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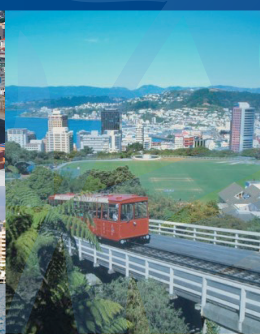


Bridging Digital Divides in the Learning Process: Challenges of Integrating ICTs in Learning

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This study is investigating the phenomenon of digital divides, in the context of integrating one-to-one ICTs into the learning process. For this purpose, we are studying a ‘bring your own device’ (BYOD) initiative by a New Zealand School. This poster discusses the background and agenda of the study, as well as some of the initial findings from an analysis of the baseline data.

Keywords: ICT integration, digital divide, learning outcomes

Background of the Study

Based on the potential benefits and opportunities that the introduction of ICTs can bring to students’ learning, educational organizations have developed projects and policies to make the learning process more engaging and participative by integrating ICTs to generate better academic outcomes (Anderson, 2009; Prestridge, 2007). Although the introduction of ICTs provides potentially valuable resources for learners’ educational and social development (Demiraslan & Usluel, 2008), previous digital opportunities projects in New Zealand show that it might end up contributing nothing more than just an effort to facilitate material access to ICTs (Rivers & Rivers, 2004). The Digital Opportunities Project was an initiative by the New Zealand government in collaboration with participating schools and associated businesses aiming to assist in bridging the digital divide in low decile schools by providing (a) material access (b) professional development, and (c) infrastructure to promote collaboration. Despite good strategy and infrastructural support, the overall goal of bridging the digital divide was not achieved (Bolstad, 2004; Parr & Ward, 2004; Rivers & Rivers, 2004; Winter, 2004a, 2004b).

The results and experiences from the digital opportunities pilot projects raised several implications for future ICT interventions of a similar kind. It has also raised the question of whether we are doing everything required to attain the goal of achieving digital inclusion for every student in the learning process. In other words, is achieving digital inclusion in access and capability sufficient, or is there any other aspect that needs to be taken into account when integrating ICTs into the learning process? To address the concerns that emerged from the initial digital opportunity projects, the Ministry of Education announced an ICT strategic framework for education in 2006. The goal of ICT strategic framework was to develop a more student-centered learning culture where education agencies and organisations focus on the students’ learning outcomes rather than the technology. However, even after the strategic framework for education there are still some unanswered questions around why these projects are still not very successful in equalising digital inclusion in the context of integrating ICTs into the learning process.

Agenda for the Study

Investigation of past and current digital opportunities projects shows that these projects are not very successful in achieving equalised digital inclusion for every student. Therefore there is a need to rethink the digital divides in learning underpinning the concept of ICT initiatives.

The opportunity to have equitable material access to ICTs and digital capability can be the necessary first step towards digital inclusion for every student, but is not sufficient. Therefore, to attain the complete digital inclusion for every student and to bridge digital divides in the learning process, we need to look at aspects of the digital divide beyond just access and capability, which has not been taken into account by the previous initiatives. This additional aspect is the learning outcomes of the student participating in the ICT mediated learning process. According to Wei, Teo, Chan, & Tan (2011), as ICT adoption advances there arise newer forms of digital divide, and even after ensuring the equalised digital access and digital capability, there is a possibility of having differences in the outcomes achieved by the individuals (in saying this, the access and capability aspects are still important because these divides are still persistent and could impact negatively on digital inclusion and students’ learning outcomes). Based on the relevant literature and the investigation of past and current ICT initiatives in New Zealand, we have been able to identify some factors which have the potential to affect the learning process mediated by one-to-one ICTs, and might also impact the digital inclusion of every student from the perspective of learning outcomes. These factors are: (a) attitude and motivation of individual learner towards ICTs, (b) nature of ICT usage, and (c) learners' capability of meaning making. Therefore, these factors should be investigated in depth to find the impact of these on digital inclusion. The BYOD project provides an opportunity to investigate these factors in a real world context of integrating one-to-one ICTs into learning.

Findings from Baseline Data

The baseline data has already been collected and analysed. This helped us to draw some preliminary conclusions. Some key findings of the analysis of the baseline data, which are of significant interest to us, are as follows:

Top 5 Positives:

1. Students can gather information quickly and easily from various sources.
2. Students don't need to carry books etc., just one device.
3. Engagement of students in learning activities has improved.
4. Students carry and use their devices anytime and anywhere they want.
5. Students do many other activities to improve their learning experience. E.g. take photos and record videos of their performance in dance, drama, and physical education.

Top 5 Negatives:

1. Distraction and lack of control in the classroom.
2. Internet problems and non-recommended devices disrupt learning activities.
3. Digital devices do not prepare students for written exams.
4. Negative impact on the students' critical thinking.
5. Increased teacher workload.

Top 5 Findings:

1. Some students do not have adequate access to ICTs, including one-to-one device ownership
2. More than half the students spend most of their digital time in activities other than learning
3. There is a significant difference in the level of digital and information literacy among students
4. Teachers tend to focus on one specific device
5. Teachers are continuing with their old method of instruction (i.e. teacher to classroom).

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Going mobile: Each small change requires another

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Students are seeking flexible study opportunities. Smartphones have potential to support learning at times and places chosen by learners but their introduction presents challenges in negotiating the changes in the behaviour of learners and in the materials and activities provided by university courses. This project, funded by DEHub in two Queensland universities, explored how students used mobile devices with many characteristics of smartphones. This paper reports on the first phase that investigated the changes required to facilitate access to course materials and activities using the devices. Data have been viewed through the lens of activity theory. The results confirmed the need for developing skills and managing expectations of learners and academics and for adjustments to design of course materials and delivery systems to facilitate access.

Keywords: mlearning, activity theory, teacher education, smartphone, iPod Touch, distance education, online education

Introduction and background

Family and work commitments are prompting more students to choose distance or online modes of study for all or part of their degrees. Implicit in their decisions is a desire for flexibility that can be limited by the delivery of bulky printed materials or media that require computers for access. One challenge faced by universities is the provision of flexible study opportunities that match the needs of students.

We live in an age of *mobilism* and access by learners to personal mobile computing devices is becoming commonplace (Norris & Soloway, 2011). Devices small enough to be ‘always’ carried by the user could overcome many barriers that limit access to study material and support more flexible distance or online learning. Although developed primarily for business and entertainment, many current mobile devices are powerful computers capable of running educational applications.

Smartphones are significant because they merge telephone, Internet-connected computer, camera (still and video), audio recorder and player, and ebook reader. Of the 89% of Australian adults owning a mobile phone in April 2011, 37% had a smartphone and the number of users going online with their mobile phone had increased by 63% from 2.4 million to 3.9 million between June 2010 and June 2011 (ACMA, 2011). Smartphones, and similar devices, offer learners more options for ‘anywhere, anytime’ learning than do larger portable devices such as laptops. They can store learning materials for later access or support remote synchronous or asynchronous interaction with content, teaching staff, and peers. As more students have access to smartphones and a growing preference for flexible learning, it is important that universities investigate both the potential of smartphones for learning and the changes that may be necessary to facilitate their use.

Literature review

Australian undergraduates include many mature students seeking career change opportunities. In 2009, 24% of Australian undergraduates were aged 25 or older and 15% were older than 30 years (DEEWR, 2010). The proportion varies across universities and disciplines with a survey of final year teacher education students reporting 45% aged 25 or older and 10% aged 40 or older (DEST, 2006). Many of these students have family and employment commitments that affect their availability for on campus classes. In 2006 the typical Australian university student was undertaking substantial paid employment during the semester (James, Bexley, Devlin, & Marginson, 2007), with as many as 70% of full-time undergraduates working almost 15 hours per week on average, 15% working more than 20 hours per week, and almost 5% working full-time. It is not surprising that students seek flexible options to meet individual needs for balancing study, family and work commitments.

From 2001 to 2010 the proportion of Australian undergraduates studying part-time declined from 27% to 21% (DEEWR, 2011). Over the same period the proportion of undergraduates studying in internal (on campus) mode remained steady at 83% to 84%, while external enrolments decreased from 13% to 8% and multi-modal enrolments (study units taken partially internally and partially externally) rose from 4% to 8%. For USQ from 2006 to 2010 undergraduate enrolment density (ratio of head count enrolments to full-time equivalent load) decreased slightly from 1.99 to 1.86, indicating a slight increase in the proportion of full-time students. Over the same period internal and external enrolments reduced from 15% and 75% to 13% and 74% respectively while multi-modal enrolments rose from 10% to 13%. The number of web-based subjects offered rose from 119 to 198 and web-based student enrolments rose from 2676 to 12485, an increase of more than 400% (USQ, 2012). These trends are reflected in the observation that in 2012 up to 70% of Bachelor of Education students at USQ are studying at least some subjects online. Moreover students studying on campus are likely to access some of their study materials and activities from online sources. The evidence suggests that flexibility of study is increasingly important to students and that the mobility afforded by smartphones and similar devices will be part of the solution for meeting the need for flexible study options for students. Hence it is important to understand both the potential and the implications of adopting and adapting mobile technologies for learning and teaching.

Affordances and limitations of mobile devices

Cheung and Hew (2009) referred to “mobile handheld devices as any small machines that can be carried easily in one's palm and provide computing, as well as information storage and retrieval capabilities.” Wireless Handheld Devices (WHDs) represent a subset of such devices with affordances that render them highly appropriate as learning tools in distance education (Soloway, Norris, Blumenfeld, & Fishman, 2001). Figure 1 represents the relationship between WHDs and related devices.

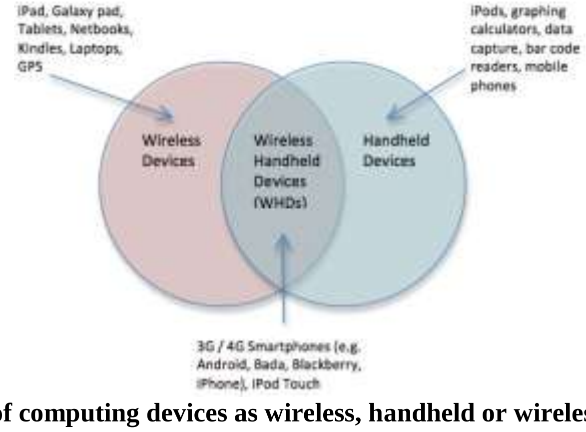

Figure 1: Categorization of computing devices as wireless, handheld or wireless handheld devices (WHD)

WHDs exhibit properties, including portability, potential for social interactivity, context sensitivity, connectivity, personal ownership, and ease of use, that can facilitate collaborative mobile learning (Naismith, Lonsdale, Vavoula, & Sharples, 2004). They are a comparatively inexpensive means for students to access multimedia content and communicate but are subject to constraints imposed by physical, logical and socio-cultural factors (Song, 2011). Physical constraints include screen size, slow processors, difficulty with text input and limited functionality. Logical constraints include availability and price of appropriate programs, difficulties in ending programs, and system instability. Socio-cultural factors include user expectations and preferences.

mLearning

Because this study investigated learning at a distance it is useful to review the praxis between distance education and mobility. Initially mLearning was viewed as a variant of distance education, which could occur at any place and time unlike conventional education that occurred at a set place and time (Keegan, 2005). The flexibility of distance education was curtailed by online learning because it required access to information from a desktop computer (Dye, Fagerberg, & Rekkedall, 2005). WHDs promise to restore flexibility to the distance learner.

Distance Education has been conceptually refined to encompass Contextual Life-long Learning (CoLL) which holds that learning is not confined to specified times and places and that traditional education cannot provide all the knowledge and skills people need to prosper throughout life (Sharples, 2000). Technologies to support CoLL need to be portable, individual, unobtrusive, available anywhere, adaptable to context of learning, and relevant to the learner's evolving skills and knowledge, persistent, useful, and easy to use (Jueming Chen, 2005). WHDs, as described above, meet these requirements.

Technologies, from posted print materials to synchronous online interaction, have always mediated the experience of distance education. As technologies change, so does pedagogy. Recent thinking recognises that new generations have not supplanted what has gone before but that layers have been added for a more complete experience embracing elements of behaviourism, constructivism, and connectivism (Anderson & Dron, 2011). Recent expansion of online learning raises questions about the nature of interaction in distance education. Moore (1993) suggested that distance in distance education is about psychological rather than geographical distance and introduced the concept of transactional distance. In an earlier paper he had clarified understanding of interaction in learning as being of the learner with content, instructor and other learners (Moore, 1989). WHDs have potential to make all three forms of interaction more conveniently available at diverse times and places, thereby enhancing learning by reducing transactional distance between learner and teacher and between learner and learner. However, for this to be achieved it is important to understand how the introduction of WHDs affects the interactions of university learners and teachers, which in turn has pedagogical implications.

Activity theory

The affordances of WHDs make them potentially useful for learning but determining their suitability requires understanding of the pedagogy appropriate to such devices. In this paper we will use Activity Theory as a lens for examining the effect of WHDs on the experiences of university learners and teachers. Activity Theory aims to understand human beings in their natural, daily circumstances through analysis of the genesis, structure, and processes of their activities. Activity is understood as a purposeful interaction of the subject with the world, a process in which mutual transformations between the poles of ‘subject–object’, via the use of tools, are accomplished (Kaptelinin & Nardi, 2006). Engeström (1987) reconceptualised Activity Theory from the initial subject-tools-object triangle into a six element model (Figure 2) which has become an analytical tool used in a wide range of educational research (Blin & Munro, 2008; Larkin & Finger, 2011; Lloyd & Albion, 2009).

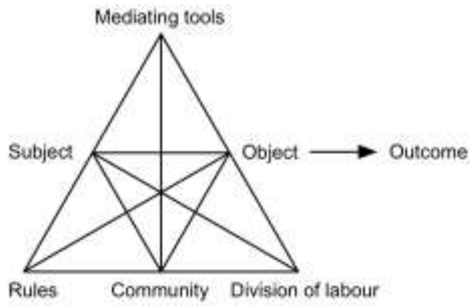

Figure 2. An Activity System (Engeström, 1987, p. 37)

Engeström's (1987) framework provides a tool for examining the various socio-cultural elements that affect the relationship between the subject and the community in attaining an outcome. Individuals and the community grow through the resolution of tensions and contradictions leading to transformations and expansions within the system. Contradictions exist when external influences change elements of activities causing imbalances between them, for example, the introduction of the iPod Touch in this study as a means of accessing course materials. Consequently, Activity Systems are almost always in flux as they work through contradictions that manifest themselves as problems, ruptures, breakdowns, or clashes (Scanlon & Issroff, 2005).

Appropriateness of Activity Theory to conceptualise use of WHDs

Activity Theory and its iteration as Activity Systems allow the researcher to critically examine the praxis between individual and society, and between object and subject, seeking to explain cognitive development through psychological processes driven by the individual but mediated by a variety of tools in a context (Larkin, 2010). It provides a coherent, theoretical framework to investigate multi-faceted sites to provide a broad and deep account of the actions of people as an activity unfolds over a period of time.

Activity Theory has been used by previous researchers in mobile learning and was used as the basis for a proposed “theory of learning for the mobile age” (Sharples, Taylor & Vavoula, 2010). Other researchers have identified limitations of Activity Theory as a basis for studies of mobile learning and suggested that an ecological approach would be more appropriate (Pachler, Bachmair & Cook, 2010). Nevertheless, Activity Theory was adopted for this study because of the prior experience of team members undertaking studies using Activity Theory (Lloyd & Albion, 2009; Larkin, 2010), and three features of Engeström’s (1987) Activity Systems that render it appropriate to our research context. First the collective activity system is taken as a unit of analysis, giving context and meaning to seemingly random events; second, the activity system and its components are understood historically; and third, inner contradictions of the activity system are analysed as the source of the disruption, change and development of that system (Young, 2005). This research adds to the body of knowledge by using Activity Systems to reveal systemic contradictions and transformations stemming from the use of WHDs in a higher education and distance learning context.

Method

The research was conducted in two Queensland universities during 2011 and 2012 in the context of undergraduate Education and Nursing courses. Each university had 40 iPod Touch devices available for distribution to distance or online students in selected Nursing and Education subjects who responded to invitations to participate.

Data to enable rich descriptions of cases based on participating classes were collected using:
1. A pre-test & post-test survey based on previously validated instruments,
2. Reflections by students and facilitators logged in an online system,
3. Interviews conducted with student participants,
4. Online discussion forums involving students and facilitators, and
5. Software developed to record applications installed on returned iPods.

Although the primary focus of the research was on the use of the iPods for learning, the researchers were interested in any use of the iPods, including personal use (even that by other family members) because of the potential effects on the participants’ learning activity systems. This paper reports data from participating Education students at one university in the first semester of the project. Other papers will report data from the broader group of participants across both semesters.

Participants and setting

Participants for whom data are reported in this paper comprised distance students completing an ICT and pedagogy course within a Bachelor of Education program at a regional university. The course explores the use of ICT for teaching and learning within school classrooms and included students from Early Childhood, Primary, Secondary, and Special Education specializations within the third year of a four year program. Participating students volunteered to use the iPod for course learning purposes and also during their professional experience where possible.

Twenty iPod touches were available for distribution and two students joined the project using their own iPhones. During the semester three students withdrew due to workload commitments, leaving 19 participants who completed the semester in the project. Each student completed a research consent form and an acceptable usage agreement form. The iPods, and iTunes gift cards ($30) to support the purchase of relevant software, were distributed to the volunteers by regular mail.

The course was offered online using the Moodle learning management system to provide recorded lectures, learning activities, additional readings, and facilitated online discussions related to the course content and assessment. Materials were not modified for mobile delivery in the first semester of this project. Students in the iPod project were supported within the Moodle space through a separate area that included information on how to use iPods, online discussion areas for asynchronous discussion, synchronous discussion opportunities through Wimba, and links to project documentation such as consent forms and surveys. It also provided wikis for students to share ways of learning with WHDs, including their use in classrooms.

Data collection

Questionnaires

Questionnaires were administered online using LimeSurvey® (www.limesurvey.org) in the first and last weeks of semester. Data were transferred to SPSS 19 for analysis. They included multiple scales, each comprising several statements to which participants registered levels of agreement on a 5-point Likert scale from strongly disagree (1) to strongly agree (5), except for the frequency of use scale which used a 6-point scale (1=Not Used; 2=Once/twice a semester; 3=Once/twice a month; 4=Once/twice a week; 5=Once a day; 6=Several times a day**)**. The scales addressed interest in and attitude toward using ICT for learning (13 items), expected (actual in the post-test) ease of use of the iPod Touch for learning (6 items), expected (actual in the post-test) usefulness of the iPod Touch for learning (6 items), frequency of use of ICT (iPod Touch in the post-test) for various study activities (30 items), and desirability of a mobile device for study (13 items). Scores on the scales were calculated and reported as average ratings.

Qualitative data collection

Reflections were collected online, with the students and the facilitator completing the online form every two to three weeks. The reflections, online discussion archives and interview data were analyzed using the constant comparison method. The researchers searched for common themes and patterns within the data and inconsistencies were also noted. On receipt of the iPods returned by the participants software was used record the applications installed on the iPods.

Results

Survey data

From the 19 Education students who participated, 10 completed data sets matched for pre-test and post-test were extracted for analysis. The students were asked to record their access to various ICT hardware and services. All reported exclusive access to a computer, with nine having access to a laptop. While all of the students had home broadband Internet access, eight did not know the speed of their connection but agreed it was fast enough. Of the remaining two students, one had a connection speed of 8000kbps and the other had 1500kbps. Five of the students had a home monthly data limit of 10GB or more, one student had between 5 and 10GB and three students had between 1 and 5GB. Given these levels of Internet access, all would have been able to access study materials in the LMS. Most students reported limited or no access to portable devices such as MP3 players, eBook readers or tablet devices suggesting that addition of an iPod Touch would be a significant change in their access to ICT but also that lack of experience might result in some time being required for familiarization.

The pre- and post-test data for the 10 students were compared using paired samples *t*-tests for each of the five scales described above and these results are presented in Table 1. Mean differences were calculated as pre - post so that positive values represent a decrease in mean rating from pre- to post-test.

Table 1: Analysis of changes in ratings on the 5 key scales (N = 10)

	Paired Differences							
	Mean Diff	Std. Devn	Std Err Mean	95% Confidence Interval of the difference		*t*	df	Sig. (2-tailed)
				Lower	Upper			
Interest in & attitude to ICT for learning	-.046	.224	.071	-.206	.114	-.651	9	.531
Ease of Use of iPod Touch for learning	.350	.506	.160	-.012	.712	2.188	9	.056
Usefulness of iPod Touch for learning	.800	.987	.312	.094	1.506	2.563	9	.031
Frequency of Use in learning	1.803	.721	.228	1.288	2.319	7.915	9	.000
Desirability of iPod touch for learning	1.115	1.280	.405	.200	2.031	2.755	9	.022

As is evident in Table 1, interest in and attitude to use of ICT for learning increased slightly (pre-test mean = 4.38, post-test mean = 4.42), but not significantly, across the semester and expectations about ease of use of the iPod Touch decreased slightly (pre-test mean = 3.47, post-test mean = 3.12), but not significantly. Measures for usefulness of the iPod Touch for learning (pre-test = 3.30, post-test = 2.50), frequency of use (ICT on pre-test, iPod Touch on post-test) for learning (pre-test = 3.65, post-test = 1.85), and desirability of the iPod Touch for learning (pre-test = 3.82, post-test = 2.70) all recorded statistically significant ($p < .05$) decreases across the semester. Individual items from those measures were inspected for patterns that might explain the differences.

The six items on the usefulness scale had registered between 3.1 and 3.7 on the pre-test and decreased to 2.4 to 2.6 on the post-test suggesting that expectations about the iPod enabling quicker and easier access to course materials and enhancing communication were not realized. The decreases were reasonably consistent across the scale items with no evident pattern.

The frequency of use scale on the pre-test referred to use of ICT and included some tasks (e.g., create and present multimedia, upload files) that might not be possible using the iPod Touch and others (e.g., publish podcasts or other audio files, maintain a blog as part of course requirements) that were not required in the course. In that light it would be surprising if responses to post-test items phrased to ask about actual use of the iPod Touch had attracted agreement as strong as those recorded on equivalent pre-test items asking about potential use of generic ICT for the same purposes in the absence of sure knowledge of course requirements. Items that scored higher average responses related to looking up reference information on the web (3.0), accessing social networks (2.9), email (2.8), downloading course files (2.8) and accessing study material (2.7). These averages are on a scale where 3 indicated once or twice a month.

The scale referred to as "Desirability of iPod Touch for learning" sought agreement (or not) with 13 reasons for using WHDs for study purposes. The statistically significant decrease on that scale was driven by a decrease on all 13 items with the extent of change varying from 0.8 (easier and more frequent communication with peers) to 1.9 (better understanding of subject material). Items with smaller decreases (less than the mean decrease of 1.12) focused on ease and frequency of communication with peers or lecturers, better results, increased general ICT skills, and convenience for completing course work. Items with larger decreases were those related to having a wider range of tools for study, improved career prospects, and better understanding of the subject.

Qualitative data

Initial analysis of the text of student responses identified frequently occurring words (including 'access', 'lectures', 'information', 'people', and 'remote') that could be used as starting points for thematic analysis. Text was scanned to generate a key phrase list, which was used to tag responses from individual respondents to each of the questions that had been posed to them. This tagging of participants' responses against the key phrase list was used in Microsoft Excel to produce a frequency table and associated radar chart (Figure 3 below) showing the relative frequencies with which identified themes appeared in responses to three key questions.

