to compare the results with other existing learning methods such as 2D images, models (wet or freeze-dried specimens and bones), and interactive resources (web, CD/DVD).

Preliminary survey

Students enrolled in an anatomy unit were surveyed about their experiences of learning and applying anatomy. This was conducted informally over about 1.5 hours with the lecturer and a half an hour with 23 students (12 female, 6 international).

Conventionally the main resources for learning anatomy are textbooks, images (from textbooks, Computed Tomography (CT) scans or Magnetic Resonance Imaging (MRI) type of radiological images, and computer based images), integrated practical sessions (self-directed worksheets are used with models, e.g. dissemble & assemble models), and cadaver examinations that could be the most natural way of learning with haptic/kinesthetic experiences. The cadaver session is run with a group of 3-4 students to dissect the body, and then the group presents findings at a tutorial. Students spend up to 24 hours over 6 tutorials. Each student has 8 hours of dissection.

The students were asked:

- What aspect of learning anatomy do you find most difficult?
- What is your usual resource to study anatomy? Why? (e.g textbooks, DVDs with animations, anything else)
- What are the limitations with which you wish to enhance the resources?

A fortunate and interesting point is that the identified difficulties in learning anatomy are same from both the lecturer and also the group of students. Both agreed that the main difficulties are applying 2D concepts to 3D spatial practice.

The following points were gathered from feedback sheets on the most difficult aspects of learning anatomy. Students had difficulty with:

- visualization of what they have learned in lectures; 2D materials are not easy to reconstruct in 3D world
- visualizing and applying knowledge practically in clinical conditions
- relationships (separate organs are understood but fitting them together is difficult); the relationship of each organ to its surrounding structures
- dissection of cadaver could be one of best learning options (only a few students mentioned this), but too complicated, so sometimes confusing; limited time access only.
- They mentioned their preference to have a 3D version of the images in textbooks
- and 3D zooming in interactive software to explore deeper layers such as vessels and/or nerve structure.

Thirteen students mentioned the limitations of 2D presentation while a few other students commented indirectly about 2D issues of putting the separate organs together in more clinical/practical sense.

It was surprising that although DVDs and online resources are well developed, they did not seem to be utilized well. One of the reasons might be cost. Another issue for not being accepted by users could be another layer of learning the tool itself. Despite all the efforts to create a transparent user interface, there is a big gap between the tool and user acceptance of it.

These computer-based resources have different pedagogical approaches as well as varying technologically.

System description

Current learning of anatomy consists of 2D coloured images (i.e. textbooks), e-resources (similar with textbooks but interactivity is added on), and cadaver dissection. An expensive cadaver option may not be a best option for learning. In spite of its cost and the difficulty of providing multiple learning opportunities with it, there are still gaps between what we can learn from it and what we can apply to clinical situations. The first image is an example of an image in a textbook. The last two images are used by the new haptic interaction system. The 3D images are rotatable and zoomable with a haptic interface (See Figure 1 for examples).

Figure 1: Image from textbook, image of cadaver, 3D images from haptic interactive system

When a student's eyes view 2D images in a textbook, they are looking at a static image which has been drawn and coloured in a specific way. The image contains a 3D model taken from a set angle with a particular status where colour-coding may distinguish digestive and blood circulatory systems for instance. Sometimes these static images are more realistic, and are based on cadavers.

By contrast, in the proposed system, the student will be able to view the organ from any angle and at any magnification. Augmented information superimposed on the anatomical visual models will display further explanations about the function and structure of each organ. Different functions will enable the student to select from colouring schemes or cadaver-like views. Different layers of organs, blood vessels, nerves, can also be selected.