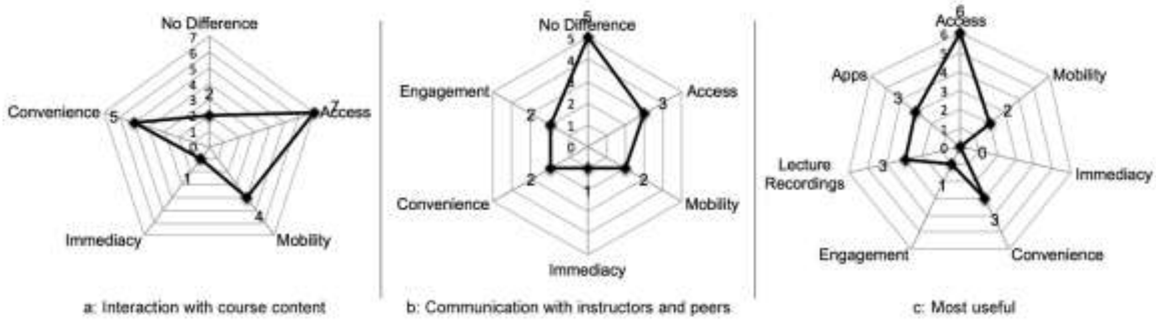

Figure 3: Radar plots of key themes from student interview data

The first question asked about differences that the iPod Touch may have made to interaction with course content (Figure 3a). Major themes in the responses were *access*, *convenience* and *mobility* with comments including being "able to listen to lectures while I walked my dogs" and "time management [becoming] less of an issue because I didn't have to rely on my home computer to access…readings and tools." One respondent mentioned *immediacy* of access "at the drop of a hat without having to set up my laptop and wait for it to load."

The second question asked about changes to patterns of communication with instructors and peers (Figure 3b). Most participants reported no difference but where changes occurred they mostly related to access, mobility, convenience, and engagement. Specific comments referred to more convenient access to email "instead of having to turn on my laptop", to access while away from home, and to being "able to record myself in the car and while taking part in normal day to day activities that I could then recall and send to my lecturers and peers."

The third question asked what participants found most useful about the iPod Touch (Figure 3c). The dominant theme was *access*, represented by comments about use away from home, mobility facilitated by the small size, and being able to watch or listen to recorded lectures "while I walked my dogs."

Across the three questions the most common themes were *access* (16 instances), *convenience* (10), and *mobility* (8) but these three and other concepts were often linked in a single statement, for example, the student who reported using the iPod to "listen to lectures while I walked my dogs." Most participants reported no change to communication resulting from the iPod; changes to interaction with course content were more numerous; and the responses for *access* in the question concerning the most useful aspects were predominantly about accessing recorded lectures or other course material.

Discussion

As noted in the literature review, Activity Theory provides a useful framework for conceptualizing the interactions of human beings with the various components of systems with which they interact in order to accomplish desired outcomes. Figure 2 represented the relationships among components in a generalized activity system. Figure 4 presents possible representations of the salient components of the activity systems experienced by students and academics participating in this study. In each case the generalized labels have been substituted with labels particular to the systems under consideration in this study. The activity systems experienced by students and academics will interact and have common components, some of which are apparent in the labels. Although the real activity systems will be more complex and will vary for individuals the representations include what we believe to be the most significant elements from this study.

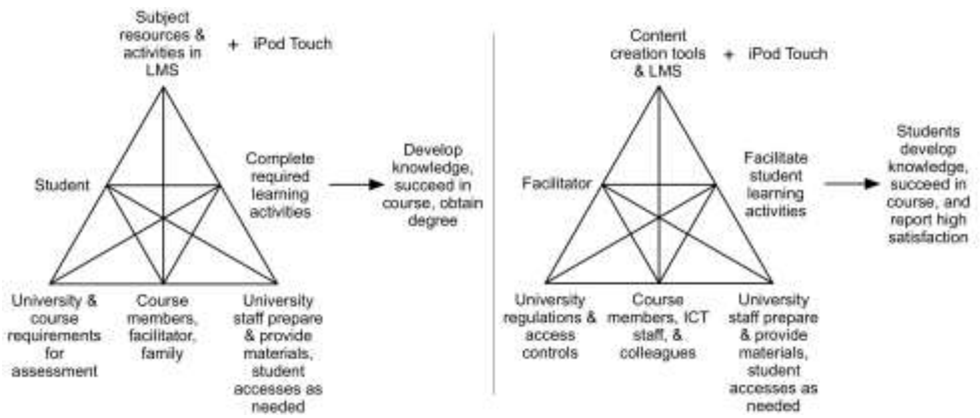

Figure 4: Activity systems experienced by students and academic facilitators

Students are represented as directing their activity toward successful completion of required learning activities as the object in their activity system with their outcome being to pass the subject and ultimately their degree. The object and outcome for the academic facilitators are related to those for the students but with a difference in emphasis on facilitating student completion resulting in passes and satisfaction with the course. Other parts of the systems are similarly parallel with variations in perspective according to the different roles being played in the systems. In each case the addition of the iPod Touch to the available tools represents a potential contradiction to the system that will affect, and be affected by, other elements of the system.

The results presented in the previous section offer some insights into how the introduction of an iPod Touch might have affected the activity systems being experienced by these student participants. Students reported positive attitudes toward the use of ICT for learning, together with levels of availability of computers and Internet connectivity that would have enabled them to conveniently access course materials and interactions through the LMS when at home or in similarly equipped locations. Most students reported limited or no access to mobile devices suggesting that access to an iPod Touch would increase the variety of locations in which they might be able to access suitably packaged course content and learning interactions.

These expectations were reflected in their responses to the questionnaire at the beginning of the semester. On the 'ease of use' scale they expected that it would be easy to learn how to use the iPod (mean = 3.8) and to get it to do what they wanted in the course (3.6), which appeared to focus more on communication with staff (3.6) and peers (3.4) rather than on access to materials (3.2) or completion of assessment (3.2). Expectations about 'usefulness' focused on increased interaction with course materials (3.7), increased communication with staff and peers (3.4), easier completion of the course (3.4) and improvements in results (3.1) through being able to work more quickly (3.1) and easily (3.1). Among these expectations the only one that was realized was the ease of learning to use the iPod, which registered an increase in mean rating from 3.8 (pre) to 4.3 (post). Every other item on the scales for 'ease of use' and 'usefulness' recorded a decrease from pre-test to post-test. Items with larger (greater than average) decreases in mean scores from pre-test to post-test included those that focused on communication, ease of completing assessment and the course, and increased interaction with course materials. The latter recorded the largest change of all items from 3.7 (pre) to 2.5 (post) which is somewhat surprising in light of the qualitative data in which accessing course materials, especially recordings, emerged as a major theme. The explanation may lie in the change being in the mode and location of access to materials rather than an increase in *amount* of access. Another explanation may be that the type or format of the materials limited the affordances of mobility because some are less than satisfactory on current WHDs. For example, PDF files may not zoom or, if they do, require inconvenient horizontal scrolling to read.

From the perspective of the activity system, students clearly anticipated the introduction of the iPod Touch as an additional tool to bring changes that would facilitate their achievement of the object and outcome. However, the effects in most areas were less than anticipated. At least part of this may be attributable to the short time over which the project ran. Allowing for time taken to recruit students for the project, distribute the iPods and return them at end of semester, and for the 3 weeks during which students were on professional experience, the participants had approximately 9 to 10 weeks of regular class time during which to experience working with the iPod Touch. Expectations about it being easy to learn to use were fulfilled but students may have needed some time to learn its use and may not have discovered all the functionality either inherent in the device and its OS or available through installable apps. Moreover, the short timeframe limited the time available for course leaders to identify, from student feedback, the resources that were problematic and provide alternatives. If course resources are to be device-independent and WHD-friendly, course leaders will need time to experiment with a range of devices to ensure maximum accessibility for students using these devices.

The course materials in this course were not modified specifically to support access using the iPod but the file formats provided in the course (.htm, .doc, .ppt, .pdf, .mp4, .mp3) were capable of being accessed using the iPod touch. Some files could be downloaded and stored for later access on the iPod Touch without access to a computer, some could be streamed while connected to the Internet, but some could be downloaded only on a computer and then transferred to the iPod, limiting the potential of the device to be the 'total' access solution. However, access to audio content, supported by the mobile devices would not have been possible otherwise for some students. Although it appears that the total amount of interaction with materials did not increase as a result, students reported greater mobility of use, for example, while mowing or walking the dog. The iPod has therefore had a perceptible effect on the activity system with regard to access to and use of course materials.

Introduction of the iPods brought fewer benefits for communication than students had anticipated. In part, this may have resulted from restricted network connectivity (WiFi only where available) of the iPod compared to a smartphone, but part will have resulted from interaction between the iPod and other tools in the activity system. Synchronous communication in the course used Wimba, which requires Java and as a consequence does not work on the iPod. Asynchronous communication using the discussion forums in the LMS (Moodle) is possible but sometimes awkward because the default configuration of the LMS is not well tuned for use on the smaller screens of mobile devices. Some students mentioned using the iPod successfully for email but other modes of communication characteristic of small mobile devices (SMS, Twitter, Facebook) are not officially supported by the university and may or may not have been in use by members of the course community in the activity system. Thus the iPod had only a limited effect on communication within the course activity system because of technical limitations in the device and historical factors in the existing tools, rules and community of the activity system.

In seeking to understand the effect of introducing the iPod Touch on the course activity system it is also important to consider the system also from the alternative perspective of the facilitator responsible for the course. As described in the section about participants and setting, although there was a specific section of the LMS space developed to facilitate students participating in the iPod project the first semester of iPod Touch use in the course involved no significant modification of course materials to support the new device. The division of labour is a key node in this activity system, with the facilitator providing links and creating the spaces for interaction and students using the links and contributing experiences in the forum. Like the students, the facilitator was constrained by the existing tools in the system that had variable levels of usability with the iPods. Resources on the web were generally accessible from the iPod by following the links provided; discussion forums were workable with effort; Wimba could not be used; and the format, and ease of downloading for offline use, of recorded materials was determined by the standard tools (Camtasia Relay) available as part of the university learning and teaching systems. Rules in the activity system, in the form of university regulations and controls on access to systems, effectively constrained the use of the iPods to substituting for a computer to access existing types of materials and interactions. Provision of materials in different formats; the inclusion of Web-based activities; and assessments that used the capabilities of the iPod to capture, create, and submit student-generated content, were restricted by existing system capabilities or university regulations that would have required more time than was available to negotiate adjustments to the course. These limitations by rules and access to technical support within the community element of the activity system may have caused contradictions between student and object that resulted in students' expectations for access to material, communications and assessment not being realized.

Conclusion

This study has limitations associated with its small size (19 student participants), restricted context (a single Education course) and limited timeline (a single semester with limited preparation). However, despite those limitations it has demonstrated the potential for WHDs to disrupt existing activity systems by facilitating access to study materials at a wider variety of times and locations. It has also identified elements of the learning activity system that may need modification in order to facilitate greater use of WHDs and suggests areas in which attention to course design might enable more of the potential of WHDs for learning to be realized.

Although students were able to access most course content using the iPod Touch, there are changes that could usefully be made to improve readability on the small screen and to make it more convenient to download files from the LMS for storage and offline use on the device. These considerations apply to all WHDs even smartphones, which are likely to be more frequently connected to the network than the WiFi-only iPod touch but can still benefit from offline access for savings of time and data costs. Communication within the constraints of existing university systems presented more challenges. The LMS and associated systems need to be reviewed for compatibility with smaller screens and there are likely benefits in considering options for shorter form communications characteristic of mobile users. SMS, Twitter and Facebook exemplify messaging that works well on mobile devices and similar functionality could be incorporated within the LMS or associated systems.

Both students and facilitators require time to become familiar with the core and extended functionality of WHDs before their true potential for learning and teaching can be realized. As the capabilities of such devices evolve it will be important for university regulations and systems, the 'rules' and 'division of labour' of activity systems, to provide for creative exploration of the possibilities for delivery of content to learners, communication within the learning environment, and the collection, possibly for assessment, of content captured or generated by students using WHDs. Shared exploration by learners and teachers will be important in enabling universities to address the challenges of providing students with the flexible learning opportunities they are seeking.

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Creativity in practice: social media in higher education

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Creativity, both as a professional capability and as a personal attribute, is acknowledged as an important dimension of education for a fast-changing world, relevant to future practice in the professions and for learners and teachers. New social media tools, which place creation, publication and critique in the hands of web users, have been recognised as having a role in democratising creativity, making the means of production and distribution accessible to most of the developed world. Using these tools to facilitate learning activities in higher education can promote creativity and many other related capabilities: digital literacy, independent learning, collaboration and communication skills, and critical thinking. It requires creativity on the part of teachers to develop and manage learning environments and tasks that are not traditional and may be quite experimental. This paper asks some university teachers who are innovating their teaching by using social media to reflect on how creativity informs their practice and the learning of their students.

Keywords: creativity, social media, higher education, graduate capabilities, digital literacy

Creativity in Higher Education (HE)

In learning for the future, creativity as an aspirational graduate attribute in higher education is related to demands from business and industry for creative graduates able to devise innovative solutions to complex problems in the new millennium knowledge economies of the developed (and increasingly the developing) world (Amabile, 1996; Pink, 2005). Progressive educationalists have revived calls to embrace a holistic education that develops all aspects of human personality and potential, including creativity (Robinson, 2000; Jackson, 2006). Creativity can be understood as systemic – a product of personal creative activity within a particular context which supports and recognises it (Csikszentmihalyi, 1999). As a personal quality, creativity can be characterised more as a disposition than a specific skill, and related to identity formation rather than knowledge. Dispositional aspects of creativity include preparedness to take risks, curiosity and perseverance. Generic graduate capabilities such as independent learning, communication, critical thinking, problem-solving and inter-disciplinary practice can all relate to a disposition for creativity.

Creative teaching and learning

Academics and students perceive creativity as a learning outcome to be closely related to creative learning activities, and creative approaches in teaching and assessment (Fryer, 2006; McWilliam & Dawson, 2007). It has also been suggested that an effective way to teach creativity is to model creative practice for students (Sternberg, 1996). Taking a creative approach to teaching, which may encompass collaborative activity, incorporating fun and play, and devolving responsibility for learning to students, is likely to be challenging to most university teachers who have not themselves had such creative models. Creative dispositional qualities already mentioned such as risk-taking and collaboration, as well as a creative approach to 'designing' a learning environment and activities which support creativity, must be brought to the teaching situation. Teachers, no less than students, need the ability to critically reflect on their creative activities to ensure that outcomes are met.

Digital literacy for creative learning

Digital literacy is also emerging as a critical capability for the future. The Horizon Report for 2012 (New Media Consortium, 2012), which is concerned with identifying trends in technology and new media for education, identifies several key trends relating to contemporary learning contexts and creative inquiry. These include the growing use of cloud-based technologies, the increasingly collaborative nature of work, and the more flexible and personalised nature of learning experiences. While a currently popular view is that the ‘net generation’ are ‘digital natives’ who are comfortable in a technology-mediated world, research indicates that student use of and skills with technologies are not uniform, and tend to be focused on ad hoc uses of established technologies (Kennedy et al, 2010). Simultaneous with shifts in technology use, ways of managing information in the world have evolved from ownership and guardianship of knowledge to ‘knowledge networking’ (Allen & Long, 2009), making digital literacy an important component of the information literacy that graduates must develop. Higher education needs to have a role in both enabling learners to manage the abundance of resources and relationships that are accessible via the internet, and in positioning them as leaders in the development and use of digital tools for knowledge management and production.

Social media for learning

The growth of the social software applications characterised as ‘social media’ that lie at the heart of Web 2.0 has been matched by the growing interest of educators who see this as an important extension of the closed functionality of the traditional Learning Management System (LMS) (Dalsgaard, 2006). A common theme underlying much current commentary on the educational web is how the user-participation and production functionality of social media opens up new approaches to learning and teaching, and challenges the traditional roles of learners and teachers (Allen, 2011; Downes, 2011). Social media tools, being socially-oriented and democratically organised, are not only more conducive to communication and collaboration, but control (and responsibility) are moving into the hands of the learner.

Technology-mediation of activities is now significant in everyday life and work, yet authentic contexts for integration of technology into pedagogy have been slow to develop. The kind of activities suggested by an authentic, learner-directed pedagogy have been hitherto poorly supported by learning technologies designed around teacher-centred pedagogy, and institutional administrative requirements. The NMC report (2012, p.6) warns that “Digital media literacy continues its rise in importance as a key skill in every discipline and profession”, but “Institutional barriers present formidable challenges to moving forward in a constructive way with emerging technologies”. The use of social media tools for teaching and learning is not systematically supported in most higher education institutions, hamstrung by policy issues around IP, copyright and security of data. However, many academics, finding that institutionally provided systems do not offer flexibility, are independently realising the benefits of innovating their teaching in this space.

Case studies

Following are examples from The University of New South Wales, where social media tools have been used to foster student interaction and participation. While creativity was not explicitly stated as a learning outcome in these instances, the course conveners reflect on how their ideas of creativity in teaching and learning were represented in the course design and its outcomes.

Collaboration and critique in Wikis (Helen Caple, School of the Arts and Media)

A first-year undergraduate media gateway course, ‘Media, Society, Politics’, makes use of the collaborative attributes of wikis in designing and assessing an online group assessment project. In terms of creativity, this project has significant implications both for the student learning experience and for the assessment protocol for the tutors involved in marking this project.

Like other social media technologies, wikis maximise the “architecture of participation” (Gross Davis, 2009, p. 181), by allowing multiple users to write and edit a web document. Versatility in content management and display in wikis means that contributors can reference a variety of different media types in the wiki page, including text, embedded (or externally linked) video, audio, pdfs, slideshows, and still images, to name but a few. Thus the architecture of the page is limited only by the creativity of the contributors.

At the same time, wikis provide complete transparency in who has contributed what and when to the page (since all page edits are tracked and stored in a page ‘history’). Such transparency impacts greatly on how tutors are able to assess the group project. It is well-known that one of the major concerns with group work lies in how the project is assessed, both in terms of what is assessed (process and/or product) and how marks are to be allocated, for instance, to the group, to the individual, to be distributed among the members, through peer review (Lejk et al, 1996). Assessing the process may mean measuring the individual’s contribution to the group or to the task, time spent on the project or the quality/quantity of work produced (Sharp 2006, Orr 2010), and gathering reliable evidence of such contributions is a major challenge. Assessing only the final product leads to inevitable inequities in the allocation of grades where the efforts of hard working students may be missed and students who ‘free ride’ are unjustly rewarded (James et al, 2002, p. 48; Pieterse and Thompson, 2010, p. 356). Wikis provide creative solutions to such issues in that they allow tutors to monitor, and consequently assess, both the *process* and the *product* of the group task, at the same time as exposing free-riders. One of the benefits to teaching and learning of this approach is shifting the focus from measuring the final outcome of a task towards supporting the learning process.

Managing communications and networking in Ning (Tam Nguyen, Faculty of the Built Environment)

A case study was conducted using a blended learning environment for design students, combining the face-to-face studio environment with an online social network to facilitate student publication, communication and autonomy. The study aimed to examine the use of a web-assisted model of assessment, interaction and publication as a mechanism for measuring the effectiveness of inclusive design learning when supported by the constructs of social interaction.

The face-to-face studio environment is typical of most practice-based forms of design education. Tutorial groups are based around small groups of students in a problem-solving setting led by individual studio tutors. Studio activities involve presentations and discussions, aimed at facilitating common understandings of design limits and possibilities, and develop into individual consultations, aimed at refining design ideas. One of the key challenges with this format is the time required to complete an activity with a student and the teacher-centric nature of class management. Students often spend long periods of solitary time, waiting for their allocated consultation with their tutor.

Ning, an online social network service, was introduced to encourage more student interaction and publication. The *Ning* site was designed for visual appeal and social presence. Social presence here is defined as the "degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationships" (Jusoff & Khodabandelou, 2009). It is also seen as the ability of learners to project themselves socially and affectively into a community of inquiry (Rourke, Anderson, Garrison, & Archer, 2001). Social presence is a complicated construct and involves privacy, social relationships, communication styles, the nature of the task, feedback, and immediacy (Tu, 2002), and can have a significant impact on student progression, improved learning, motivation and engagement (Jusoff & Khodabandelou, 2009; Richardson & Swan, 2003). The *Ning* site was centred around an 'activity feature' on the front page, which contained a stream of up-to-the-minute activity within the site. Students could immediately see and interact with tutors' comments, developmental work in student blogs, course discussions and announcements. They could also establish their own relationships with peers, at varying levels of intimacy. The social presence of the site produced intense communication between students and staff, ranging from social chats to critical review of work. Tutor feedback was driven by student initiative, shifting the responsibility of learning to the student. Feedback from both students and staff indicated the value of the social network to their sense of identity and belonging to a community of learners. It is clear that this social media technology is able to enhance identity formation and collaboration, promoting better sharing, inclusion and enjoyment of course activities. Online social interaction can greatly enrich engagement for both student and staff, encouraging a more creative approach to learning and teaching.

Independent learning in Facebook (Kate Coleman, College of Fine Arts)

Is creativity in the execution or the thinking that encourages participation online?

The act of creativity in this teaching instance was establishing a social media collaborative site to extend student discussion from the end of the lecture to the tutorial and back to the lecture in a learning loop. For a teacher who is an avid user of social media and has a strong philosophy in utilising the best technologies for student learning and community, *Facebook* offered a space to develop this community, to also encourage creative thought and ultimately creativity in community. The creativity that encouraged the students was the act of participating in an ever-changing discussion that continued to grow and develop. This group of students is in the creative industries, and students who graduate and seek employment in this field require good networking, strong communication skills and the ability to self promote (Bridgstock, 2005). With this in mind, *Facebook* was selected to be the predominant social community space alongside the LMS, *Moodle*, for lecture summaries, slides and recordings and a micro blog, *TodaysMeet*, for student commentary in lectures.

Utilising social media in face-to-face teaching doesn't require changing the course design, its function is to engage the students in the act of developing and sharing learning content and resources. Use of these tools for social and creative learning also encouraged a growth in digital literacy among these students, who developed a practice of sharing *YouTube* links related to lectures, including links to exhibition openings, student run projects and assessment topic discussion. Student posts were content- and course-related, supportive of assessment and driven by student need. Creating a student-owned page outside the LMS allowed for creative freedom in writing, sharing, reflecting and publishing of content related and course related material. To promote student ownership of the activity, students could nominate as co-administrators so that they too could manage requests and add students to the group, making enrolment easier and quicker.

Positive outcomes included increased interaction between students and peers, students and lecturer, and students and tutors, which led to development of a learning community with shared resources. An unexpected but important outcome was that students contextualised their learning in relationship to other courses in the degree programs, as they began quite early in the semester posting queries regarding other courses, asking for advice on assessment from other course components and chatting generally about their learning in the program. In this way students developed a way of working informally in *Facebook* in the context of their learning.

Conclusion

In these instances of course activities utilising social media, teachers were asked to retrospectively consider aspects of the teaching or learning that they consider to be 'creative'. For teaching, creativity was seen to be inherent in:

- taking a creative approach to designing the learning activity and learning environment
- being creative in their role as a teacher by both providing and participating in social communications
- becoming familiar with the social media tools that facilitate this approach through personal use and experimentation.

For students, creativity was promoted by expectations that they:

- collaborate and contribute a range of media inputs
- publish and reflect on instances of their own creative output, and give feedback to others
- participate in a community of learning where they are expected to contribute course resources.

Creativity requires a propensity to take risks, and a preparedness to fail, but this is not generally supported in the current university environment. The kinds of activities described here provide a moderated environment for students to practice being more creative in activities and communications. However, their propensity to take risks is dependent upon how these activities will be assessed. The potential of these technologies to promote formative assessment, and assessment of process rather than product is helpful, as is the opportunity for students to develop their own abilities for self and peer assessment. These kinds of activities also require risk-taking on the part of the teacher - to be prepared to assume a role as co-learner, and to experiment with technologies that do not have the institutional imprimatur. To achieve the potential for learning for the future offered by new and emerging technologies, institutions must support such experimental practice.

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LMS Encounters: Promises and Realities – (e)Learning for Sustainable Futures?

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Although there are radical opportunities afforded by e-learning technologies (Hemmi, Bayne & Land, 2009), digital Learning Management Systems (LMSs) can be risky and "disorienting spaces" for participants (Bayne & Ross, 2007) even though they often replicate traditional rituals and forms of university bricks and mortar teaching spaces. Whilst we need e-platform standards, we also need flexibility and diversity to avoid replicating sameness in LMS design and implementation. In any educational platform selection, there are always risks and uncertainties, but if we embrace informed, sustainable and ecological design, we can evolve beyond purely market-driven agendas towards pedagogical designs that have a "learning-centric university mission" (Ellis & Goodyear, 2010, p. 153). This paper juxtaposes LMS discourses *in theory* with participant LMS experiences *in practice*. Emergent tensions of *(hyper)textualising* the university are discussed with/against neoliberal agendas of the (dis)embodied individual. At the forefront of our research agendas, we need to move beyond espoused e-learning technology promises to consider participant realities to inform (e)learning designs and choices, whilst experimenting with how to create sustainable learning/knowledge spaces for sustainable (e)learning futures.

Keywords: LMS, VLE, digital spaces, sustainable spaces, learning design, affect, subjectivities, identities, Actor-Network Theory, Non-Representational Theory, e-learning, e-teaching

If universities are to sustain and renew their digital spaces and presences then new (e)learning cultures necessitate "cultivating the imagination" in "a world of constant change" (Thomas & Seely-Brown, 2011). As early as 2002, Salmon (2002) advocated that universities explore "creative possibilities" rather than relying on "forecasting the future" through various scenarios to consider their desired (e)learning and (e)teaching possibilities. She outlined four scenarios to envision potential digital futures ranging from 1) "Contenteous" which relied on transfer and transmission models, 2) "Instantia" which involved actual e-learning, 3) "Nomadict" which involved mobile learning where physical campuses do not matter much and learners are mobile across institutions and cultures, to 4) "Cafélattia" where u-learning ('u' is for universal) proliferates through learning communities that extend globally beyond the walls of an academy. In u-learning, the "(clicks and mortar) are of key importance" (Salmon, 2002). The learning social context is paramount, and learners find "… like-minded individuals anywhere (e.g. by gender, by interest group, by profession)". Here the e-moderators can "… think globally but are able to turn their thinking into local commitment. They see the technologies as yet another teaching and learning environment rather than as tools" (Salmon, 2002). Wherever universities might be in terms of these scenarios, and whatever the extent of their (e)learning delivery, institutional digital spaces are essential for sustaining current university (e)learning and (e)teaching practices.

Currently, Learning Management Systems (LMSs), also known as Virtual Learning Environments (VLSs), or Course Management Systems (CMSs) are *the rock* of a university's (e)teaching and (e)learning enterprise. How these are used depends on whether they are viewed as tools or as environments (spaces), which is "a matter of perspective rather than something inherent in the tool/space itself" (Ellis & Goodyear, 2010, p. 139). I consider LMSs to be both spaces and tools, depending on their relationship with other entities. Whilst a proliferation of various university physical spaces abound, there are comparatively fewer variations in the digital learning platforms used – the Learning Management Systems. We need to consider the sustainable ecologies of LMS platforms. Whilst there are many LMS promises and challenges, Ellis and Goodyear (2010, p. 188, original emphasis) highlight that:

> It takes time for researchers to make sense of new pedagogies and the affordances of each new technology. It takes more time to produce useful sources of guidance and to disseminate them effectively. But it is rarely possible to put innovation 'on hold' while experts or enthusiasts try to sort out optimal strategies. Instead, university leaders must work with the ecology of learning that a good university needs to be. This means promoting the healthy functioning of the ecology, but also relying on it to adjust to new challenges.

In part, what LMS platforms help sustain are the discourses of the enterprising university (Marginson & Considine, 2000) in a neoliberal managerial bureaucratic sense (Davies, 2005; Davies & Bansel, 2007) of universities becoming organisational business structures with entrepreneurial autonomy, intensified work conditions and a culture of surveillance. Learning *Management* Systems imply that learning is *managed*. In the entrepreneurial bid to develop and benchmark e-courses for global access, curriculum becomes a modularised commodity (more so unintentionally). Yet, "It is ironic that most universities are using a medium that enables endless travel to construct learning within the confines of a module or course" (Cousin, 2005, p. 127). LMSs support a neoliberal agenda that placates critical scholarly resistance by virtue of 'access' to everything to a 'consumer' of everything. "By offering electronic users the appearance of a world controlled from their keyboard, a world in which everything can be 'accessed' and everything can be had, as in fairy tales, by a simple tap of the finger, multinational companies have ensured that, on the one hand, users will not protest against being turned into consumers ..." (Manguel, 2008, p. 227, original emphasis). How then will universities and their e-courses distinguish themselves in standardised LMS platforms to maintain their individuality?

The aim of this paper is to juxtapose LMS discourses *in theory* with participant LMS experiences *in practice*. Emergent tensions of *(hyper)textualising* the university (because of the LMSs) are discussed with/against neoliberal agendas of the (dis)embodied individual. The term 'text' in this paper refers to digital text used via the LMSs. Typed text still dominates within LMS use and discussion forums. (At the time of data collection there was limited use of multimedia texts due to bandwidth and LMS limitations. Todays enriched ease of multimedia embedding within LMSs given bandwidth improvements and updated LMS versions would alter potentially alter user experiences no doubt, but it is not the focus of the texts used in this study.) By using a sociomaterial lens of Actor-Network Theory (ANT) (Fenwick, 2010; Fenwick & Edwards, 2010; Latour, 2005; Law, 2004;) and an affective lens via Non-Representational Theory (NRT) (Thrift, 2008) to focus up material, spatial and affective considerations, the aim is to highlight learning from participant realities to inform learning design and choices of digital platforms of the future. Far from technological determinism, where technology determines society, or social determinism, where humans configure technology, I favour a relational sociomaterial perspective of socio-technical emergence – where technology and society co-shape the other and are more complex and unpredictable. I move to argue that the LMS is multiple *affectively charged spaces* (Navaro-Yashin, 2009) in practice — *The LMS Multiple* — drawing on Mol's (2002) notion that an object is performed through multiple enactments that emerge in various sociomaterial practices.

I first contrast the *LMS in theory* to highlight the discourses surrounding selection issues made by universities and then move to the *LMS enactments in practice*. I conclude by discussing emergent tensions of *(hyper)textualising* the university with/against neoliberal agendas of the (dis)embodied individual.

The LMS In Theory

Universities have to make digital platform choices guided by their educational, IT and visionary leaders. Whilst there are choices to be made between open source and commercial products (e.g. WebCT versus Moodle, etc.), there are many shared commonalities in LMS formats and styles that replicate notions of the 'traditional academy'. Even based on LMS names (e.g. *Moodle*, *Sakai*, *WebCT* and so on), one is uncertain of any major distinguishing or differentiating feature amongst them. However, more recently new such as *Desire2Learn* promises to be "more than just an LMS"[1] with a more student-centred approach that integrates diverse technologies. Nonetheless, most LMS products have tended to replicate 'traditional academic' delivery formats of the lecture. Far from being transformative, one can ask to what extent are LMSs contributing to any major "paradigm shift in teaching and learning" in adhering to traditional delivery formats (Cousin, 2005, p. 124)? In the mantras of e-learning and e-teaching innovation, standardised traditional face-to-face practices underpin much of e-teaching and e-leaning LMS platforms. The ambivalences surrounding traditional formats of the lecture, tutorial and exam as a pedagogical technique to stimulate student learning have been questioned (Laurillard, 2002; Phillips, 2005; van den Eynde, Newcombe & Steel, 2007, p. 1041). Sheely (2006, p. 769) argues that lectures have been placed as a central discourse of the academy and its educational activities, such that lecturing is aligned to teaching, so that moving teaching online for many lecturers involves moving lectures online. He echoes Phillips (2005) who is concerned by this persistent dissonance. Sheely (2006, pp. 772-773) suggests that not only do we need to talk about (and question) the technology we are moving to but the technology we are moving from — the lecture. Whilst many LMS platforms promise innovations and transformations in learning, these are based too often on replicating traditional formats of the academy online.

[1] http://www.desire2learn.com/

So how might universities select from LMS platforms? EDUCAUSE's (2011) "LMS evaluation" initiative recommends asking questions of the LMS in terms of: 1) What is it? 2) How does it work? 3) Who's doing it? 4) Why is it significant? 5) What are the downsides? 6) Where is it going? And 7) What are the implications for teaching and learning? Whilst the issue of pedagogy is placed last and more pragmatic and instrumentalist issues are raised first, further LMS viability consideration issues are suggested by Childs, Korkusca and Swartz (2009) and Katsifli (2010) to:

1) Start from a basis of teaching and learning principles, rather than financial cost prioritization.
2) Consider project management phases: Initiation ~ Consultation ~ Evaluation~ Selection ~ Transition ~ Implementation.
3) Develop a campus/university strategy: e.g. Teaching and Learning, IT, etc.
4) Decide between open source and commercial LMS products. Consider:
    a. Support-end (cost, quality, availability, transition, long-term quality investment)
    b. Stability and reliability for end-users
    c. Licenses (Free versus commercial motivations)
    d. Transition (transferring context online is a demanding and time consuming effort)
    e. Decision choice (5-10 year time-scale)
    f. Investment in human capital
    g. Innovation directions (Hierarchical versus distributed models)
    h. Expectation management (be attuned to campus staff concerns, outsourcings versus in-house)
    i. Risks (What risks can you take? What are the systemic pressures and software's ecology?)
    j. Stakeholders (consult all stakeholders, especially students)
    k. Security (critical mass, back-office vs. front-office help, ease of code fixing, vulnerabilities, critical mass, cost of security updates …)
    l. The product life cycle (LMS lifetime/shelf-life and how long to wait to recycle it, open source versus commercial permanence and viability)
    m. Exit strategies (what costs are there if you need to make a change, lock in issues, maturity upgrades…).

Choices are complicated in that the answer to which LMS to choose and its future longevity depends on the context and the future an educational organisation envisages for its (e)teaching and (e)learning. An academic community may be more likely to support an open source LMS more readily as it moves towards open scholarly communities, open universities, and open source journals. Whilst LMSs may wither as we move towards cloud and wave computing and new emergent environments in the future, within the next 5-years, the investment in LMSs will remain. Who and what informs their design, purchase, implementation, and use are vital actors in the e-pedagogies that emerge and are made possible (or not).

Consequently, we need to consider espoused (explicit and implicit) LMS configuration designs and pedagogical underpinnings (e.g. student-centred, learning-centred, collaborative, flexible, accessible) versus actual participant, desires, uses and practices. Hannon (2009, p. 423) highlights the need to explore the transformations that are enacted in practice "and their effects on the participants of online learning" which "tend to be less prominent in large-scale discussions" (Hannon, 2009, p. 423). Whilst some studies have dealt with some of these aspects (Al-Mahmood, 2006, 2008a, 2008b), Coates (2005, p. 68) has advocated detailed analysis of LMS engagement styles given that "… almost every institution has invested in an LMS as a means of leveraging the Internet to enhance some kind of competitive advantage. The challenge that institutions now face is not technological or financial, but educational. Institutions need to identify how to maximise the return on their investments by using LMSs to manage the quality of university education." For as he says, "our understanding of the influence of LMSs on student engagement remains in its infancy" (Coates 2005, p. 66). Higher education e-learning and e-teaching are still "works in progress" and "in flux" (Poster, 2001).We need to consider sustainable and ecological designs (Ellis & Goodyear 2010) in our choices and understand these new emergent learning environments more — these "learnplaces" (Goodyear, 2008). It is in this vein that I move to consider what occurs *in e-learning practice* from participant perspectives to understand these LMS spaces beyond instrumental and fiscal organisational concerns to inform (e)pedagogy.

The Study

This qualitative 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 and e-teaching 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 were used (Büscher & Urry, 2009; Büscher, Urry & Witchger, 2011; Sheller & Urry, 2006) to capture various actors across physical and digital spaces. These methods included participant interviews, participant observation, photographic data, and participant reflections across physical and digital spaces over a period of 6-10 months, as well as document analyses. This facilitated qualitative validity via triangulation from multiple data sources. Triangulation is "a validity procedure where researchers search for convergence among multiple and different sources of information to form themes or categories in a study" (Creswell & Miller, 2000, p. 126). Data were collected from 24 participants — 19 online postgraduate learners, and 5 teaching staff (2 females and 3 males) ranging in age and teaching experiences. Daily scheduled observation diaries of the online subject sites were recorded, and participants were invited to record their reflections and provide images of their various learning spaces. A wealth of detailed data were amassed. Whilst the aim was to add to the world through ANT and NRT lenses, glimpses into human, spatial, discursive and artefact interactions were 'traced' (Markaskuite, 2011, p. 244), whilst attempting to 'capture' and '(re)present' the sensuous and affective dispositions and spatial ambiences.

THE LMS In Practice

The three enactments and discussion that follow include participant segments based on detailed thematic analysis of face-to-face in-depth interviews/conversations (each ranging from 1.5-2 hours each) and participant reflections. These fragment selections highlight spatial subjectivities rendered with/against current neoliberal climates. Through these enactments, screening practices and the effects of textual LMS thresholds, their politics, and limits to subjectivities are illustrated. What emerges are the configurations of censoring and censored selves in the (im)mutable LMS spaces in the three enactments that follow titled *tracing*, *labouring*, and *viewing*.

Enactment 1 — Tracing

- **Visibility — "There are consequences!"**
  "… you need to lay down some foundations that people have an understanding, particularly when it's written … that there are consequences of the written word … sometimes people don't realise the harshness of an online interaction and that it stays sitting there on the web (laughter) to be revisited and revisited …. as opposed to a comment that can pass and then be forgotten …"
  (Bernie, lecturer, with recent experience in e-teaching and digital technologies)

- **Riskiness — "Putting your head on the chopping block!"**
  "… there's still that sort of reticence to put your identity or reveal too much about yourself … it's a requirement of the interaction to put stuff out there and some people even put their photographs on. I didn't do that … and … sometimes, in some ways, I felt like a little girl … because you're putting this stuff out there, you're actually almost putting your head on the chopping block …"
  (Peta, student with extensive experience as a face-to-face lecturer and online lecturer in her professional life but new to being an online student)

- **Permanency — "It's there forever!"**
  "… being an online student is a bit more threatening than being face-to-face … because everything you're doing is … written. If you are online, you say something, no one's going to forget. When it's online, it's there forever! It's recorded! So if you don't understand something, like your stupidity is there for the whole online community …"
  (Sandy, student who experienced strong negative aspects of online learning)

- **Masking — "Revealing a part of yourself in time"**
  "… if I was sitting up at one o'clock at night and I wanted to send my email, I didn't ... because I didn't want the lecturer to think I was some weirdo person sitting up at one o'clock at night (laughter) …. Maybe it's because it's the one part of learning online where you actually reveal a part of yourself … outside of academia. It's yoohoo, I sit up at two or it's five o'clock in the morning …"
  (Natalie, student who loves the newness of the online learning medium and sees it as an adventure and novelty despite the uncertainty of not having done any prior online study)

- **Photographs online — "I put up a photo of my office…"**
  "… getting back to photos on the Internet, a couple of years ago, because there's a lecturer's page, and I did have on my lecturer's page … photographs, and then I took them off because I read a paper about why on earth would you ever put your photograph on the web, because it can be taken by anybody, it can be

manipulated. You could be starring in a porn movie because you innocently put your photograph up. … it's actually a security measure so I decided to take photos off … I put up a photo of my office to make it a bit more personal …"
(Peta, student with extensive experience as a face-to-face lecturer and online lecturer in her professional life but new to being an online student)

- **Censorship, surveillance, and codes of practice — "… everything is traceable…"**
"… the subject content was fairly innocuous so it wasn't as if I had to reveal a personal political view or have a debate ... Had it been that … I would've been extremely uncomfortable in the current climate to say much at all … as everything is traceable …. I suppose I'd have to say that I'd probably censor what I'd say! What's really absent is a code of ethics, of rights and obligations for how students" and lecturers" online content is going to be treated and stored … so far I've never seen anyone address this issue openly or in a policy sense or even raise awareness of it …"
(Miranda, student who has had extensive experience teaching in blended university environments who is enrolled as a student online for the first time and other online digital environments are a strong feature of her daily interactions)

- **Transparency and accountability — "… you can track me down"**
"… and you can track me down, you can see how I respond to you, you can see from the dates. It goes 13th, 20th, 27th, absolutely to the week. Because it all started in one of the earlier years where there was this cry there was no support, and the Dean, I don't know, there was some letter that went to the Dean and he came to me and said, "What's been going on?", and luckily I kept all the email log and I was able to furnish him with all the contact and of course he then said, he laughed and said, „Well, she [the student] doesn't have a leg to stand on here, but I have."
(Sam, lecturer, who is a highly and extensively experienced and engaging face-to-face lecturer who has taught online for some years but sees the online LMS as not providing the same richness of face-to-face teaching)

- **Private and public intersections — "Can you imagine…"**
"Can you imagine if some classmates recognise you in the street and say, "Koko you are a student in the [x] course". You'd be terribly shocked, and your privacy would be a little bit invaded … just like if you … put your picture on a very famous Yahoo website …"
(Koko, student, who is a 21 year-old international Chinese student who is digitally savvy and views the university technologies being used as old and antiquated)

The LMS space and its permanence, visibility, and longevity raise significant complex traceability and surveillance issues for students and lecturers (Bennett & Regan, 2004). For the four online subject content of this study, the content was fairly innocuous, there were no major political ramifications or viewpoint *voicings* about *political* issues required. Participants though still alluded to censoring their content, destroying the myth of anonymous, democratic online spaces. Jones (2005: 105) emphasises just "how little anonymity the internet *actually* provides to its users". The panopticon (Foucault, 1979, 1988) of constant (self)surveillance (Poster, 1996, 2001a, 2001b) is even more applicable *online* (Land & Bayne, 2005b). Ironically, LMS tracking facilities were originally designed to assist lecturers to monitor and understand their students' learning (Phillips, 2006). Whilst lecturers benefit from being able to improve their online courses through continual evaluation (Goldberg, 2000 cited in Land & Bayne, 2005b, pp. 165 & 166), there is rarely *disclosure* to students. Poster (1996) refers to *virtuality* as a "superpanoptican" because of the detailed possibilities of surveillance. Land and Bayne (2005b, p. 171, original emphasis) remind us:

> … not to underestimate the extent to which this power to constitute and disperse subjects can be applied in virtual learning environments. Whilst humanist ways of knowing might resist the idea that identity formation can take place outside the skin of the individual, we need to consider the possibility that the online student may be starkly objectified in her virtual construction, that 'the learner' may be, as far as our systems are concerned, to some extent constituted by records of her first login, last login, frequency of login, number of discussion board submissions, pattern of page visitation across the site, and so on. Such an identity might exist not only beyond the control of the individual learner, but its very existence — and possibility of 'judgement' being applied to it either wittingly or not — might remain unknown to them.

This may well be the case with the rise of web analytics and its uses to analyse behaviour patterns. Philips at al. (2011) have shown the limitations of using quantitative web analytics and the need to include rich qualitative data to extend understanding of how participants learn and use LMS environments. There are significant ramifications that arise regarding public and private online personas (Burbules, 2000, 2002, 2006a, 2006b; Conole & Dyke, 2004; Dawson, 2006). Yet detailed archiving, visibility, and permanency can provide transparency that puts lecturers' teaching *out there* providing evidence against student complaints. However, the roles and privileges remain unequal for both sides. In LMS design configurations, "There is an unequal power relationship between the seer and the seen — the visibility of the seen enables the seer to 'know' them, to alter them. Access to this knowledge, to this power, is of course unevenly distributed" (Land & Bayne, 2005b, p. 168).

Enactment 2 — Labouring

Here, I address human/machine/material thresholds regarding how students and lecturers *labour* in using the LMS. We see online textual translations of selves as *laboured* and *labouring*, not assuaged by the apparently considered responses of their lecturers in these cases.

- **Glued to the machine!**
  "I had a love hate relationship with my machine, because I was entranced by the online world, I was glued to the screen, my mouse and keyboard, the tension in my shoulders, arms and neck was excruciating, not to mention the long hours just sitting there with glazed eyes. I keep thinking I have to move away from it and get out and hug some trees (laughter)!"
  (Miranda, student who has had extensive experience teaching in blended university environments who is enrolled as a student online for the first time and other online digital environments are a strong feature of her day-today interactions)

- **Online forum as "glorified email"!**
  "It was a glorified email. That's all it was!"
  (Sandy, student with strong negative experiences of the online learning spaces)

- **Talking to a machine!**
  "I was talking to myself" and "I told you, I felt like I was talking to my computer!"
  (Sandy, student with strong negative experiences of the online learning spaces)

- **Consumed by email deluge!**
  "..There might be hundreds of unread messages… and it's quite interesting… I just don't bother, it's just, already your life is consumed with the instant email that comes through …"
  (Meg, who has extensive experience teaching face-to-face and has returned to study online for the first time)

The human-machine configurations are further complicated by bodily challenges of screen reading and subject LMS platforms, as Meg, says:

> … he [lecturer] posted [via hard copy] the first three weeks of readings, which is good; I appreciated that. Then I had to brace myself that I was going to have to access the rest of it online, and I can download, and once I've downloaded stuff then … it's straightforward reading. I'm fine with being just a lone student, engaging with paper and print. I don't like reading on the screen for a great length of time, because in terms of reading stuff, I want to highlight it, scribble notes in the margin, make connections and links …

Online reading is further aggravated beyond the screen issues by being confined to a chair, desk, and laptop for some students. Meg highlights, "you're confined to your chair and to your desk and to this laptop for so many hours in a day". Ergonomics (Goodyear, 2000, 2005) is a pertinent issue for students and lecturers — seldom discussed. Indeed, how will ever smaller gadgets impact on physical well-being? Participant accounts attest to the density, volume, screen reading, and printing required online. Far from being paperless offices and studies, hard-copy rescue missions are required to sustain students, as Peta highlights, "I always print out the notes …. I haven't fully adapted to the technology in that I still like a print-out as well. It's a bit hard to read on your computer in bed at night, but you can flick through your notes". Sam also highlights that text is tiring for lecturers, saying, "... I find it tiring to type.… I never send anything out because I've always got to reread it and make sure it's correct and makes sense … if you're a lecturer at university, you've got to come out as somebody who knows something".