Haptic technology provides the sense of touch and controls of computer system through force (kinesthetic) or tactile feedback. Haptic feedback provides another dimension to understanding anatomy efficiently. The Phantom Omni (Figure 2) is one of the relatively cheap haptic devices available. Effects provide a way to render forces to the haptic device to simulate arbitrary sensations. Force effects can be started and stopped or triggered in response to events, like touching a shape or pressing a button on the haptic device. Unlike shape rendering, effects will persist until stopped or until the duration has elapsed for trigger effects. This device provides 6 degrees of freedom to drag, rotate, zoom-in and out, and touch. By pressing an organ which is displayed on the monitor students can compare different sensations and hardness of parts of organs or inside and outside of an organ. Other programmable functions such as dissection can be added to the system.

Also one of the main difficulties in understanding anatomy is the gap between illustrations *per se* in textbooks or learning resources and the actual body or cadavers. By implementing augmented reality, various conditions with shapes and colours can be displayed at users' selection.

This study will explore these new affordances of technology and evaluate their effectiveness in learning.

Methods

The current “integrated practical” anatomy learning session consists of five (5) work benches allocated with different resources. An additional work bench will be added for this experiment. The system will be developed with Visual Studio 2010 in C++. OpenGL will be used to create high quality 3D images. A Phantom Omni robotic tool will provide haptic feedback with 6 degrees of freedom and will utilise the Openhaptics tool kit (Itkowitz, Handley & Zhu, 2005) to interface with the anatomical visualisation data. In order to develop augmented representation of 3D information, marker-less augmented reality will be adapted. Instead of creating markers, the extracted patterns of the images from the textbook will retrieve the information to be superimposed.

A user-trial experiment is designed in an activity-based curriculum. A mixed experimental research design will be used to evaluate participants’ practical examination scores as well as their perception of the computer program’s effectiveness in helping them learn anatomy in the form of questionnaires and video recording. The user survey with questionnaires and video recording are currently undergoing the ethics approval.

In order to test user acceptance by human users in the subject area, two different interfaces will be implemented. One interface is to use a haptic device such as Phantom Omni (Figure 2) that provides different type of haptic feedback to the user depending on his selected activity. The other interface is to use the same system with commercially available game device, Xbox 360 Kinect. This will provide an interface with fingertip control (Figure 3), but without haptic feedback.

Figure 2: Phantom Omni robotic arm with ‘touch feedback’

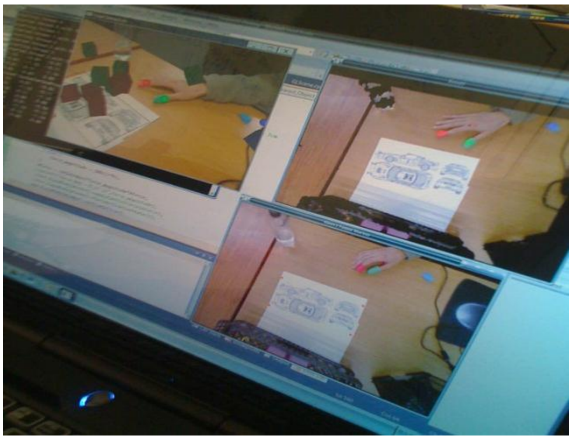

Figure 3: Xbox 360 Kinect detects coloured fingertips

The effectiveness of the AR system will be analysed by comparison of learning achievement measured by conventional academic assessment. User acceptance will be judged from videos showing how students used the system, and logs of their progress through the structured learning sequence.

Conclusion

This paper has described a problem in learning anatomy and how this project will aim to overcome some of the difficulties. Augmented reality is a relatively new area of research, so implementation and investigation are developing fields with emerging methodologies. Some comparisons of training using AR in the discipline of anatomy have shown promising results, with simulated human body organs providing better learning experiences (Leblanc et al., 2010). Activities in the museum sector have also shown that three dimensional objects can be better appreciated using a haptic interface (Butler & Neave, 2008) so this aspect of the current project appears promising. One novel feature of the proposed system is to incorporate a structured learning sequence based upon the anatomy lecturer's worksheets which will direct students through a series of investigations using explicit teaching. This will be followed by unstructured investigations using the affordances of the technology, and finally by an interactive quiz to verify learning. These aspects provide a good reason to hope the system will be effective when compared to traditional learning techniques.

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