Sam’s further frustration is with the inadequacy of online text to reveal her embodied self as a lecturer, saying: “… it can’t convey me very well”. She elaborates: “Yes, well actually I think … online, I’m fairly boring. I respond, I try to raise it [online interactions] a bit, but it’s nothing like my face-to-face where you can have a joke and where I do a lot more. You can see I talk a lot but as I don’t write a lot, I feel it can’t convey me very well down in writing”. Yet, for Barrie (lecturer), who loves the online medium and sees it as efficient, saying, “I just bang out a reply back!” to students, highlights:

> … We’ve got a rule, if they send me an email, if I haven’t got time to read it, I just bang a reply back, “Got it!” That takes two seconds …. That’s not a bad system of doing it … it’s very quick … you say: “How’re you doing? Haven’t seen you for a while”. That’s it, it takes 30 seconds …. but I’ve been lucky — my class size has always been about 20 or so.

Yet, the online screen and textual manifestations of self can be a source of anxiety. Sandy (student) who had experienced the online space as highly limiting points to LMS postings being like “glorified email” and like *talking to herself*, highlighting her palpable concerns in feeling quite alone, asking: “Is anyone out there?”. She points to the intimidation she feels by another student’s textual persona. Clearly, digital textual footprints can (im)press *loudly*!

> … there was someone who intimidated me completely. … she was so professional … she probably did 10 of these things [online courses] already. Everything she did was so like a text book. I was like, “Oh my gosh”. I thought people were supposed to be new to this subject. This person was writing as if she had probably [completed] 500 already … Any attempt that you made at anything, you saw her response and you thought: “Oh my gosh, forget mine”. … So you see people’s depth of how they respond or how short they respond. …. It’s like you’ve got to be that daring or confident person who is going to be the first person to respond. Like you break the water and everyone else sort of follows after that.

Yet the online textual medium can be democratising, as Brian (lecturer who has extensive experience of teaching face-to-face and is most engaging, as well as experience teaching online) suggests, conceding though that “language difficulties will come through”, that the medium is:

> … probably the democratisation of education in … that you aren’t prejudiced … you don’t necessarily colour the feedback you give according to whether the person is older than you, younger than you, extremely senior, less experienced, from another country. None of those things are immediately transparent.

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 (a softly spoken and poetic Chinese student who majored in English literature in China and hence is aware of English language textual nuances) highlights:

> 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. Okay more efficient. But also I think that makes peoples’ interaction and communication less and less and so makes you feel other things are more commercial…

In summary, these *screening* enactments highlight e-learning and e-teaching materialities and thresholds. LMS environments are complex multiple actor-networks. Online space can be seen as providing a fluid space in LMS forum postings, where students and lecturers respond (or not) to postings. The LMS screen configures users, and the postings act as mediators. Postings to the LMS are permanent, visible to all, and stable; yet they are also deemed fluid by participants as the can be moved, archived, and screened by potential unknown others any time. The various LMS posting features from tone, font, timing, and so on, simultaneously (dis)connect participants — whilst (dis)enrolling some and not others. Hence, LMS postings censure and/or extend some participants to configure more censured, anxious, or fragile subjectivities online. The LMS is *multiple* and not singular — it can take on “different forms, different performances, different realities, that co-exist in the present” (Mol, 1999, p. 79). Different relationalities and materialities lead to different threshold *screenings.*

Next, I move to a final enactment to consider how the LMS platform is *viewed* aesthetically, an area too often neglected in terms of the affective consequences.

Enactment 3 — Viewing

- **LMS Aesthetics**
  "Well the two courses that I've done online at Cyberia [de-identified] university both had the same look about them. Cyberia Uni uses, what do they use [x, LMS de-identified] system and they're identical in format. Visually unexciting I suppose you would have to say, and as I said, I feel that they are just there simply to have notes online. There's nothing more. There's no third dimension to it. …"
  (Peta, student with extensive experience as a face-to-face lecturer and online lecturer in her professional life but new to being an online student)

- **Flatness of text!**
  "I found after a while of reading all the posts and the emails, I really started to want to see someone's personality in some way through the text. I grew sick of the flatness of the text, everyone having the same default font of the LMS, the same colour, the same font …. of course you could get a sense of people's tone through words and their subtle nuances, but I started to get really bored by the flatness of the text, its physical flatness! It would've been so good to have had people come to life more through font choices maybe … just to alleviate the monotonous **flatness** …"
  (Miranda, student who has had extensive experience teaching in blended university environments who is enrolled as a student online for the first time and other online digital environments are a strong feature of her day-today interactions)

  "…. but I started to get really bored by the flatness of the text, its physical flatness!"
  (Miranda, student who has had extensive experience teaching in blended university environments who is enrolled as a student online for the first time and other online digital environments are a strong feature of her day-today interactions)

- **LMS design look and feel affecting *"the classroom"* feel!**
  "It [the LMS] looks too boring and dull. The colour and all the things — the colour is so ugly. … it can be like Yahoo and you can add some expressions and little icons …. Emoticons … emoticons or something like that and the colour can be more like, more beautiful. Why don't they ask some people who really learnt about art and about the design to design this beautifully? That [the subject LMS] makes the classroom ugly … So for me, my online classroom is that forum, and that classroom is ugly. So I just get inside — so, I just write down my answers — my tasks — in word processing — word processor, and after that I just copy and paste it to the classroom and send. So I only stay there for a few minutes. So I won't stay there for longer. … I think make it more — just more beautiful."
  (Lillian, a softly spoken and poetic Chinese student who majored in English literature in China and hence is aware of English language textual nuances)

  "It [the LMS] was just a bit dull."
  (Sandy, student with strong negative experiences of the online learning spaces)

What I have highlighted in this section are glimpses into LMS engagement issues *in practice* to show multiplicities, complexities, and materialities, as well as configurations of/by various actors. Whatever the limitations, universities need to consider the emotional and affective aspects of LMS engagement and "visual ergonomics" regarding the "look and feel", the fonts (Danet 2001), as well as "intuitive navigation and iconic signalling" preferred by participants — too often ignored by multimedia designers (Flood 2004, online). Bayne (2008a) also invites consideration of the impact of visuality of LMS spaces and suggests that higher education online is a visual practice.

The LMS Multiple

In practice, LMS encounters and spaces are much more complex, unruly, and unpredictable. In some instances, the LMS is a fluid object/space with less tangible and more fluid boundaries where university LMS subject borders are stretched to wider global Internet resources. The LMS was also perceived and used multiply from a "fantastic" connecting global knowledge space to a space of "deluge" and caution — for some, digital spaces are potentially disruptive and unruly places that threaten to drown them with information exceeding the limits of information manageability. The LMS can be viewed as a fluid ambivalent and changeable object with multiple identities and enactments. The LMS as a fluid technology (De Laet & Mol, 2000) has its boundaries enacted in various configurations. For one participant, the LMS may be a life-saving space, and for another, an ugly and bounded space; and yet for another, an enticing space; and for another, a disorienting space, and so on. The

LMS might be better viewed then as a boundary object (Star & Griesemer, 1989, p. 387) performing differently in different worlds (Star 1995, p. 12), or a fractional object that performs itself as one entity in "irreducibly different ways in different circumstances" (Law 2002, 2004). Implicit throughout these enactments are the varied effects of LMS spaces. At times, they act as boundary objects (Star & Griesemer, 1989) providing thresholds for crossing through, from, to, into, and beyond — opening up possibilities. Their (dis)locations vary according to their status across various networks.

Our subjectivities are configured by our digital spaces, as much as we attempt to configure them (Woolgar, 1991a, 1991b). For example, our configurations by Google and the production of knowledge are extraordinary, and there are implications for neuroplasticity changes (Brabazon, 2007) in how we think/act in digital worlds. Digital spaces can seduce, entice, command attention, and become "space invaders"; yet they too can be deserted and abandoned in favour of new technologies. LMSs command our spaces/places as they too change or stagnate and age. Current LMSs, however, remain predominantly, entrenched in textual practices, bringing with it, the *(hyper)textualisation* of universities with further ramifications in current neoliberal university climates.

(Hyper)textualising The University

Whilst one could argue that much of the traditional university has been textualised through books, notes, etc., in the online medium everything and everyone is *hyper*textualised. We become mediated through e-text through infinite computer screen wordings. Through the textual typeface, we become infinitely worded — digitally *(hyper)textualised*. In moving the university online through digital textual inscriptions, digital academe becomes simultaneously (de)stabilised in various ways in its boundaries, aesthetics, longevity, and yearnings.

The LMS hypertextualises (e-)learning and (e-)teaching. These provide boundaries that are productive and secure for some, yet limiting and intolerable for others. For example, the bounded space of the subject LMS and the inability to go beyond the university's LMS boundaries facilitate a sense of safety in containing, limiting, and gate-keeping information/knowledge flows for some students. Knowledge here is regionalised, and students are not overwhelmed by massive information — tolerance boundaries and thresholds are controlled. Boundaries can help enclose and secure participants from the big WWW, and shield them from information overload — hence, pragmatic and practical selves (and roles) emerge productively in *(hyper)textualised* e-learning worlds. Here, boundaries and limits enable do-able e-learning.

In terms of the textual limiting aspects (intolerances), the LMS already configures users by virtue of its design and aesthetics (or lack of). For some, lack of aesthetic appeal and user-choice limit participants' contributions and exposure to the subject's LMS. So we see the yearners, yearning for things to be otherwise. The look and feel of the LMS (in its "clunkiness" and "ugliness") only serves to highlight the LMS as a commercialised educational product, devoid of any "personal touch" (human touch). For some, this cannot equate to the quality of engagement with a lecturer in the flesh. Human yearnings (in the flesh) are not only echoed by students, but also by some lecturers, who would have "face-to-face any day". So we have not only disenchanted and disillusioned selves, but also enduring selves — as participants find ways to resist, endure, and survive e-learning and e-teaching challenges.

In these accounts, the LMS in its look and feel, its limitations, its erasures, its standardised spaces, its flatness and its lack of a "3rd dimension" in the words of one participant, make e-learning and e-teaching a limiting experience. The LMS configures and is configuring of how participants engage (or not) in e-learning and e-teaching.

Further, bodies are configured and restricted to be "glued to the screen" as one student put it. As our bodies traverse the boundaries of work, home, and digital academe, ergonomic and EHS (Environment Health and Safety) issues spread across various locales. There are few policies that place limits on student numbers or the additional hours required for e-delivery. In Sam's (lecturer) case, her department made no distinction in her workload between her enrolled e-students and face-to-face students; rather, these two groups were enrolled in the same subject code. Hence the invisible additional e-work required of her, remained just that — invisible! Bodies, however, need care and demand attention! Whilst universities tend to address EHS issues in their physical university spaces, they tend to be remiss in addressing them for e-teaching and e-learning across other locales.

In online LMS (hyper)textualisation, there is a significant concern with the longevity and visibility of participant textual contributions — these risky spaces of the LMS are potentially "there forever". This leads to censured selves and further self-censoring and extra editing work. The LMS platform configures the learning spaces as potentially risky, where participants' vulnerabilities are visible and remain permanently online, for example, when Sandy suggests that one's "stupidity is there for the whole online community" to see, or when a student may not respond because of the time visibility of their contributions and possible judgements placed on them. The configuration is towards self-censured responses and contributions due to the visibility and permanency of the online text. What are the effects of the residues and traces of selves, knowledge and materials left behind online? What digital imprints and traces do we leave in the e-academy in our digital archived selves?

These imprints raise digital anxieties regarding digital fingerprints. Indeed, the extent to which online media are "democratic" and "freeing" is contestable. I would like to think that "all identities are fictional to any degree, and all points of departure are available" (Cousin, 2005, p. 127), but are they? I have alluded to LMS tracking facilities and their intended uses and archiving concerns for academic selves, views, and curricula. McShane (2006) refers to the tensions of the archived academic. Archiving of online textual interactions can have multiple ramifications, although this may seem fairly innocuous, but in the digital age where there are visible traces of political, moral and substantive viewpoints, there can be serious consequences. Yet, beyond the "petrified selves of audit" (Stronach et al., 2002, p. 121), for Sam (lecturer), the archived online interactions provided evidence of her diligence and responsiveness against a student's dissatisfaction complaint. Archiving and visibility are ambivalent spaces and practices. There are serious educational issues regarding archival permanence (Land & Bayne, 2005b, p. 172). Burge (2007) passionately discusses significant issues regarding students' rights to privacy and confidentiality versus an institution's right to data capture. She asks "burning" questions about a lecturer's material becoming available online, and what public access could do, from fears of plagiarism to peer critique. She also asks if it is appropriate or fair to subject the online classroom to "scrutiny at a higher standard than we would a ground-based classroom" (Burge 2008b, online; Burge 2008a). In 2007, Campbell and Oblinger (2007) rated security as a number two concern in e-learning and e-teaching, and in 2008 Allison and DeBlois (2008) found that security was the number one issue of concern. Further, a number of ethical concerns are raised in the literature about the e-academy and online education (Anderson & Simpson 2007; Demiray & Sharma, 2009; Haughey 2007; Hinman, 2005; Spinello, 2006; Tavani, 2007).

Perhaps surprisingly, the greatest limitation of (hyper)textualisation for some e-learners was yearning for the lecturer in the flesh as the body is 'lost in translation' online. The LMS with its access and flexibility simply can never make the mark — yielding nostalgic selves, yearning selves, grieving, and mourning selves. What becomes of embodied educators and their skills as they become a "hybrid subject shaped by other networks and flows in which they are enfolded" (Edwards & Usher, 2008, p. 92)? For Dreyfus (2009), e-learning and e-teaching can never approximate the presence of a lecturer in the flesh; e-learning can only ever be an approximation or a loss and can only ever produce competence — which can never equate to the engagement in the flesh in a scholarly community. e-Learning for Dreyfus (and for some participants) is forever tenuous and remains untenable — ever in a comparative state with *what it is not* rather than with *what it is* and *might or could be*.

Whilst the (in)visibility of the flesh is a cause for grief for some, there are other losses in invisibilities via *hypertextualisation*. Sky (an international student new to the online medium) highlighted how the LMS textual medium placed her Canadian nationality under erasure as it became difficult to glean from the typed English screen text. She also mentioned that many of the Australian idioms were not easily transparent or understandable, saying, "just because we speak the same words doesn't mean that they have the same meaning" — highlighting that just because we 'speak' (write) English, doesn't mean we 'speak' (write) *the same* English. This is significant for international students, although textually some aspects of the non-native speaking of English may be more transparent via text. Here we have a national identity erased to a large degree by virtue of the medium. Yet for others, this *hypertextualisation* is a welcome opportunity for the individualised one-to-one email interactions between the lecturer and the student, where there is an increased and heightened sense of lecturer presence.

So with what consequences do we translate ourselves digitally across geographical borders — with what erasures, with what (in)visibilities? We need to find ways to imbue e-learning and e-teaching LMS platforms with more embodied richness to allow for diversity.

I have shown that there are multiple ramifications of *(hyper)textualising* the university online. The strength of qualitative studies and their contextualisation contribution is to add depth and richness to understanding LMS use *in practice* based on actual participant practices to help understand what might lead to sustainable digital spaces in (e)learning platform evolutions.

(e)Learning for sustainable futures?

Regardless of the élan of digital learning technologies, whatever our LMS and digital platform selections, we will need to know how to use and transform knowledge to consider what constitutes desirable designs for e-learning and e-teaching? Oblinger and Hawkins (2006) suggest that the question, "Does technology make a difference?" depends on how we ask the question — for *what* and for *whom* and in *what way*. They point to the added flexibility, affordances and also to moving beyond replicating our existing teaching practices to consider *redesigning what we do*. "Are we doing the same things with technology, or are we taking advantage of the unique capabilities of technology and redesigning our activities?" (Oblinger & Hawkins, 2006: 15). *LMS-ing* of knowledge can make e-teaching and e-learning (*inadvertently*) much more *teacher-centred* than the intended and purported *student-centred* or *learning-centred* LMS designs. How might we work with/against these tensions?

Further, with increasing conceptualisations of education as a commercial enterprise (Marginson & Considine, 2000) and knowledges as mass commodities, what will it mean to teach in a *borderless* university — at what cost, to whom, and for whom? In the enterprising e-university, we see students, lecturers, and the academy (by virtue of its buy-in to LMS companies) as consumers, so knowledge readily becomes a commodity. Enterprising in a commercial sense is not always experienced positively, despite the implied e-learning flexibility and access, because here the pedagogical student-teacher relationship becomes one of facilitator-customer/client.

Whilst these "less familiar and less stable environments" (Hannon, 2009, p. 428) of LMSs could provide new pedagogies and paradigm shifts (McLoughlin & Lee, 2008), we need to explore how to move beyond the textual drowning and linear restrictions of LMS standardised designs. How do we imbue aesthetics of educational design — for aesthetics matter (Udsen & Jørgensen, 2005)? There are marketing and policy implications for what a university looks like via its LMS platform, what it exudes, how universally accessible it is, and how immersive it is — as well as its spatial atmospheres. How can we create LMSs with multiple places for students to explore and mingle beyond the linearly ordered and the academic — where social spaces (e.g. digital university cafés, digital noticeboards) might co-exist alongside the serendipitous, surprising, and unexpected?

A more encompassing and ecological approach might involve embracing a "learning-centric university mission" (Ellis & Goodyear, 2010, p. 153). Despite the radical opportunities afforded by these technologies (Hemmi, Bayne & Land, 2009), they are risky and "disorienting spaces" for students and lecturers (Bayne & Ross, 2007). How might we create multiple LMS platforms designed and individualised to consider diverse learning and teaching styles, pedagogies, curriculum, and preferences? In commercialised LMS platforms, uniformity and standardisations of formalised traditional academe dominate. Whilst we need standards, we also need flexibilities so we do not merely replicate sameness, but embrace, innovations, diversities, and differences. We need counter-narratives beyond the studies by large multinational digital knowledge companies that have a vested interest in presenting their products enthusiastically; rather, we might seriously consider student expectations from LMSs and their e-lecturers (Steel 2007) to inform design. We need to experiment with how to create sustainable learning/knowledge spaces, keeping these issues alive on our research agendas (Ellis & Goodyear, 2010; Riddle & Howell, 2008). These are questions and issues I raise for system and policy planners, e-learning and e-teaching designers, and education practitioners. We need to *renegotiate* — in all sorts of ways and with all sorts of *things such as the LMSs* — how we go about learning and living. In any educational planning, there is always uncertainty (Ellis & Goodyear 2010: 106), but if we have at our base a willingness towards sustainable and ecological design then we can find ways to explore and evolve beyond purely market-driven technologies towards innovative pedagogical designs that have at their heart user-choice, universal accessibility, and flexibility. To consider our possible (e)learning futures, we need to take heed ultimately, of what Agre (1999, p. 39) points out that "Our choice is not technology versus no technology, but a wider determination of the concepts and the values that higher education should embody".

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Over a decade of promising pedagogical models and technology for music teaching: Can the past still reliably guide the future?

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Research papers reporting the potential of new technologies and pedagogical models have a tendency to mushroom as educators disseminate the results of promising pilot studies. Some ideas and technologies gain traction and prove sustainable while others are superseded or fall by the way side in search of the next best thing. As a first step towards examining the sustainability of new models and technology for music teaching, this concise paper compares relevant themes in a selection of current publications with those in past publications around the turn of the millennium. In so doing, this paper also considers the ASCILITE 2012 "premise that what happened in the past is no longer a reliable guide to the future."

Keywords: music technology, teaching, higher education, models

Introduction

In spite of some early teething problems, the Internet along with advances in digital music technology has empowered teachers, producers and consumers of music in ways that were virtually unimaginable several decades ago (Lipshitz, 2005). The capability to preview and purchase music online is clearly a benefit to consumers. For musicians and students of music, especially those working at the grass roots level, modern home studio technology enables essentially 'do it yourself' production of higher quality recordings than were possible using the typical four-track analogue tape recording machines of the previous generation. In addition, the Internet can be used for accessing professional mastering studios, distribution services, and for promotion and professional networking via social media.

The unforeseen impact of such changes would seem to support the ASCILITE 2012 premise that "what happened in the past is no longer a reliable guide to the future." On the other hand, a broader historical perspective offered by Laurillard (2005) is also worth considering. Comparing new media and delivery technologies for information processing (1970s - 2000s) with their functional equivalents for reading and writing, and in turn with information and communication technologies developed throughout history, Laurillard suggests:

> "The development in information and communication technologies over the last three decades is comparable with the development in information and communication technologies over the last three millennia" (2005, p.8).

Continuing on to discuss the learning support function of recent developments, Laurillard concedes, "it is difficult to represent the importance of computer-mediated conferencing, for example, as there is really no clear historical equivalent to enabling large group discussion across huge distances (ibid)."

Moving music education online

In the 1990s through to the early 2000s, many education research papers focused on the feasibility of online teaching and learning. Technical constraints and related concerns about equity of access were topical, as a significant proportion of the population did not own a computer with an Internet connection. The quest for appropriate pedagogical models also featured prominently as it does today.

As high-speed broadband access improved across institutions and households, the potential of streaming multimedia for instructional purposes captured the imagination of early adopter music teachers. Instructional videos of serviceable quality could now be produced and distributed via the Internet using 'plug n play' web cam technology that required little, if any, training to operate (Karlsen, 2002; Anderson & Ellis, 2002). In addition, desktop videoconferencing via web cam offered possibilities for synchronous tuition one-on-one or in small groups, although latency has continued to impose some constraints to the present day in spite of faster connections and readily accessible software such as Skype. Large room-based videoconference systems were also being trialed by a number of universities and conservatoriums around the world (Maki, 2001; Eberle, 2003). Subsequent studies investigated how to effectively blend the use of these corporate room-based videoconference and Learning Management Systems with applications that individual teachers could use to create and distribute content with from their personal computer.

All the abovementioned technological developments were part of the Information Communications Technology (ICT) landscape by 2000, however, in practice web resources were commonly treated as supplementary rather than integral to course design (Webster, 2011). Learning Management Systems (LMS) have often been used in a similar fashion, although some teachers began to investigate the possibilities of making LMS environments more central to student learning of musical instruments through the integration of replayable media such as MIDI files, music notation files and video recordings of music teachers, students and guest lecturers demonstrating performance technique (Anderson & Fitzgerald, 2007). More recent developments in Web 2.0 social media and mobile learning applications are making it even easier for music educators to design courses with student-generated multimedia content and collaborative group work in mind. To that end, some of the earlier studies outlining instructional strategies for multimedia-assisted teaching and learning can still be useful to inform the development of new pedagogical models and practices. The same could be said of computer laptop orchestras that began around a decade ago yet foreshadowed the kind of collaborative networked music making and educational opportunities that could well be taken for granted today.

Past assertions and models reiterated

Towards determining whether lessons learned from the previous decade can reliably inform the future, an online library catalogue search for relevant journal articles was conducted using the keywords: music technology, music teaching and higher education. Closer inspection of a sample revealed that many claims reiterated what had been said in past journal and conference publications. In table 1, the first column shows author-date referenced assertions or models proposed in recent publications; the second column shows past publications that raised the same or similar issues, models or predictions about tapping the potential of new technology.

Table 1: Comparison of past and present assertions about tapping the potential of new technologies

Assertion or model in recent publication	Previous publications (similar assertion or model)
Australian Government (2005, p.v) to improve music education, and access to instrument tuition.	Commonwealth of Australia (1995) identifies need to improve quality of music education, including access to instrument tuition
Burnard (2011, p.201) Music educators could exploit rapid advances in IT and music technology, however, schools have found it difficult to provide equipment at a level that students are sometimes using outside school.	Savage (2002) notes opportunities for technology-enhanced and collaborative music making relative to actual take up by teachers. Brace-Govan & Clulow (2000) teachers must be prepared to reconceptualise their pedagogical approach and develop skills to enhance student learning through Internet and Web technologies.
Webster (2011, p. 118) Video conferencing with high-quality sound is a very promising development.	Maki (2001) Promising applications of videoconferencing for distance music teaching. Eberle (2003) videoconferencing. Karlsen (2002) e-learning. Laurillard (2005, p.8) e-learning.
Webster (2011, p. 118) Online communities facilitated by "expansion of social media hosting user-generated content … may effect music education outside of formal school."	Wenger (2000) Conceptual framework for understanding social learning systems in online communities of practice (COP). Waldron (2009 in Webster (2011) Online COPs help spread the knowledge of a music tradition outside of traditional boundaries.
Mudd (2012) "ensemble develops transferable skills in higher education music courses. Laptop ensembles … can help integrate such development into more technologically oriented music degrees."	Related benefits foreshadowed in PLOrk: The Princeton Laptop Orchestra (2005). Philippe Chatelain Laptop Orchestra founded in Tokyo 2002 cited by Huddersfield Experimental Laptop Orchestra (HELO) [Accessed online Sept. 2010].
King (2009, p.175) learning technology including instructional multimedia resources and discussion boards can be a successful support tool."	Salmon (2000) e-moderating. Kearney & Treagust (2001) constructivist design … using interactive digital video to enhance learning. Ho (2004) using IT to improve music education.
Brader (2009, p.159) Music technology focus to improve teaching via real-time communication.	Maki (2001) distance education through synchronous (real-time) communication technologies (e.g. videoconference).
Leong (2011, p.233) "Our globalized world is having to … reinvent itself in the face of new capabilities of advanced technologies..."	Tapscott (1998) foreshadowed future needs of the Net Generation. Kirschner & Selinger (2003) examined the state of teacher education in regard to ICT, pedagogy and education.
A "pedagogical method for improvisation that goes beyond the acquisition of stylistic features and technical ability" (Monk, 2012, p.2)	Bitz (1998, pp. 21-) methods for teaching improvisation outside of jazz settings. pp. 21- 41. Theoretical models based on research into improvisational cognition (Sarath, 1996).

Summary

As a first step to assessing the sustainability of new models and technology for music teaching, themes in a sample of recent music education and music technology publications were compared with themes in turn of the millennium publications. Upon closer examination many of the recent publications reiterated or expanded on assertions made in the earlier publications. For example, calls for improved access to high quality music tuition were evident in a number of successive government reports. The potential of videoconferencing technology was reiterated in relation to music teaching and higher education in general. Calls for teachers to consider new ICT-enhanced pedagogical approaches were also repeated.

The expansion of social media hosting user-generated content (Webster, 2011) stands out as a disruptive yet positive change providing new opportunities for collaborative music making and learning. Efforts to ascertain the sustainability of this phenomenon, however, must surely take into account its influence on how other technologies are used. For example, in regard to laptop computer orchestras, recent advances in digital audio and mobile social media connectivity are helping to bridge practice and conceptual gaps between the traditionally specialist domain of the computer music composer and that of the music enthusiast in the broader community. Similarly, the rise of e-mastering services has empowered grass roots musicians and music students by giving them unprecedented speed of access to professional mastering studios around the world.

The notion that such developments were largely unforeseen by most bodes well for the ASCILITE 2012 premise that "what happened in the past is no longer a reliable guide to the future." However, assessing future sustainability remains - as Laurillard notes in regard to computer-mediated conferencing - "difficult to represent … as there is really no clear historical equivalent … (2008, p. 8)." Perhaps more reliably based on past history is the fact that significant advances in technology have often taken the world by storm, largely unforeseen by the masses. This view suggests there is still much to be learned from the past, especially concerning the way that people have historically learned to exploit initially disruptive technological innovations.

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Humanizing e-lecturers and engaging online writing students via dialogic video

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This paper reports on a study of integrating instructor-produced video 'profcasts' (Edirisingha, Salmon & Fothergill, 2007) into all 12 units of an online Master of Arts in Writing delivered asynchronously. While the value of short, targeted, quickly-made podcasts and extensive streamed video lectures in educational contexts has been researched (Williams, Birch & Hancock, 2012), few studies consider how customized videocasts supplement and complement core content to create engaging units of learning that learners value. Instead of producing instructivist, sage-on-stage, reiterative lectures, the Writing team filmed lecturers in semi-spontaneous dialogues to create critically challenging interactive experiences. The teaching and learning challenge is deeper than humanizing e-lecturers; it is about creating sustainable interfaces drawing on unique human capital: the lecturers as future-makers. It is a journey of creating enduring and impactful resources. Foregrounded by a literature review, this paper presents qualitative data from students and staff responding to the question of how valuable dialogic videos are to students' experiences as online students of Writing. In addition to confirming students appreciate the humanizing of lecturers, data shows video makes ideas more accessible to visual learners and more engaging overall. Most importantly, informal dialogues with their exchanges of ideas clarify written course materials, supporting learning while helping to future-proof the program in a time of change.

Keywords: Audiovisual materials; Education; online teaching and learning; Writing

Introduction: The need for audiovisual dialogues

In an age where technology must constantly respond to change, e-educators play a major role in delivering, maintaining and sequencing authentic, engaging and reusable learning objects within cohesive pedagogical frameworks (Juweh, 2006). The conception of online learning environments as comprising a motivating array of dynamic multimedia resources has effectively led to a new culture of learning. Within this culture, e-learners potentially face nearly unlimited resources and multiple possibilities for interconnectivity (Thomas & Brown, 2011). This culture provides 'environments that are bounded yet provide complete freedom of action within those boundaries' (Thomas & Brown, 2011, p.18). Absent, though, are opportunities for imagining the lecturer as either a cohesive pedagogical presence or a thinking human being. As Fowler and Mayes argued in 1999, *who* learners learn from is crucial in constructivist environments mediated by technology.

Educationalists in disciplines such as Writing strive to create sustainable learning environments within their disciplines; but at the same time the investment learners have in developing their identities as writers depends on trust (Andrew & Arnold, 2011). Writing learners need to develop trust in their peers and tutor, and this involves getting to know them. This paper proposes an effective way to get to know the tutors while creating authentic, engaging and reusable learning objects: Dialogic 'profcasts' (Edirisingha, Salmon & Fothergill, 2007). These exemplify the role of innovation in online teaching and learning in the discipline of Writing, and highlight the need for the human in the Humanities. Whatever the discipline, educationalists need to be aware of their roles as future-makers: creating reusable resources that continnnue to engage target learners. To cite Diana Laurillard's (2002) comment on teachers as future-makers in a world where univeristies need to future-proof themselves: '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 reports a case study focusing on integrating customized, pedagogical audiovisuals into an online Master of Arts in Writing delivered asynchronously at Swinburne University. Foregrounded by an investigation into previous studies of using audio-videos, podcasts and profcasts to enhance learning and a description of the project, this paper presents qualitative data from 26 students and 8 staff responding to the question of the value of customized profcasts to their learning experience. The study is similar in nature to that of Stodel, Thompson and MacDonald (2006), who discovered that the elements of F2F learning online students miss most are the robustness of online dialogue, spontaneity and improvisation, perceiving and being perceived, getting to know others, and learning to learn online. This study hypothesizes that informal dialogues with their exchanges of ideas model robust online dialogue, offer natural spontaneity and provide a visual image of teaching presence where learners can ‘perceive’ their teachers, getting to know them in the process. This study investigates how such interventions support the learning that characterizes a Writing program.

Both research into online learning in asynchronous modalities and our own student evaluations indicate that a key challenge lies in learners’ perception of the e-lecturer as *faceless* (Flecksenstein, 2005; Stodel et al., 2006). Hence, the teaching team decided to incorporate audiovisual representations of lecturers enacting their knowledge and being themselves as learning objects. In addition to introducing faces – and voices and body language – the team wanted to portray the personalities of all teaching staff, both lecturers and tutors. The team followed the hypothesis that content is more engaging when it is delivered by personalities rather than figures. As practitioner-researchers, team members built their hunch by reflecting on the use of audiovisual dialogues to build perspectives in ‘real world’ creative enterprises: The addition of ‘extras’, particularly interviews with personnel, to the media of DVD and Blu-Ray adds value to the experience of those experiencing the art form. Similarly, the interviews with artists in the Metropolitan Opera’s High Density (HD) cinema series (http://www.metoperafamily.org/metopera/liveinhd/LiveinHD.aspx) adds exegetical value to the experience of viewers. ’Exegetical value’ can be understood thus: learning about being involved in creative enterprise from insiders’ perspectives produces an intertextuality that elucidates both the creation itself and the act of creation. In Writing, this, to return to Laurrilard (2002) and Stodel et al. (2006), is what students demand.

At the program level, the team aimed to create dynamic learning objects to motivate and provoke students through the incorporation of the human into the electronic. At an institutional level the challenge is deeper than merely proving lecturers are not, as several students commented, ‘cyberbots’; it’s about creating more future-proofed and sustainable learning interfaces drawing on unique human capital. This capital comprises the teaching staff themselves. It’s the personalities that make the materials unique and different from other institutions’ products. Instead of producing streamed talking-head lectures replicating lecture material in a sage-on-stage manner, the team decided to have lecturers and tutors in dialogic conversation to create a more socially constructivist, more challenging, interactive televisual experience for students.

This paper plays into a discernible research gap around non-reiterative customized audiovisual production for online delivery, particularly in the postgraduate levels in Writing. ‘Non-reiterative’ refers to materials that do not replicate the materials of ‘the lecture; or ‘the text’, but which are spontaneously co-constructed dialogically by specialists in the field. Few studies in the wake of Edirisingha, Salmon and Fothergill’s ‘profcasts’ (2007) have, however, considered how audiovisual materials designed for asynchronous use can be used to supplement and complement core lecture material to create more a more engaging and sustainable learning interface.

Background: The project

Swinburne University, allied with Open Universities Australia (OUA), has delivered its 12-unit online MA in Writing since 2002. Since that time many other institutions have produced their own, often competing, online Writing programs. The original iteration of the program used HTML lectures together with mostly static, lecturer-led monologues paraphrasing these lectures. These are delivered via the Learning Management System (LMS) Blackboard. Several lectures contained interviews, where lecturers captured writers in the workplaces and created stretches of authentic, two-way, situated dialogue. These, but not the talking heads, were well regarded in student evaluations of units.

In 2009 it was the institution’s and the discipline’s challenge to create unique pedagogical features to individuate its product, future-proofing the program and competitive advantages and migrating from the lecturer-unfriendly Dreamweaver to ‘easy-to-use’ Contribute (http://www.adobe.com/au/products/contribute.html). As part of a *carpe diem* project involving lecturers, information technology specialists and librarians, the goal was to draw on lecturers’ potential as effective future-makers and update the suite incorporating insights from research and experience. We knew more about online praxis, how learners construct knowledge and what media are most effective in creating multi-dynamic weekly modules scaffolded into 12-week sequences of learning according to constructivist patterns. We began with an audit of our assets.

The Writing discipline’s most identifiable assets are its staff - published, industry-based teaching and writing professionals – and ‘how they get their acts together’, their ‘Discourses’ and ‘ways of being’. The terms ‘how people get their acts together’. ‘Discourses’ and ‘ways of being’ come from literacy scholar James P. Gee (1990), who argues that effective learning occurs most readily in situated contexts, within authentic environments. It happens among real identities being themselves; that is, using naturally the big-D Discourse of their discourse community or community of practice. For Gee, ‘Discourses’ are:

> Ways of behaving, interacting, valuing, thinking, believing, speaking, and often reading and writing, that are accepted as instantiations of particular identities by specific groups … They are 'ways of being' in the world. (Gee, 1990, pp. 2, 161)

The goal in the Writing program was to create authentic audiovisual materials featuring the university's unique teaching staff using their 'Discourses' naturally, as we observed in the well-evaluated early interviews. It is about 'ways of being'; about making Discourses accessible. In the logistically simpler audio-podcasting championed by Salmon and Erdirisingha (2008), the human voice has power. Situated literacies theory enables us to argue for the pedagogical power of the contextualized ('situated') whole person over that of the faceless voice. Further, Sian Bayne (2004) suggested 'embodying' the lecturer adds value to online learning. As analysis of the views of one student in Bayne's study of embodiment in cyberspace suggests, 'the body of the teacher … becomes a locus for the aspirations of the learner' (p.111).

In representing the teaching staff as embodied, this study draws on Bourdieu's (1977) understanding of thought and discipline knowledge as embedded in embodied practices. The spontaneous nature of the spoken word profcasts allows writer-lecturers to access and project what Gee would consider their 'ways of being' or what to Bourdieu are their living practices, sensibilities, modes of speech, manners and tastes. In the process, the team marks itself as belonging to a particular social group, that of the Writing discipline. The lecturer identities the profcasts convey aligns with Bourdieu's concept of the *habitus,* marking the writer-teachers as representatives of the social order of Writing. In the eyes of students, this builds trust and credibility.

In a study of possible relations between text lectures and audio or audiovisual postcasts, McGarr (2009) identified three relations: *substitutional, supplementary* and *creative.* In the findings of the study, the first of these is ineffective while the second and third can affect active learning. Accordingly, the Writing team wanted the profcasts to work as *supplements* or *complements* to the canonical 'printed' lectures produced by the specialist lecturer in each module. The nature of the relation between written lecture and audiovisual supplement/complement is crucial since Copley (2007) valorised 'supplementary' audio and visual podcasts for on-campus students. We define 'supplements' as working alongside the lecture, bringing in additional perspectives, examples and materials, while 'complements' offer a contrasting or alternative interrogative position, effectively deconstructing the canonical nature of 'the lecture'. Clearly, the goal is to create more balanced, engaging and critically challenging technology-generated materials. They not only appeal to a wide range of learning orientations, but they also increase accessibility and flexibility since the audiovisuals can be downloaded as either video or sound files and played on portable mobile devices.

In analysing the role of conversation in constructivist learning, Allen (2005) wrote: 'One of our greatest learning and teaching tools within higher education is language. By this we mean genuine dialogue not monologue' (p.253). Similarly, the team chose to use dialogues rather than monologues to capture a more engaging and interactive audiovisual pedagogical sequence involving natural, yet organized, conversational turn-taking. The dialogues can reflect a range of dynamics:

Peer-on-peer: A balanced two-way conversation, discussion or debate with equal turn-taking on a key topic.
Interviewer-to-expert: In cases where a specialist or industry-based guest lecturer participates, they are given more talking time through the use of targeted interviewer cues with a lecturer.
Member-to-apprentice: Sessional tutors who have been students are interviewed for lecture 1 in the sequences of 12 to clarify aspects of the unit's key assignments. This brings a voice closer to that of the students and better targets their potential concerns. This also affords sessional tutors visibility and positions them as important identities and voices in the pedagogical team. Students can relate to sessional who, like themselves, are positioned as apprentices to a desired community of enquiry.
Platonic symposium: The Platonic dialogue, where lecturers take on expert but sometimes dogmatic and controversial positions (for instance about the role and value of critical theory for writers) is a valuable pedagogical device because it involves the use of devil's advocacy and the creation of multiple positions. Its goal is to emulate, anticipate and give voice to the range of objections and contrasting opinions students may have. Introductions to these dialogues contextualize what follows so students clearly understand that lecturers are representing positions that may not be their own.
Panel discussion: Two 'experts' are interviewed in relation to particular cues relevant to the unit.

Not only do the voices vary, countering the boredom that may come with listening to monologues, but there is also room for multiple perspectives. The dialogues are based on cues negotiated in advance by the two participants so that broad subject areas and trajectories of discussion are agreed. The performances, however, are unrehearsed, spontaneous and authentic: 'They are 'ways of being" in the world' (Gee, 1990, p.161). The semi-scripted nature of the enterprise allows for interesting opportunistic digressions while keeping the timing of the interviews controlled: the target length is 12 minutes, a length designed to avoid both outstaying its welcome and being mistaken for a lecture substitute.

From 2009 to 2012, the recordings were variously made in a once-camera blue-screen studio or a two-camera television studio and required the help of a technician or technicians who operated the camera(s) and organized postproduction. The more expensive two-camera set-up allowed for close-ups to be interspersed with long-shorts for dynamic variation, while the one-camera set-up is static, requiring more dynamism and movement from the lecturers. Postproduction involves editing, the superimposition of a suitable backdrop and the interspacing of introductory sequences, captions and inter-titles and leads to a quality branded product. The Writing discipline remodeled the units between 2009 and 2012 and needed to evaluate the usefulness of these pedagogical innovations. Informed in general by action research's reflective learning cycles, the researcher sought evaluative responses from two stakeholder groups: students and tutors. The question asked was open: 'How valuable are the videos in the Writing discipline's delivery of its Writing subjects?'

Literature review

Koumi (2006) surveyed the potential of video as an e-learning tool under three key categories: *assisting cognitive learning and skills development; providing experiences unavailable through other media* and *nurturing feelings and motivations.* This drew attention to the potential of video resources. Valorizing discussion-embedded video lectures, Haga (2002) argued 'watching a video enables learners to study as if they were participating in traditional classroom' (p.120). Athey (2010, online) suggested video infuses asynchronous e-Learning with human interaction and visual demonstrations that can be lost outside of live instruction. Berner and Adams (2003) noted that while adding video to audioslides is 'expensive' it also 'personalizes' learning (p.190) particularly where lecturers are more expressive. In one rare study of bespoke audiovisuals, Tantrarungroj (2011) demonstrated the capacity of learning interfaces utilising streaming video to improve learning performance in neuroscience by improving retention of content knowledge.

The majority of relevant studies on podcasting investigate practice-based applications within specific learning environments. Larkin (2010) concluded that audio podcasts represent 'an opportunity to add value to existing teaching and educational strategies' (p.247). Usefully, the study challenges online teachers to ensure that lectures not merely used to convey information but 'to support the transformative nature of real learning' (p.248). Copley (2007) reported positive student evaluations of AV podcasts, while Lonn and Teasley (2009) found little evidence they help teaching. Lazzari (2009) and Demetriadis and Pombortsis (2007) see minor impact on grades when students are lectured via AV lectures. In a medical radiation program, Scutter, Stupans, Sawyer and King (2010) found podcasts were reported to improve students' learning, partly because of their ability to be replayed at leisure, even though this learning may be of a passive and superficial variety. For them podcasts were substitutional – 'the uploading of lectures onto the subject website' (p.180). It is unsurprising the researchers remain unconvinced about the value of podcasts for teaching deep and abstract concepts but enthusiastic about their intermittent value to clarify key points. Demetriadis and Pombortsis (2007), too, stress their usefulness in knowledge acquisition, but not knowledge construction. Peden and Domask (2011) showed 'there is little evidence regarding the relationship between podcasts and student engagement' (p.175) and a lack of compelling evidence that they impact student learning outcomes.

The value and applicability of podcasting with MP3s in distance learning is clear in research-based studies of the 'podogogical' use of podcasts to improve reflective capacity, promote dialogue and maximise the transference of skills (Salmon & Erdirisingha, 2008), amongst other things. These studies show teaching using podcasting can impact student learning by:

> supporting organizational aspects of learning; developing positive attitudes towards the lecturer, bringing in an informality and fun to formal learning; helping with independent learning; enabling deep engagement with learning material; providing access while being mobile (Edirisingha, Salmon & Fothergill, 2007, p.134).

Two of their findings are the themes *Sense of informality in learning* and *Deeper engagement with learning material and a deeper understanding.* Lee and Chan's (2007) discovered podcasts can help decrease feelings of isolation and increase sense of community. The enthusiastic work of teaching practitioners like Guertin (2010) suggest a wide range of creative possibilities for activity-based and task-based learning using podcasts in weekly discussions, opening the door to creating community. Broadly, any discipline can create and use profcasts to target their units' learning outcomes, and create effective tools for review. There are clear guidelines about their instructional design and they can use video (Edirisingha, Salmon & Fothergill, 2007; Salmon, Erdirisingha, Mobbs, Mobbs & Dennett, 2008). In a multimedia communication program, Lazarri (2008) concluded the use of podcasting 'in an appropriate and challenging educational context can influence the quality of the learning experience and help students achieve good results' (p.33).

The use of web-based learning technologies (WBLT) such as Lectopia has produced many studies, most dealing with face-to-face (F2F) versus flexible/ blended deliveries. Most report little difference in efficiency. Demestriadis and Pombortsis (2007) suggest recordings made with WBLT could be valuable in online and blended deliveries, but recommend 'thematically-focused, short e-lectures that need not be regularly updated' (p.148). Like Demestriadis and Pombortsis, Brechy & Ogilby (2008) argue that so long as they match student learning styles, e-lectures are beneficial, being course-related, replayable, flexible and portable. Bennett and Maniar (2008) warn videoed lectures make learning unengaging and hinder independent learning. Bennett, Maniar, Clark and King (2008) report supplementary podcasts in on-campus programs add value for students.

Little of the research, Williams, Birch and Hancock (2012), write, tells us more than that students like them (for their time-flexibility and replay-ability) but that they can lack engagement and prevent the lecturer's personality from shining through. Many argue their mere existence mitigates against lecture attendance, but, like Larkin (2010), emphasise that perceiving the use of WBLT as a *substitut*e is counter-intuitive. Harnessing its potential as a non-reiterative *supplement* or *complement,* as this study of audiovisual profcasts does, is more the point. It's about deepening the learning experience and increasing engagement through multimedia. Williams et al. (2012) conclude that students using recordings as a substitute are less successful than those viewing them as a complement. This insight is useful in application to designing units for online delivery: the meaningful relation of other material placed beside 'the lecture' needs to be clear.

Methodology

This study reports on the evaluation stage of an action research project inestigating the value of an innovation – dialogic profcasts – in response to a key problem in the teaching and learning environment: the need to future proof the Writing program while integrating lecturers' 'lived Discourses' into our learning environment. In action research, reflecting on experience involves problematising and meta-thinking and is a crucial source of authentic data in teachers' lives leading to theories for practice (Burns, 2010). These practices accord with Little's (2012) description of action research: 'as teachers continue to teach, implement new methods and resources, and reflect on the results, the goal is to improve student learning' (p.70). This action research uses a method characteristic of case studies. Case studies are detailed contextual analyses of a limited number of events or conditions and their relationships and relate to everyday experience. The study's main method is a single-event case study generating discourse involving 26 student and seven tutor responses to a directed cue.

Procedure

Twenty-six students and seven tutors voluntarily replied to a one-question email survey sent to 55 students enrolled in semester 1, 2012 and the entire cohort of 10 tutors. Respondents wrote freely, cued by the following question: 'How valuable are the videos in the Writing discipline's delivery of its Writing subjects?' All students and tutors gave permission to cite them anonymously. Accordingly, they are described as student 1-26 (S1-26) and tutor 1-7 (T1-7). In this methodology, counting responses as they emerge does not have statistical significance, but indicates to the researcher issues closest to the forefront of respondents' consciousness.

Data analysis and presentation

In isolating and presenting themes, the researcher uses the qualitative descriptive methodology Sandelowski (1995) employed in analysing naturalistic texts in nursing contexts. She described a method of closely reading material, identifying key storylines to understand everyday practices and underlining key phrases 'because they make some as yet inchoate sense' (p.73). This method draws on recognized qualitative word-based and scrutiny-based techniques of readerly observation, and has allegiances with thematic analysis and narrative enquiry. The findings are presented as themes and discussed in the light of issues raised in the literature review.

This is a small-scale project with a data set from tutors triangulating that of students and informed by the researcher's reflective observations as writer-teacher-researcher. It's an example of how teachers might be future-makers by applying to their own practice the analytic phases of *immersion, incubation, illumination, explication* and *creative synthesis* (Moustakas, 1994).

Because this research occurs in the context of creative arts, there is more awareness of the researchers' implicitness and agency, to echo Bakhtin (1990). I have created and appeared in more than 40 educational videos, and my educational philosophies, epistemological stances and understandings of ontology impact on the project. Concurring with Richardson (1994), I believe my researcher and lived selves as writer-educator are inseparable; indeed I have already impacted on the responses of my subjects due to the wording of my cue and my personal history of communications with my respondents and, as with all researchers, I am part of my data. Although the findings merely report the themes, the methodology used forces me to storify them.

Findings

Theme 1: 'Not cyberbots – real!'

The first theme groups together a range of ideas related to the benefits for students of seeing their tutors. T1 sums it up neatly:

> *One of the difficulties frequently discussed by online students is the facelessness of their encounters. The video not only puts a face to their tutors but also a personality, allowing students to see themselves as mentored by real people rather than faceless representatives of a dmbodied authority.*

S5 wrote with ironic tongue-in-cheek: *They were not cyberbots out there with automated course content. My tutors were real!* T6 reiterates the metaphor: *It's important for them to know we are not automatons!*. S17 adds: *There are humans on the other end of this course after all!*.

1.1 Know our tutors' personality
Students and tutors positively comment on videos' ability to personal the lecturer and the adjectives *real* and *personal* resound in the responses, along with the verbs *human* and *meet*. *I find it personally valuable to put faces and voices to the people on the other end of the lesson* (S14) is a typical response. 'It gives us a sense of character' writes S19. As T7 points out, *in a real tutorial, you'd see your tutor's expressions and hear his or her thoughts, and you'd gain insight into the person.* The profcasts personal materials and allow personalities with *mannerisms* (S18) to shine: *There's a sense of their becoming real people with personalities, while lectures tend to show them at their self-conscious scholarly best* (T7). In addition to creating more authentic communication channels, the videos also allow access to 'voice': *The video component allows us to 'know' our tutors and lecturers a little better – tone of voice is very helpful in 'hearing' their messages* (S1). Over and above the tone of voice and its inflexions is the paralinguistic communication: S4 appreciates the paralinguistic *hand gestures* used as underlining and T4 mentions the *warm dynamic* lecturers exhibit on screen using what S15 calls *spontaneous exchanges of information.*

1.2 The casual complements the formal
The spontaneous, informal nature of conversations and discussions is also viewed as a positive and the adjectives *more interesting* and *more engaging* appear with iterations of this theme. S14 gives a typical description: *The informal nature of the interviews makes the video content more accessible*. The fact that they are casual discussions not formal lectures is mentioned in 14 responses. The casual nature allows the staff to *drop their guard and their passions to show* (T7) allowing students to access *extra bits and pieces beyond the content of the written lecture notes* (S15) and providing an *extra dimension* (T5). S6 writes: *To have a more casual discussion…is also useful and provides a backup to what we have been reading about*. The casual videos support the formal lectures. *Sometimes the informal view just clarifies a point not quite understood in the written lectures.* They also *assign a human identity to the 'ruling authority' in the learning transaction* (T1), meaning that the informal humanity projected augments the formality of the knowledge embodied in lectures, turning them into approachable 'mentors'. T4 adds the videos students favour *show a bouncing backwards and forwards of ideas between interviewees rather than the formal question and answer style* and that students need explicitly to know that videos are a complement not a substitute. The data suggests students do understand the complementary relation: *The video lectures always cover extra areas to the written lectures and do complement them quite well* (S17) and *add analysis to the written material* (S20).

1.3 Reducing isolationism
S23 argues videos are *a step forwards – they reduce the isolation of online studies.* Along with 8 others, S21 shares her experience of aloneness: *As a long distance student, my study would otherw be conducted in solitude with only the printed word for company*. The 'otherw' indicates a contextual reference to the role of the videos in creating a human presence in the learning suite. *While flexibility is a plus,* S21 continues, the *isolation can be*

at times a negative. T3 adds, *the online learning environment can be an isolating experience for many and the video lectures go some way to address this issue.*

Theme 2: 'Unlocking' understanding

2.1. Use of different media solidifies learning
When S22 writes videos *create a variety and helps stimulate learning,* she is one of 12 articulating the idea that triangulating learning materials with different media is a key strategy. The video dialogues help to unlock understanding: *listening to these discussions clarifies and expounds aspects of the learning material* (S21). The metaphor comes from S3, who says *the videos…have been key to my understanding* and requests more. (S4 wants more too and suggests Skype, with S7 wanting *video link ups).* S6 writes the videos *helped transform* (subject name) *from an unknown beast into a comfortable friend* and that the type of articulation they convey *floors* her. S13 tells a similar story:

> *In the discourse … one or another of the two participants often reveal gems of ideas that motivate me and encourage me to become involved in the learning process in a way that would not be possible had I just read those same words on paper.*

2.2. Variations in dynamics aid engagement
The contrast in dynamics between the lectures and the videos is an important subtheme, with the videos validated for being more *personal* and *direct* and lectures called *bland. They provide a great starting place in understanding and engaging with the material in the lecture*, says S9, who supposedly chooses to watch the video before reading the lecture. *They are a stepping stone to the provided learning materials,* writes T2. *Videos are a worthwhile learning tool that complement the written material and, with technology…there are many possibilities for the future…films, poetry readings and even links to Youtube* (T2). T5 points out, *interviews are easier to digest than reading lectures.* S20 concurs: *Some days my head is full of written words already and audio adds another dimension.* S23 explains why: *Videos contribute to a more rich and diverse study experience.* S20 gives an example: *I like the interaction where* (lecturer) *paraphrased one of* (lecturer's) *questions. It clarified … the debate … I'm still coming to grips with many new concepts.*

2.3. Consolidating moments of serendipity
Video exchanges can crystall 'a-ha' moments. S14 writes, *I often pause the video and refer back to my notes and have the inevitable 'a-ha- moment.* T1 thinks that for some learning styles they better *encapsulate* key ideas. S10 describes changing her mind about her choices for the assignment as a result of one such spontaneous interchange and S11 reals what a *cop-out* she has been in avoiding journal writing as a research strategy. The scenarios described in the dialogues create stories and vignettes with which students can relate and project their own thinking. The fact that students often refer to the videos as resources in their weekly posts makes it clear to T2 that students really *connect to and engage with these videos-not only as a starter point for further discourse…but as a way to build connections with their tutors.*

Theme 3: Becoming part of the discussion

While videos cannot provide the same experience as being there, they can provide a simulacrum, making S9 feel *the same as we would if we were actually attending a university lecture in person*. S25 agrees: *It makes me feel I am attending a normal lecture…It gives me hope for the future of my own writing*. Feeling she is part of the discussion helps her to feel part of a future, imagined community of writing. S13 says *the videos allow me to feel we are on a journey of discovery together.* S2 finds the videos *amazing: I feel I can be part of the two-way discussions…It's more like a tutorial.* S2 goes on to speak of i*mmediacy* and *connectiveness* in contrast to autocue monologues. The 'inclusive' nature of the encounter is important for S21 and 10 others: *Watching the dynamic interchange between members of the staff is both insightful and effective.*

The visual nature of the material is the key here: *I believe that visual material contributes to a feeling of real life contact with the lecturers.* Ours is a visual age and, as S24 asserts, *we have a right as students to expect at the very least to have videos.* Three respondents state they are auditory learners, with S25 listening to the lectures *in the background* and finding it an effective way to learn.

Discussion

Using bespoke audiovisual dialogues involving teaching staff appears to have value as a teaching and learning innovation. As learning objects, they create a complementary and supplementary relation to formal lectures by using positive and casual interchanges. Their purpose and relation need to be explicit. They are ‘non-reiterative’ and not intended as pedagogical substitutes. They are a creative use of the medium, of the sort described in Guertin’s (2010) study of podcasts. They foregrounding the ‘Discourses’ of teachers as unique learning capital that learners value because it humanizes lecturers and provides provocation and clarification.

Audiovisuals involving interacting academics are a way of engaging learners by employing different dynamics from print e-lectures. They also incorporate socialisation by giving lecturers faces and personalities, creating for many a feeling of ‘being there’. This adds to the sense of social presence Stodel et al. (2006) identified as lacking in online learners’ experience. For some students, dialogic videos help reducing isolationism. This study supports Lee and Chan’s (2007) belief that podcasts help decrease feelings of isolation, specifically by showing lecturers are not cyberbots. While the study does not show they contribute to the increases sense of community Lee and Chan also saw, there is a clear sense that learners see podcasts’ potential to humanize the lecturers and bring the university tutorial room into the online environment as engaging and valuable. Together with dynamically used discussion forums and the ‘community of enquiry’ pedagogy Stodel et al (2006) describe, they can be part of a teaching and learning package that promotes community (Andrew & Armold, 2011). The fact that the profcasts are customized is testament both to the regard for students and to the program’s need to futureproof itself with a pedagogical variation on the unique selling proposition. There are, unsuprisingly, no comments on the futureproofing calue of the audiovisuals; only on their pedagogical value.

The study supports the claim that AV profcasts’ multiplicity, flexibility and portability appeal to many learners. They enable a crystallisation of learning for some and an ‘a-ha’ moment for others and this suggests a more than superficial or passive engagement of the kind Scutter et al. report (2010). There is no evidence that the bespoke profcasts are unengaging or that they hinder independent learning, charges laid against WBLT. Where research on podcasts might tend to suggest they, too, are unengaging and add insufficient value, the Writing discipline’s creation of dialogic profcasts suggests students are engaged and value their impact.

These media allow personalities to shine where it might be formalized or even appear haphazard in WBLT like Lectopia. Indeed, the findings concur with Edirisingha et al. (2007) and support two of the study’s findings - *Sense of informality in learning* and *Deeper engagement with learning material and a deeper understanding.* The profcasts’ tone of casualness and their participants’ ability to discuss and debate, throwing the ball from one to the other, appeals to learners and creates a learning intervention that complements and supplements and certainly cements knowledge conveyed in lectures. The findings suggest the embodiment of the teaching staff serves as the kind of aspirational spur Bayne (2004) identified.

Conclusions

The profcasts described in this project have a number of unique features which impact on their value. The fact that their relation to the lecture is supplementary or complementary, adding alternative or different views and voices, is a part of their effectiveness. This supports studies by McGarr (2009), Copley (2007) and Larkin (2010), preferring a supplementary relation between podcasts and lecture materials. As supplements or complements, their relation to the lecture needs to be clearly conveyed in the curricula. They are not substitutes, and research suggests pedagogical interventions conveying similar information in a similar way lack value (Larkin, 2010; Williams et al., 2012). Their length – up to 12 minutes – is a virtue, as is the fact that they are dialogues, simulating the dynamics of a lively collegiality. Their ability to bear an interrogative relation to the lecture provides a space for critical thinking and reflection. Their potential to present a range of identities and ‘ways of being’, at the same time embodying *habitus*, is valuable too since it codifies the teaching staff as members of the Writing community to which the learners aspire. It is a way of valorising sessional staff through presence and representing those who are apprentices to the community of practice of the Writing discipline.

An insight into the *habitus* of lecturers is an insight into that of practicing academic-writers and a mirror into the students' imagined communities and aspirational goals. In this way, the profcasts connect the here and now with the aspirational futures of learners. They effectively model Gee’s (1990) ‘ways of being’ by ‘situating’ the Discourse of lecturers in an accessible learning environment. For many of the writing students, getting to know the teaching staff via profcasts adds value to the online learning experience while providing materials that supplement and/or complement the written lectures. The authentic, embodied practices portrayed in the videocasts together with the 'ways of being' conveyed combine to create this engagement. As well as providing engagement, they mark the MA in Writing as unique and contribute to future-proofing.

The adoption of the *carpe diem* process for creating and rewriting online units signals a team approach where the lecturer, not the instructional designer, generates sequences of content and where representations of teacher identities are as central as those of students. This study corroborates the idea that teacher identities can be used as tools for engaging pedagogically with students. It is possible for teachers to create interchanges which are involving and inclusive and which will last over time: teachers as future-makers, contributing to pedagogic and resourcing sustainability.

To foreground and even commodify the teaching staff as bearers of disciplinary and institutional banners is to move a long way from the online learning worlds of 1997 when McWilliam and Taylor noticed the teacher's 'material presence in the learning context' was represented almost as an 'impediment to learning, a stumbling block in the path of access to information' (p.2). The new culture of technology-mediated constructivist learning using multimedia learning objects needs to celebrate the *who* and not just the *how.*

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Distance learners’ use of non-institutional social media to augment and enhance their learning experience

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This paper reports on initial data elicited from two related studies which draw on the learner voice in relation to experiences of distance learners in their use of social media in higher education contexts across four universities. Data from these studies suggest that the wide availability, accessibility and affordances of social media create alternative learning options for some distance learners. The studies reported here draw upon affordance theory and identify that some distant learners are actively and deliberately using popular, non-institutional social media tools to augment and extend their learning experiences. This brief paper discusses emerging findings and the possible implications of these findings for the sector.

Keywords: Distance learners, social media, affordances, higher education

Introduction

Distance learning is a rapidly growing segment of the education market with more learners moving to online distance learning every year (Allen & Seaman, 2010). Online distance learners are those whose learning is delivered and mediated by technology and who have little or no face-to-face interaction with teachers or other students (Keegan, 2008). Social media is becoming a major form of communication, interaction and information access and generation for people globally and as Selwyn (2012) suggests, in recent years the wide-scale uptake of these tools ‘has transformed the ways in which the internet is experienced by most end users’ (p. 1). However, it remains that widespread benefits of web-based tools have largely failed to materialize for the majority of distance learners. The focus of much online learning is still based on the delivery of content rather than the emergent possibilities for engagement and interaction (Lonn & Teasley, 2009; McKeogh & Fox, 2009).

This paper draws on data from two phenomenological studies. One pilot study completed and reported elsewhere (Andrews & Tynan, 2012; Andrews, Tynan & James, 2011) and the second building on the findings of the pilot study to a) attest the veracity and extant of the early findings; and b) develop the research towards unanswered and raised questions of the pilot study. Emergent findings are reported as follows and illustrate that social media plays an important role for some distance learners whose use of social media for social and emotional learning support is surprisingly a deliberate and considered choice of students. Social media is being used by students outside of the intended curriculum design without teacher intervention.

The rise of social media

Social media, as now very well known, comes in many forms with Facebook, Twitter, YouTube, and Wikipedia being some of the most commonly used and recognised tools (Selwyn, 2012). Despite the variations in the activities they support or enable, social media “rely on openly shared digital content that is authored, critiqued and re-configured by a mass of users” (Selwyn, 2012, p.X). It has also become apparent that social media use is not just the province of young people with large numbers of older people adopting these tools for a wide range of activities (Lenhart, Purcell, Smith, & Zickhur, 2010). While the social use of these tools is undisputed, use of social media for teaching and learning activities remains less explored. Much of the current literature reporting on the use of social media for teaching and learning suggests that on-campus learners do not generally use social media much for deliberate or teacher constructed teaching and learning activities As Selwyn suggests probably no more than 10% of these leaners fall into this category. However these studies have not investigated the ways in which online distance learners use social media in relation to teaching and learning activities.

Conceptual framework: Affordance theory and its application to social media and learning

Originally conceived by Gibson (1979), affordance theory is described as a way of explaining 'what the environment offers an organism … and were thus seen as properties of the environment relative to a specific organism of group of organisms of the' (Day & Lloyd, 2007, p18.) Over time the concept has evolved with Norman's (1998) addition of the understanding of the distinction between actual and perceived affordances to more recent additions by Day and Lloyd (2007) who draw upon contextual factors in applying affordance theory. This could be extrapolated to include curriculum development, teacher facilitation and the learning environment more generally. Affordance theory therefore becomes a welcome lens to explore the wide availability and ease of use of social media (as the environment) and their wide spread use by students (human interaction). The intersection of the environment, student interaction and learners contexts (contextual factors) and the purposes for which social media have arisen may well alter and will no doubt evolve from what they were originally envisaged.

Investigating learner experience

Distance learners from five different Australian universities are participating in the studies reported here. As noted earlier the study builds and extends on a previous pilot study conducted in 2010. The original pilot study explored the 'lived experience' of twelve distance learners use of ICT for teaching and learning (Andrews & Tynan, 2012; Andrews, Tynan & James, 2011). The current study is further testing the findings of the initial study and expanding on the recommendations of that study which included amongst others further investigation of distance learners' use of social media. Forty learners across the partner universities, have been recruited under strict ethical approvals. Appropriate ethical clearance for the studies was obtained from all participant institutions, with particular attention being paid for permission to use photos, videos and voice data for presentations. To date thirty eight students have completed the current round of data collection activities and data collection will be completed by the middle of October, 2012.

Methodology

The two studies discussed here adopted a phenomenological approach to investigate the 'lived experience' of distance learners' use of technology for teaching and learning (van Manen, 1997). Students were purposively selected for participation in the study on the basis of identified criteria including: students currently actively participating in distance learning courses; students working full time and studying part time; international students; students representing a range of different course; postgraduate students; undergraduate students and students living on-campus and studying via online distance learning materials. The current study also had a specific focus on recruiting males as in the original pilot study all participants were female.

The same tools were utilised by both studies to collect data to provide 'thick descriptions' (Mayes, 2006) of distance learners' daily experiences with technology for teaching and learning. The data collection tools which included two journal tools, the Day Experience Method (Riddle & Arnold, 2007) and Charting the Week's Activities (Andrews & Tynan, 2012) provided the participants with an opportunity to provide detailed daily accounts of their activities.

The Day Experience Method (DEM) is designed to collect a snapshot of participants' activities. It involves sending text messages with a set of questions to participants on their mobile phones at irregular times throughout a 24 hour period (Riddle and Arnold, 2007) Participants were required to answer the questions at the time they receive the message in as much detail as possible. The questions asked participants to identify their activities at the time the messages were received as well as information about who they were with, what technologies they were using and how they were feeling. For the purpose of these studies the DEM was adapted slightly to cover an eighteen-hour period and during this time participants received 7-8 msn messages.

The Charting the Week's activities (CWA) was developed by the first author for the pilot study to overcome perceived limitations in the DEM method in developing an understanding of patterns and routines in the ways in which distance learners use technology for teaching and learning. For the CWA, participants were required to provide a summary of their daily activities including learning activities across a week. Participants could use print, video or audio for their diary activities. Participants were required to provide a photo or photos of their learning spaces. Learning space was identified as any space they used to engage in learning activities. The photos were used as prompts in follow up focus group discussions conducted using Skype and a software tool that plugs into Skype, Call Recording, was used to record the Skype conversations.

Analysis was undertaken using Interpretative Phenomenological Analysis, (IPA) an approach described by Mayes (2006) and requiring reading and re-reading the data to extract themes and meaning.

Results and discussion

As noted above analysis was conducted using IPA, with the conceptual framework of affordance theory being used for the first time to assist in the explanation of the learners experiences. Fifty students from five universities have completed the study so far. These students represent a wide range of distance learning contexts including international students, postgraduates, undergraduates, males and females, full and part time workers, full and part time students. Programs represented include Primary Teaching, Secondary Teaching, Education, Environmental Science, Psychology, History, Social Science, Music, French, Italian, Business, Science, Maths and Agricultural Science. To date, ten males have participated in the study. These participants also represent a great deal of diversity in their ages, personal circumstances, work and family situations. The analysis of data, although in the early stages, suggests that use of social media to augment and extend the learning experience is emerging as a strong trend from both studies. While there is no doubt that some learners make little use of social media for teaching and learning as suggested by Selwyn (2012), forty one (more than eighty percent) of the students that have completed the study to date, currently make deliberate use of social media to augment their learning in some way. Below in table 1 is a summary of some of the social media technologies being utilized by distance learners, the ways in which these learners are using them to support teaching and learning activities and their reasons for adopting these tools.

Table 1: Distance students' use of social media to support teaching and learning activities

Social media	Activity	Reason for using social media
Facebook	Replacement of BB discussion forum Language learning Creating a learning community Connecting to experts	Dissatisfaction with quality of discussion Dissatisfaction with BB discussion forum interface Practicing a foreign language in a safe environment Passion for learning and desire to connect with other learners around items of interest Accessing other 'expert' opinions
Skype	Assignment Discussions Completion of quizzes Participation in informal learning	Opportunity for real time discussions Discussion of assignments/developing an awareness of different perspectives
MSN	Connecting with other learners	
Blogs	Connecting to other professionals	Seeking alternative expert viewpoints Engaging in professional discourse around course topics Participating in special interest groups related to studies
YouTube	Watching educational videos Animations	Dissatisfaction with quality of institutional lecture recordings Seeking other recognised experts' views on subject matter Seeking additional content to that provided Seeking increased understanding of content
Yahoo groups	Discussion with experts Special interest groups	Seeking alternative viewpoints Engaging in professional discussions
Google tools	Special interest groups	Engaging in professional discourse around course topics

As shown in Table 1 our emergent findings are explicitly identifying ways in which some distance learners are using social media to augment and enhance their learning experience. As noted, some make considered decisions to 'stretch their understanding' beyond what is provided by the institution. The affordances of social media enable easy access to 'experts' or professionals in the field who are themselves active users of social media. Furthermore, this kind of activity has enriched and extended students' learning experience well beyond what was perhaps intended by their universities. In some cases this kind of activity was motivated by a lack of meaningful interaction on institutional forums. For others it was a desire to extend their learning and develop alternative perspectives to deepen their understanding. There are also indications that some students, familiar with the ease of use of widely available social networking tools and other popular online technologies struggle with the perceived un-user friendliness of tools such as institutional learning management systems and are shifting their learning activities, both formal and informal to these tools: *It's so hard to find anything in blackboard (discussion) and so difficult to search. I don't know why they don't do it like Facebook* (participant, CQU University, 2012). These emergent findings offer insights when viewed through the conceptual framework of affordance theory. It appears that where learners augment their learning experiences through the adoption of social media that they are demonstrating an evolving new use of social media where the learning context and human interaction as afforded by social media (Day & Lloyd, 2007) are merging into an unexpected learning space which was previously used for more personal and social interactions.

Conclusions

The emergent ideas presented here suggest that there is a need for universities to recognise that distance learners are using social media to support a range of learning needs in unexpected ways and that this trend is most likely one that will continue to grow as internet users develop greater familiarity with the range of technologies and resources available and accessible online and the affordances they enable in teaching and learning contexts.
It may be worth noting that learners need to be able to perceive potential affordances in order for them to be actualised and learning conditions need to support the use of those potential affordances. If, as the data here suggests, there is an emerging trend in the use of social media by online learners in higher education, the implications for institutions will include the need to help all students to see the potential affordances of social media within the learning context and to support the realisation/utilisation of those potential affordances. Such support could include re-structuring of learning and teaching activities, support and development of teachers and support of technology. Furthermore, given that students are accessing study materials from a diverse range of sources, rather than relying on those provided by the institutions at which they are undertaking their studies, there is an increasing need to ensure that students possess the skills necessary to evaluate the credibility of the sources they are using to augmenting their learning.

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Engaging higher education students via digital curation

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The emergence and adoption of freely available digital curation tools has shown a public desire to locate, evaluate and organise web content into manageable, shareable collections. These tools occupy a unique niche, often overlapping with other web tools. This necessitates a clear definition of tools laying claim to this space and suggestion and direction for the use of digital curation to build student engagement. A definition is suggested, as well as a discussion on the emotional design principles and how they build sustained engagement with users.

Keywords: digital curation, digital literacy, information literacy, student engagement, higher education

Introduction

The ubiquity of the internet has led to the easy availability of vast amounts of information. Therefore, the development of information and digital literacy skills is critical for the 21st century learner. An emergent suite of digital tools have aligned themselves to the perceived need to locate, select and synthesise web content into open, user-organised collections. Constructively aligned with learning outcomes, these tools potentially support the development of academic reading, writing, and research skills for higher education. This paper will, firstly, establish a definition of digital curation which will robustly stand apart from the mainstream, market-driven catchphrases already in existence; attendant with which is the construction of a framework for evaluating the fit of digital tools to the curation definition. Secondly, the emotional design of these tools to potentially improve student learning outcomes is explored and, thirdly, practical suggestions for using these tools to enhance the learning experience are offered.

Defining Digital Curation

While definitions of curation have been proposed, they have not been applied to, or tested against, the tools that could benefit from such a classification. Prior definitions have included the addition of an active and ongoing editorial component to a digital collection of content (Scime, 2009) or the human filtering and organisation of information (Rosenbaum, 2010). The maturation of these tools necessitates a more fulsome definition of digital curation, which is proposed as:

> an active process whereby content/artefacts are purposely selected to be preserved for future access. In the digital environment, additional elements can be leveraged, such as the inclusion of social media to disseminate collected content, the ability for other users to suggest content or leave comments and the critical evaluation and selection of aggregated content. This latter part especially is important in defining this as an active process.

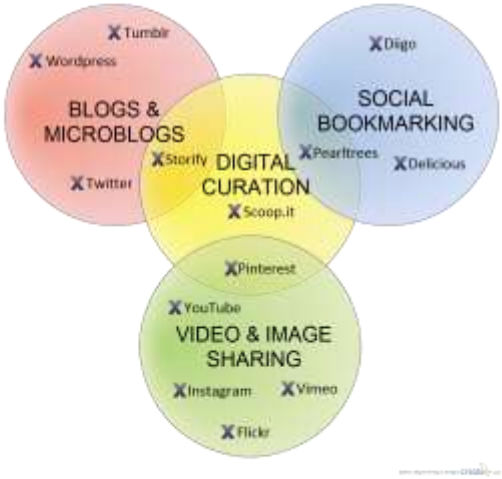

Figure 1: Digital Curation Tools

Conceptually, this definition can be expanded to four distinct, yet overlapping areas (Figure 1), informed by the users' primary activity within the tool. These are blogs and microblogs, social bookmarking, video and image sharing, and, at the centre, digital curation. Scoop.it requires the user to define the sources from which potential content will be suggested. These automated searches gather content from the selected sources, but the decision for content inclusion rests completely with the end-user, making this an active process. A social element is also introduced as users can suggest content to others, and collect content from other collections. Some tools (Storify, Pearltrees, and Pinterest) overlap with but are not exclusively curational, yet require tangential discussion to establish the validity of the definition proposed by the authors. Storify (a blogging and curational service) allows users to actively draw in content from disparate sources (such as news feeds, websites and social media) in order to construct a narrative. However, there is no functionality to embed suggested content from other users or aggregated content based on keywords. Pearltrees facilitates web content collection similar to social bookmarking and visually presents the linked content but it is dependent on user-discovered information. Pinterest curates information and supports image sharing by allowing users to both post their own content on 'pinboards' and collect content from other users (referred to as 're-pinning'). While Pinterest has aspects of digital curation, it lacks the ability to suggest content for the user.

Emotional Design

The complex interplay between cognitive, emotional and behavioural responses to create positive and engaging online experiences is influenced by Maslow's Hierarchy of Needs (see Maslow, 1954: p. 236). The reconceptualisation of the hierarchy for web user needs is directly relevant to the design and adoption of digital curation tools (see Walter, 2011: see Chapter. 1) (Figure 2). Functional needs refer to the user's ability to complete the task required (despite the lack of 'smoothness' of the experience) while reliability depends on the consistent, 24-hour availability of the web. Usability denotes how the design principles impact on the ease of use of initial exposure to the technology whilst emotion, (represented by the uppermost segment in Figure 2) pertains to positive emotional responses such as pleasure, fun, and delight. This latter is particularly pertinent to the potential of these tools to engage learners.

Figure 2: Web User Needs (Walter, 2011)

Prior research has shown a correlation between emotions and the learning process. Isen (see Isen, 1990: p. 76) examined the impact of feelings on cognition and social behaviour, finding that positive feelings facilitate active information recall. Izard, Kagan and Zajonc (see Izard, Kagan & Zajonc, 1984: pp. 5-6) argued that one's emotional state before learning may affect one's cognitive results. Alternatively, emotions may develop throughout the learning process and, in such cases, emotions tend to shift a person's prior goals to something new. It is reasonable to assume that emotions play a role in determining how much knowledge is retained (Hay, 2008: pp. 1269-1283). Excessive negative emotions may hinder the learning process while positive emotions are likely to build confidence and self-efficacy, thus encouraging the student to attempt and persist in new learning opportunities (Bandura, 1982: pp. 122-123). Bandura's social cognitive theory of psychological functioning (see Bandura, 1977) suggests that much of human learning occurs in social environments. Self-efficacy is a key tenet of Bandura's work suggesting that a higher sense of self-efficacy (one's perceived capabilities for learning or performing actions at designated levels) positively affects learning, achievement, self-regulation and motivation. As students perform tasks and observe their learning progress, self-efficacy for continued learning is enhanced (Schunk & Mullen, 2012: p. 221).

Emotional and social components of learning are intrinsically linked. If educational technologies (particularly digital curation tools) can yield positive emotional responses, then their use in higher education potentially leads to positive learning experiences and, by extension, improvement in learning outcomes. In a study that explored the relationship between emotions and the acquisition of computer knowledge, it was found that negative emotions were negatively correlated with ability (in relation to nine computer-based skills measures), while positive emotions (happiness) showed a positive correlation (Hay, 2008: p. 1275). Social networks, such as Twitter (Junco, Heiberger & Loken, 2011: pp. 119-132; Hoffman, 2009: pp. 92-100) have shown a positive influence on student motivation, retention and engagement, while similar conclusions have been drawn in previous studies of community college students (Hughes, Karp & O'Gara, 2009: p. 195; Karp & Hughes, 2009: pp. 73-82). In these cases, students tended to benefit from social experiences integrated with their course learning. While the existing research has focused on harnessing social media tools to increase student involvement, the potential of digital technologies to emit an emotional response and engage the learner is still in its infancy.

This paper proposes that digital curation tools (specifically Storify, Pearltrees, Pinterest and Scoop.it) can be utilised in higher education curricula to increase student motivation and engagement and, potentially, improve student learning outcomes. Evidence (see Reeve, 2012: p. 149) suggests that students' engaged in self-directed learning display higher levels of motivation, and it is the convergence of autonomy, engagement and educational technology driving our exploration of these tools. Each tool fosters a sense of ownership and potential for personalised learning. Moreover, the aesthetically pleasing layout of these tools is a foundation for emotional attachment which makes sustained engagement in the activity desirable. The learner also gains a sense of autonomy and ownership of the digital collection. We contend that this has the potential to encourage the learner to interact with these tools on a regular basis. The learner has a certain degree of control over their learning journey, in terms of the ability to synthesise and filter the information coming to them, and control over the final presentation of that content. If the social component of learning can be successfully integrated into the curricula, then it can be reasonably argued that curation likewise has educational potential.

Digital Curation Tools in Higher Education

Table 1 offers a number of suggestions for using each of these digital curation tools in higher education.

Table 1: Applications of Digital Curation Tools in Higher Education

Tool	Possible use in Higher Education	Extending on the work of…
Storify	**Journalism students** could use Storify to depict a current story as a series of images and social media posts to engage a wider, authentic readership. **Political science students** could map an election, and responses to policy in this format.	Harsch, B, 2011 Markey, L, 2011
Pearltrees	**Philosophy students** could evaluate and visually organise disparate web resources for assessment tasks. **Tutors** could curate and build a visual representation of resources in their subject area.	Team Plenk, 2010
Pinterest	**Visual Arts students** could create a portfolio showcasing their work whilst gathering inspiration from others. **Marketing students** could explore brand image and social media marketing strategies.	Yale University, 2012 Duke University, 2012
Scoop.it	**Literature students** could filter and synthesise web content, creating an annotated bibliography. **Knowledge Management students** could create a group repository of knowledge.	Dixon, S, 2012

Conclusion

Emotional design principles can shape learning and teaching experiences, and recognising their significance merits further consideration in both learning theory and pedagogical practice. This paper has offered a number of suggestions for embedding digital curation tools into higher education, focusing on increasing student motivation, engagement and, potentially, student learning outcomes. The proposed definition seeks to give practitioners a framework for aligning a tools' purpose with learning and assessment activities.

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Follow me! Increasing participation in online conferences

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There have been mixed reviews about the use of Twitter for increasing interaction during online conferences. Social media platforms such as Twitter have the potential to satisfy a perceived need for networking and communication opportunities that are commensurate with the face-to-face environment but generally lacking in the online world. However, a reluctance to adopt new and emerging technologies, or perhaps a lack of understanding about how to use Twitter for a more interactive conference experience, has inhibited its success. This paper reports on the use of Twitter in the Follow the Sun Online Learning Festival and provides an overview of the challenges involved in encouraging and sustaining participation in a virtual environment.

Keywords: Twitter, social media, online conferencing

Introduction and Background

Conference organisers have already discovered that Twitter is ‘a powerful component of one’s networking activity’ (Reinhardt et al, 2009, p. 147) and are thus using this microblogging platform as an additional form of communication during face-to-face conferences. In an analysis of ‘How people are using Twitter during conferences’, Reinhardt et al (2009, p. 153) argued that ‘Twitter helps you reach out to others with similar interests [and] provides networking potential’. Martin Ebnar (2009, p. 97) likewise found that the use of Twitter during a conference ‘enhanced the words of the keynote speaker [and] turned the presentation into an interactive, highly attention-evoking act’. Twitter enabled ‘the previously hidden thoughts of the participants…to become visible and thus helped to deepen the presented subject’ (Ebnar, 2009, p. 97). While the use of Twitter for increasing interaction during face-to-face conferences has been widely documented, little is known about the potential of Twitter for creating networking opportunities in online events.

This paper reports on the use of Twitter as part of an online, synchronous conference, which was organised by the Australian Digital Futures Institute at USQ, Beyond Distance Research Alliance at the University of Leicester and Athabasca University, and the challenges involved in encouraging participants to adopt and interact with this written, and often foreign, form of communication. There is no doubt that the social component of the traditional conference contributes to its appeal. Most people like to travel and to ‘meet and interact with other people who are physically present’ (Kimura & Ho, 2008, p. 121) and the ‘spontaneous and random socialising and networking that can happen…may be inhibited or even eliminated by online participation’ (Anderson & Anderson, 2009). However, online conferences can be organised to utilise an array of communication modes to promote interaction. The purpose of using Twitter during the Follow the Sun Online Learning Festival was to analyse how people are using social media during online events.

Establishing a Twitter presence for #FTS12

Twitter was used during the Follow the Sun Online Learning Festival to add a dimension to the conference by allowing geographically dispersed individuals to communicate with each other. At the conclusion of the conference, delegates received a survey that analysed their social media usage throughout the event and the main messages that were expressed via Tweets. Delegates who consented to their Tweets being analysed were required to use the conference hash tag (#FTS12). It was found that the majority of Tweets were informative, instructional, promotional or conversational. (See Table 1)

Table 1: Categorisation of Tweets from Follow the Sun

Tweet Category	Example Tweet
Informative: Tweets that pointed to resources with an accompanying link	'Recordings from #fts12 now available @ http://t.co/smWYn413'
Instructional: Tweets with a directive to perform an activity.	'Click latecomers link to join! http://t.co/5iTLCwN'
Promotional: Tweets that promoted an upcoming presentation.	'Nominal Group Technique Session @ #fts12. Join us!'
Conversational: Tweets that included an observation or expressed an opinion.	'Interesting conversation about the future of the world' or 'Very impressive start to Follow the Sun!'

Twitter usage, according to Java et al (2007), can be roughly categorised into three types: information sharing, information seeking and friendship-wise relationship. However, analysis of the Tweets emanating from the Follow the Sun Online Learning Festival indicates that information sharing was the primary motivator for using Twitter during the online event. The informative, instructional and promotional Tweets invariably provided information for others regarding an upcoming presentation, change of location or a complementary link to issues discussed. There was no evidence to suggest that conference delegates used Twitter as a friendship-wise relationship tool. In fact, despite the networking potential of social media platforms, only 41% of survey respondents indicated that they were actively listening, asking questions and/or communicating using social media during the sessions and 36.2% of respondents said that they did not communicate with others during or after the festival. This suggests that, despite the best attempts by the conference organisers to facilitate an interactive, social learning climate, creating a community or network is challenging in the text-based environment.

Conclusion

Initial indications suggest that when used appropriately, Twitter is extremely useful for the fast exchange of thoughts, ideas and information. Twitter proponents value its potential as a backchannel for the reportage of live events and the layer of interconnectivity it provides, while its critics chastise the tool as a meaningless distraction. A number of challenges need to be addressed before Twitter can be used as a networking tool at online events. This form of written communication does not come naturally to most people and it cannot be assumed that all conference delegates will embrace it. Conference organisers need to both educate participants on how to network in an online community and find alternate means of interacting with those who are disengaged with Twitter. From the outset, conference facilitators need to explain that the intent is to share important ideas, gage audience reactions and push thoughts and ideas to a new place. The key is to figure out how to implement these social networking platforms, whilst managing expectations of what is actually possible in an online verses face-to-face environment.

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Using a Learning Management System organisation as a resource site for blended learning

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The majority of universities in Australia provide learning and teaching resources to staff via their corporate website, or through their own intranet system. This is not possible at the University of the Sunshine Coast and so an alternative had to be provided. Rather than place many files in a central area, it was decided to utilise the organisation facility of the Blackboard Learning Management System (LMS). This poster outlines the goals and processes of designing the site as well the future plans for its implementation.

Keywords: Blended learning, learning management system, professional development

Introduction

By 2011 the University of the Sunshine Coast, a predominantly on campus teaching institution, reached the stage whereby every course delivered was required to have an online presence. As a result, all teaching staff were beginning or continuing their journey into blended learning. Support for teaching staff up until that point was delivered predominantly through individual faculties, with few university-wide resources. To provide professional development resources to all staff, allowing anywhere, anytime access, a central repository of material was needed. A Blackboard organisation was chosen to become the access point for these university-wide resources, in lieu of an ability to utilise the university website.

Development

Initially it was thought that the use of an organisation in Blackboard would be limiting. Concerns included the limited flexibility of presentation and arrangement/management of material. However, on further consideration it was decided that there were potential benefits of using the LMS, along with elements that could be maximised to encourage staff development in the online environment. The analysis of using Blackboard is outlined in Table 1.

Table 1: Analysis of the Blackboard environment as a resource site

Challenges	Advantages
Difficult to format and make visually appealing	Model layout and design
How to manage high volume of material in folders	Model good practice in presenting material e.g. learning modules
Lack flexibility of HTML formatting	Good practice examples of educational tools available in the LMS
	Demonstrate future possibilities e.g. template material
	Opportunities to use and model collaboration tools
	Closed to public – potential to encourage sharing

By using the LMS, staff will be able to experience modelling of elements of course design directly in the LMS itself, share in an safe environment with a known audience and see examples of pedagogy from the showcase area, all of which are characteristics of effective professional development for teachers (Harlen & Doubler, 2007). Including and encouraging examples of staff practice will demystify the unknown of what colleagues are doing, seen as a significant barrier to educators integrating blended learning approaches into their teaching practice (Diaz & Brown, 2010). The use of the LMS blended learning site will both ‘emulate the student experience’ along with providing a home for a learning community, both factors used as guiding principles in Penn State University development of blended learning (Diaz & Brown, 2010).

A secondary outcome of the site is that it will become an educational tool to build staff competencies, and this aspect is already being trialled at sessional staff development workshops. Staff are guided through the site to find resources to address their individual learning needs, and are encouraged to take an experiential learning approach to ‘help themselves’ with future queries.

Design

The site was geared towards those staff beginning their journey into blended learning, but provided considerations for staff who were further along the blended learning continuum. A conscious effort was also made to not overload the site with information. For example, the key areas of good practice and planning included a one page overview of each topic, a more detailed explanation for those interested to learn more, then a case study from a university staff member to illustrate each topic. An outline of the structure is provided in Table 2.

Table 2: Blended Learning site structure

The essentials	Blended Learning frameworks including good practice and planning Best practice modules – based on available tools Student survey results Accessibility, Copyright, Netiquette
What's new	A snapshot of sites indicating the future of blended learning in higher education
Blended Learning at USC	Blended Learning Statement Support details
Showcase USC	Examples of technology being used by staff
What works for me	Blog – staff contributions
Educational technologies	Summary of available technologies plus support material
Blackboard help	Orientation material, Tip sheets, Examples

Next Stage

A key development of the blended learning site will be to make it dynamic and endeavour to grow a community of practice among its users. This will require an investment of time and energy of support staff, as virtual environments are prone to decline in activity (Johnson, 2001). A communication plan will be required to notify staff of the changes, developments, new resources, along with notification of responses to their feedback. Strategies will need to be developed to promote and maintain interest in the site, along with activities to encourage active engagement; factors recommended for enhanced practice (Keppell, McDermott & Hard, 2011). It is hoped that an advantage of using the LMS will be the closed but familiar environment, potentially providing a private community for USC staff and therefore increasing the potential growth of a community of practice (Wenger, McDermott & Snyder (2002).

At an appropriate time, the site will be formally evaluated. An analysis of the Blackboard usage statistics will be conducted to gauge the level of activity in each area. A follow-up survey will be implemented to gather staff feedback regarding the usefulness of the site and to inform future developments. Evidence gathered will be fed into a University level Action Research project lead by a member of the Blended Learning Team.

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Growing, leading and measuring online Communities of Practice

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Intended audience and degree of expertise/past experience required

This workshop is suitable for leaders of learning who are considering establishing online learning communities in their organisations. Some experience with social networking would be an advantage but not necessary.

Statement of objectives for the workshop

By the end of the workshop the participants will:

Knowledge: Understand the key concepts, principles and terminology of leading online learning communities.
Skills: Identified the key skills of facilitating and leading an online community of practice.
Values: Appreciate the value of learning and sharing together to enhance learning opportunities and enhanced performance in the workplace.
People: Have strategies to connect, and collaborate with others to build and lead an online community
Learn: Locate, evaluate and share resources for building online learning communities.
Integrate: Integrate an online learning community into their existing practice and a learning leader.

Detailed description

The workshop participants in groups will plan, create and develop an online community of learners. The facilitators will share strategies and approaches they have learned from the experience of establishing and facilitating two growing, vibrant online communities of practice that are specifically focussed on professional development within education contexts. There will also be guidelines on how to grow an online community of practice from scratch, as well as ideas that will help manage expectations, and manage risks.

The participants, during this workshop will 'learn by doing' as they become part of a live community. The aim is to create a live learning community that supports the facilitators and developers of other online communities as workshop participants establish them.

Thinking, researching and living in virtual professional development community of practice

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This paper is a comparative case study of two virtual professional development (VPD) communities of practice established and maintained to support teachers in their learning and development. Each community was studied and evaluated by its facilitator. The purpose of those studies was to identify behaviours and capture shifts in educators' professional identity as they engaged in VPD. The researchers were interested in those practices that indicated embedding of practice, co-construction of knowledge, and development of skills and values. Many of the factors identified in the VPD initiatives explored the link to the wider conversations that are occurring around education in general in a time of change.

Keywords: virtual professional development, communities of practice

Introduction

Educators today are working within an environment of continual change, with influences from both external and internal sources. Teachers are challenged to justify their curriculum, methods, and approaches to student learning. Under this intense pressure each teacher has their own way of coping and their own unique identity. Each teacher, busy with a full workload, is trying to address these issues within their own context. As such, there has never been a greater need for teachers to be supported by like-minded educators and leaders, who are connected in networks. This paper explores the initiation, development and leadership of two virtual professional development communities of practice in a time of great change in education. The research conducted in each community is also described and compared. The commonalities and differences of two online CoPs provide rich insight into educators' community development, participation, learning and developing identities.

Background

Communities of Practice (CoPs), that enable situated learning are based on previous research into learning in professional practice. (Lave & Wenger, 1991 & Lai, et al, 2006). The CoPs include facilities of knowledge management and professional growth for a group of people who, via a common space on the Internet, engage in public discussions, interactions, and exchanges (Tilley, Hills, Bruce, & Meyers, 2002, Wenger, 1998, Owen, 2011b, Lave and Wenger, 1991 & Flagg & Ayling, 2011).

Central to participation in an online CoP is the concept of an educator's identity. Wenger (1998) explained, that "issues of identity are an integral aspect of learning and are thus inseparable from issues of practice, community and meaning" (p. 145). Identity is the 'pivot point' between the social and the individual. Westfall (2000) suggests that "the idea of truly departing from social hierarchy and restriction does not occur on the Internet...with identity construction still shaped by others" (p. 160), in particular in response to each individual's literacy and communication skills within the online context. Identity according to Grey, (1994) is a project of self. There are two types of identity Common and Common Bond. The Common Identity is commitment to an enterprise or a value, where as the Common Bond is to the people involved in the enterprise (Prentice, 1994). According to Handley (2006) we derive our identity from the communities to which we belong and are accepted. Utz and Sassenburg (2002) suggested that membership of a community relates to identity and identity relates to purpose.

To further understand the ideas that underpin VPD engagement and participation in online CoPs, the work of Schlager and Fusco (2003) provides a useful structure. In their research into a large, multi organisation VPD project, they used the Activity Theory Framework (Engestrom, 1987, 1999; Cole & Engestrom, 1993) to analyse how individuals and groups engage in a VPD. Schlager and Fusco explained that participation in online community is a new project (activity), designed to support and develop members (subjects), to use new activities and information (tools), to improve their performance (object). To undertake these activities using tools and objects, members must take on new collaborative roles (division of labour) based on values and norms (rules). The members are encouraged to develop trust in, and form lasting relationships with, one another (community) as they implement new ideas in their practice.

The authors believe educators find the pace, nature and demands of change from external and internal sources extremely challenging. Ann Austin, (2012, p 57) says the work teachers do must be understood within, and connect and respond to, a rapidly changing world. As such, teachers should offer both vision and practical paths to aid students and the broader society in moving forward with hope, wisdom, integrity and courage. William G Tierney, (1992) believes educators need to create communities that recognise and honor difference, cultivate respect and foster dialogue. In these communities, communication as a concept is in constant negotiation, dialogue and reformulation, and the process is characterised by the 'politics of hope'. In such dialogues individuals retain their unique identities, while meaning is created for the organisation. The challenge for the leaders of these communities it so create online community spaces, which aid and promote conversation, are key elements to fostering communication.

Context

The authors of this paper are community facilitators/leaders of two online CoPs, which, between them, have over four hundred educators and leaders as members. These virtual communities were formed to support educators and help them develop professionally by providing access to resources, connections and support. The members of these communities are located over a broad geographical base, working in diverse organisations, and across a variety of educational levels, from primary through to higher education. The communities have grown organically over a three year period and become lively, vibrant and safe spaces that encourage conversations around professional practice, identity and student learning, as well as being containers of 'things' (Ashton, 1999), such as resources, conversations, videos, podcasts and images.

Community One:

This CoP, 'The Teaching and Learning Community at Unitec' (T & L Community - http://tlcommunityunitec.ning.com/) was established in 2009 and had, by early 2011, evolved into New Zealand's largest and most active online teaching and learning CoP, with over 360 members engaged in higher education from across New Zealand and around the world. The focus of this community is higher education and the community is drawn from a range of different organisations, although the predominant membership is from one large institute of technology in New Zealand.

Community Two:

The Virtual Professional Learning Development (VPLD) online community was established in November 2009, and now has one-hundred-and-thirty-five members located in and around New Zealand. Members of the community are mainly from the primary and secondary sector, although there are a few members from tertiary or associated PLD providers. Most members are located in a variety of schools and education institutions, although the core focus of the community is the VPLD programme, which directly involves thirty-five of the community members.

Aim

Each VPD was evaluated at different points in their development. The purpose of those studies was to identify behaviours and capture shifts in educators' professional identity as they engaged in VPD. The researchers were interested in those practices that indicated embedding of practice, co-construction of knowledge, and development of skills and values.

Method

Community One:

The development of this site had been based on the work of Wenger, White and Smith (2009) and was structured on findings from White's Online Community Builder's Purpose Checklist (2009). The study was three months duration. It employed a single survey and an examination of the Teaching and Learning Community website using platform observation and Google Analytics. At the time of the survey there were 280 members of the community and 23 members responded to the survey. The return rate of less than 10% is not uncommon in online environments, where a small core are fully participating members.

Community Two:

The VPLD initiative has been underpinned by a research focus since its inception (October 2009), which performs an iterative feed-forward function as well as providing outcomes and comparative longitudinal evaluation data. Data has been collected from all areas of the VPLD online CoP, from project documents, recorded discussions and notes from mentor meetings, and from Webinar sessions, as well as via three online surveys per year in 2010 and 2011 (conducted in January, June, and November/December). The main question pertaining to the VPLD online CoP was: How are participants' opinions of the value of the VPLD pilot affected by participation in the VPLD CoP?

To assist in the comparison of results across the online VPDs, only data collected using the online surveys of 36 participants will be reported. Designed with mainly open-ended questions, the survey aimed at gathering richer, fuller understandings of the experiences of the VPLD participants as well as gathering suggestions for the future of VPLD.

Results

In both communities the members' responses to the surveys provided insight into members' participation in the communities. The research findings are examined within the structure of the Activity Theory Framework (Cole & Engestrom, 2003). Using themes from the Activity Theory Framework the authors have categorised responses relevant to themes of activity, subjects, tools, object, division of labour and rules. These themes provide valuable insight into participation, learning and identity.

Participants (Subjects)

Overwhelmingly, the participants in both VPD communities were teachers and/or leaders within education. Some members were managers, and some had professional development roles. The majority of members were teachers with full time teaching responsibilities and they were diverse in knowledge, experience, skills, locations, and teaching contexts. To fully understand how the VPD environments support teachers it is essential to understand their nature and characteristics. Both CoPs studied had variable levels of participant engagement, which depended on the members' confidence, capabilities (digital literacy), motivations, access to technology, and available time. Not all members had equal opportunities to fully participate in the VPD environments.

Community One respondents in the higher education environment had very different levels of participation. As the literature explained (Lave & Wenger, 1991; Brown & Duguid, 1991; Wenger, 2009), more than three quarters of the members of any online community take the valid role of passive consumers of community cultural artifacts (resources, knowledge, skills and values). Interestingly, just over a quarter of the members (27%) uploaded a photo of themselves to their profile page on the CoP platform. By uploading a photo teachers were be more likely to be ready to participate in a VPD. This could be seen as an integral part of teacher identity, as well as being indicative of existing skill sets.

Community Two, at the time of publication, has seen 100% of participants upload a profile picture, and contribute some information about themselves and where they are working, suggesting a strong sense of belonging, or desire to belong, as well as indicating the positive modelling by existing members of the community. While some might point to a reasonable level of digital literacies as one of the reasons there is such a high rate of profile development, the survey responses indicate that participants have a wide range of technical skills, familiarity with social networking, and access. For example, during the course of the pilot project (2010) it became obvious that there was not equality of access to the technology itself, or in the level of technical support provided by the institutions.

In any self-motivated learning environment participants are provided with the freedom to choose whether to engage (with or without genuine enthusiasm), and some will decline to embrace the opportunity (Bruckman, 2003). This is an important part of identity. The aim of the VPD's was to find a balance or compromise between self-motivated and socio-constructivist environments, where engagement and up-skilling were the ultimate rewards, and a more traditional perspectives where professional development was directly linked to performance reviews and promotion. It was challenging for the facilitators/leaders to find the right balance, especially as work commitments ebbed and flowed for participants.

Learning about practice (Object)

The object of both CoPs was to support teachers' professional development, in part by removing barriers of time and geography. The CoPs delivered both formal and informal (spontaneous) learning. While not specifically delivering online professional development (in the sense of generic workshops), the VPD environments were established to support situated learning (Lave & Wenger, 1991). As such, the aim of the facilitators was to create environments where educators could learn *from* and *with* each other (Wenger, White & Smith, 2009, p. 7). Practitioners were encouraged to share and reflect on their day-to-day experiences, stories, and ideas. Key to this approach is a willingness to learn more about practice.

Community One

The respondents in this community recognised the professional development purpose of the community and the need to assimilate new learning into professional practice. One respondent spoke of the positive sense of innovation and creativity provided by an online community.

> The Ning is quite liberating, because in a sense, it enables us (participants) to leave the box (figurative or actual!) in which we work, and cast off the restrictions and 'urgency' of our day to day roles to reflect, explore and give commentary on those issues which are important in our practice, or about which we are truly passionate.

The facilitator/leaders were an experienced and active presence in the CoP. Resources were created and developed by members through blog posts, while discussions on speciality topics in education were held in groups. Members with a 'strong online presence' had created and shared, and participated in a variety of discussions in the community groups. However, it was the norm for members to consume rather than contribute and collaborate. In terms of Activity Theory, this disconnection between members' perceptions about their competence and behavior was important to understanding their participation. As higher education is a competitive environment with individual rather than group rewards, it is not unusual to find members learning from the community without feeling any obligation to reciprocate by contributing to community outcomes and resources.

Community Two

The VPLD online CoP has developed into a space where practitioners feel comfortable reflecting about their experiences and their practice. Furthermore, by being immersed in an experience that models aspects such as valuing existing world views and skills, as well as making it OK to 'make mistakes', participants were often encouraged to use such approaches with their own learners. One member commented that "I often get...rejuvinated [sic] to focus on certain aspects of my teaching, which filters down to the learning of the students" (survey response, 2010). There was also a sense of re-invention and renewal expressed by participants:

> What a difference a year makes. Prior to becoming a participant in the VPLD I had been reflecting for a few years as to whether I even wanted to continue in the teaching profession. I was tired of asking students to 'copy this down' and I was sometimes struggling to engage students as participants in their learning instead of just passive recipients. My reflections and my timely introduction to the VPLD started me down the path of 'what if' (end of year reflection, 2011).

The VPLD sessions, activities and programmes were designed by the facilitators/leaders to be culturally responsive, take into consideration aspects such as accessibility (physical, technological, and geographical), while also being relevant to the wider community of education. A by-product of teacher engagement was that students became empowered co-constructors of outcomes and facilitators of sessions, as well as more confident, engaged learners who were "*empowered ...to learn on their own terms*" (*Survey response, 2011*).

> I think that I as a teacher [I] am now obsolete but my role as a facilitator is primordial and very active. Because the students are now in charge of their own learning, I am no longer at the front of the class. Instead I am sitting among them and I can go around and help them. I actually now have

more time to spend with the kids to enhance their learning (reflective post, 2011).

A culture of trust (Rules)

Both VPD communities were under pressure from internal and external influences that could increase or decrease the relationships of trust between the facilitators and the members. Trust is enhanced when teachers believe they are operating in an authentic learning environment in which members are open in their profiles and are willing to engage not only online but face-to-face. While teachers need to understand and represent their own perspectives they also need to listen to and honour the perspectives of other members. Teachers need to go beyond consumption to contribution and ultimately to implementing new ideas and technologies in their own practice. Palmer, in The Courage to Teach (1998, p 12.) explained "Good teachers... are able to weave a complex web of connections among themselves, their subjects, and their students so that students can learn to weave a world for themselves. One way of doing this is through dialogue." He goes on to explain that "identity and integrity are more fundamental to good teaching than technique - and if we want to grow as teachers - we must do something alien to the academic culture: we must talk to each other about our inner lives - risky stuff in a profession that fears the personal and seeks safety in the technical, the distant and the abstract."

Schlager & Fusco (2003) explained that a VPD CoP would benefit from fostering trusting relationships, and the formation of a lasting community where teachers encourage each other to apply what they had learned and disseminated their learning to their colleagues. Roberts (2006) suggests that in most conventional management-led organisations it is difficult to foster an environment of trust. Any such developments need to be grown within the VPD CoP. The facilitators/leaders have an important role to play in supporting both the community and members to foster their relationships with other members and to build the community. However, they cannot negate an external hierarchical and managerial approach common in educational institutions. Although none of the respondents of either online CoP identified issues of 'trust' explicitly, it is clear from the literature that trust is a key element for a successful online community of practice (Roberts, 2006; Schlager, 2003). Members of an online CoP have to believe they are learning and sharing in a collaborative and respectful environment.

Community One

The public/private exposure afforded by a VPD CoP was important for some members. The online CoP was open to the public and included a small section for members only. Some members would have preferred the whole site for members only, with no public access. One of our respondents stated,

> A good example is the opening of the CoP to members outside Unitec - a decision which I had no say in and which constrained my willingness to participate. (Survey response, 2011)

Clearly, members are challenged in an environment that requires publicly sharing of ideas and activities in an online environment. Over all 66% of respondents indicated they wanted the site public. The members gave no reasons for their preference, and this could be the subject of further research.

Community Two

Trust in Community Two gradually built as the VPLD CoP matured. The sense of collective identity strengthened, and the feeling of socially-mediated shared understandings and experiences increased, thereby helping to strengthen resilience in the face of change.

> Being geographically diffuse the creation of a community of other teachers who are progressive in their development and practice both affirms and supports the collective confidence in the validity of our projects.

Another participant wrote:

> Sometimes you feel very isolated (e.g. I am the only French teacher in my school) and you feel you are the only one doing what you do. Being part of the VPLD made me realise that I am not alone and gave me the opportunity to grow...as I could read what others were doing. This gave me great ideas to try in my own class (End of year reflection, 2011).

Social Learning (Community)

Schlager & Fusco, (2003) acknowledged that the VPD CoP model did not fit within the existing infrastructure of their members' organisations. While teachers may have been familiar with CoPs they were not used to participating in an online environment to learn more about their practice. This is somewhat ironic considering most education organisations use some form of online student learning management system, and have certain expectations of student learning, collaboration and performance within online spaces.

Community One

One respondent, from Community One raised issues of reasons and purpose of the online community stating,

> I want to know what the aims and/or objectives are, so that I can assess from the outset whether my time is best served participating in such a forum. (Survey response, 2011)

Similarly, another respondent stated,

> It's all all a bit too vague and airy fairy for me in terms of my precious time. I like to know beforehand what I will get out of any time I put in. (Survey response, 2011)

In terms of activity theory it is clear members want to know the purpose of the community before fully engaging. It is therefore the role of facilitators and technology stewards to encourage the negotiation of roles, rules and purposes of a community. Community one developed organically and these matters were not clear as the community was being established. Once more people joined and began to participate, the need for clarity was increasingly evident. Community two supported members to develop their own learning plans and goals around a project of interest to them that they would work on in their own context. As such, it is suggested that the reasons to engage in the VPD were much more transparent to members. The VPD became a valuable resource for critiquing ideas, exploring thoughts and gaining feedback, and the VPLD community became another tool for participants in their toolkit. It gave them more than they had in their own context and fostered their engagement and their change in identity.

Implications

Based on the evaluation of both Community one and Community two, and observation of the communities over a period of time, the authors conclude VPD supports teachers' engagement in professional learning. A healthy and active community can support educators and leaders to undertake transformative learning experiences that can result in a shift in professional identity, and in turn to meet many internal and external challenges. The research has provided insight into the factors that make VPD relevant and useful.

Participation and non-participation are behaviours that are based around affective factors such as identity, belonging, and trust. Such affective factors are something that contributed to what Dron (2010) refers to as 'Social Velcro' - the elements that help a community to form and 'stick' together in a way that enables them to learn effectively, but then to 'un-stick and reassemble'. The social structures that are established are underpinned by agreements about interactions, processes, norms, and rules - although these too are in a constant state of flux, being re-negotiated, re-evaluated and altered. It is likely that as more VPD groups become established, it will be the serendipitous encounters and overlaps between groups, as well as what occurs within them, that will have the potential to encourage diversity, which in turn should ultimately lead to vibrant and creative social learning (Dron, 20120).

Particularly important is the feeling for teachers and facilitator/leaders that they are part of a meaningful community of professional practitioners who share similar interests and goals. A genuine, supportive, safe, friendly, knowledgeable community, can provide opportunities for educators to take responsibility for their own learning, as well as discuss learning and teaching, troubleshoot when they face problems, and share advice, support, resources and tools. It can also provide a space for the celebration of the robustness and alternative points of view from other disciplines and sectors. VPD environments have the capacity to positively engage teachers in their own learning and practice. This engagement has positive effects for teachers' identity as self-managing professionals negotiating their role in a constantly changing and challenging education environment. VPD communities offer authentic support for teachers grappling with change and technology.

Conclusions

Many of the factors identified in the VPD initiatives explored above link to the wider conversations that are occurring around education in general, and social learning in particular. Questions are being raised around what actually should define a programme of education, as well as the role(s) of educators in social networks and learning. The general shift appears to be toward personalised learning environments, self-paced learning, and social identity (Owen, 2012). The teachers who are trialling these approaches are discovering the types of skills that they as educators, and their students as learners, need. It is here that PLD offered via CoPs will come into their own. There are affordances built into the VPD model that encourage and enable practitioners to move at their own pace, in a supported, supportive environment, with access to all that they need to scaffold their learning journey (Owen, 2011a).

Results reaffirm learning as a social phenomenon, while also indicating some members of these online communities took the valid role of passive consumers of community cultural artifacts (resources, knowledge, skills and values). Benefits reported by participants include a change in their own role as educators, as well as improvements in student engagement, and increases in the quantity and quality of collaboration and communication. While it would be simplistic to draw a direct relationship of cause and effect with the online CoPs and these reported shifts, there is an indication that an effective approach to PLD provision is one that does not divorce the educator from their context, or add to significantly to their workload, but which does enable them to be connected and professional *learners*.

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ASk for student teachers: An online support site for ECE student teachers to develop their academic literacy

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ASk101 is an online academic literacy development site for early childhood teacher education students at New Zealand Tertiary College, a specialist early childhood teacher education provider. The site provides equitable access to information and support staff for all students, the vast majority of whom are online distance learners. The Poster demonstrates the personalised and interactive features of this site, which meets the challenge of sustainable online support for an ever increasingly diverse student population.

Keywords: Academic Literacy. Early Childhood Teacher Education. Online Learning. Interactive. In-person Support.

Introduction

ASk101 (or, **A**cademic **Sk**ills 101) is an online academic literacy development site. The users of this site are early childhood education (ECE) student teachers, enrolled in initial teacher education programmes at under-graduate and postgraduate levels. It is crucial for these students to develop and master academic reading and writing skills within the content of their study programmes. Weaving academic literacy development with discipline specific content is effective, with text based contextualised online writing support having already been piloted with positive outcomes for Education students (Straus, Goodfellow & Puxley, 2009) and Pharmacy students (Wingate & Dreiss, 2009). Working with Commerce students, Percy, Yanamandram and Humphrey (2007) audio streamed a lecture on referencing, which was linked to related online quizzes. ASk101 blends text based information with audio, videos of tutorials and animations, along with enabling access to support staff. The site has been developed as a cross-departmental project between the Academic Skills (ASk) support team (comprised of lecturers with expertise in academic skills tutoring) and IT developers at New Zealand Tertiary College (NZTC). A key goal of the site is to offer sustainable and equitable support to all students.

Academic literacy development in distance learning

The vast majority of the College's students are online distance learners, studying throughout New Zealand and also in other countries, including Australia, Germany, India, the Philippines, the UAE and the UK. Many of the students speak English as an additional language or come from non-traditional backgrounds. To meet such diverse needs and to maintain equitable access to learning materials and staff, the College has created *NZTC Online*, a purpose built LMS for high touch low tech users. This acts as the students' one stop shop for their academic studies, which they are introduced to during a free orientation course prior to commencing their study programmes. ASk101 has recently been added to that system.

ASk101

The ASk101 site within *NZTC Online* harnesses a number of digital technologies to support students in the development of their academic literacy. Content, which is grounded in ECE literature, is provided in: videos, animations with accompanying audio tracks, and traditional textual form which can be downloaded and printed as handouts. Students also have access to interactive quizzes for self-review, practice tasks and guidance about how to arrange face-to-face or phone meetings with the ASk team. The main goals of the resource are to enable easy student access to information and support with academic skills, regardless of geographical location, and for that information to be relevant, understandable and easy to navigate for those students who access it.

The resource was made available to students in August, 2012, with the initial content being:

- An introduction to the ASk team and the services it offers students;
- Guidance on effective academic reading strategies;
- Advice on how to analyse assessment tasks;
- Detailed information on essay writing;

- Guidelines for APA referencing.

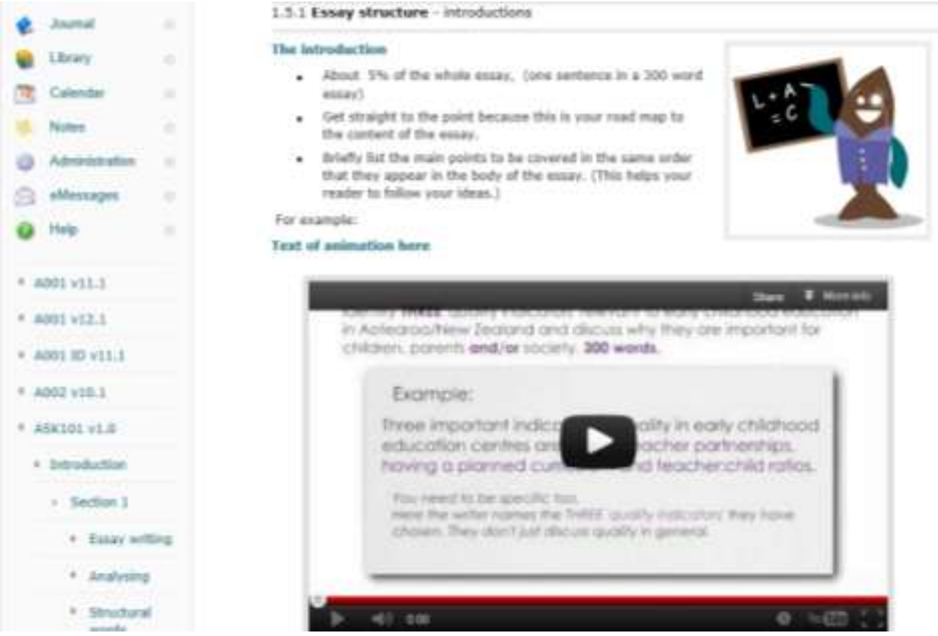

Figure 1: A sample page from the ASk101 essay writing guide

Student response

The response from both staff and students has been positive. Students are able to easily access essential information about how to study and write effectively and have become less anxious about academic work. The ECE student teachers say it is easy to engage with the information because it is ECE contextualised and presented in bite-sized pieces, in both visual and audio formats. Easy access to ASk support and formative feedback on their work has also been a major benefit. And, lecturers are able to direct students, who they have identified as requiring support, to specific aspects of online information and to support staff if needed.

Future directions

Following the initial success of the ASk101 resource, a number of new developments are underway:

- The addition of a “chat” feature, enabling synchronous communication between students and staff;
- Information and advice about plagiarism and practice of how to write with academic honesty;
- Information and advice on literature reviews and developing critical thinking capacities;
- ASk102 – a resource specifically designed for post-graduate ECE students

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Analytics and complexity: Learning and leading for the future

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There is growing interest in the application of learning analytics to manage, inform and improve learning and teaching within higher education. In particular, learning analytics is seen as enabling data-driven decision making as universities are seeking to respond a range of significant challenges that are reshaping the higher education landscape. Experience over four years with a project exploring the use of learning analytics to improve learning and teaching at a particular university has, however, revealed a much more complex reality that potentially limits the value of some analytics-based strategies. This paper uses this experience with over 80,000 students across three learning management systems, combined with literature from complex adaptive systems and learning analytics to identify the source and nature of these limitations along with a suggested path forward.

Keywords: learning analytics, complex adaptive systems, e-learning, managerialism

Introduction

Higher education is being challenged by uncertainties associated with the need to respond to local and global exigencies. Government scrutiny, government reforms, increased competition and the pace of technological change are impacting on how universities conduct and manage their learning and teaching within this volatile environment. The increasing accessibility and globalization of higher education is also creating problems for universities due to the challenges associated with the increasingly diverse range of students. The management and delivery of learning and teaching is particularly challenging for Australian universities seeking to respond to government targets specified in the Bradley review (Commonwealth Government of Australia, 2008). Achieving the goal of 40% of 25-34 year old Australians with, or progressing to, bachelor degrees will require a significant influx of students from very different cultural, educational, experiential and socio-economic backgrounds.

Universities are increasingly accountable for their learning and teaching by government despite decreased public funding and burgeoning demand (Kenny, 2009; Macfadyen & Dawson, 2010; Nouwens, 2002; Reid, 2009). Consequently, universities are being managed as business or corporate entities where academic activities are managed through strategic control with a focus on outputs that can be quantified and compared (Reid, 2009). This is affirmed by Kenny (2009) who suggests that while universities are aiming to be dynamic and innovative enterprises, many operate under onerous external accountability processes with top-down, corporate management structures. The teleological approach to the management of universities is known as managerialism and its influence has extended to how universities manage their learning and teaching. The prevalence of managerialism in higher education, coupled with the rapid adoption of technologies that support learning and teaching (Ellis, Jarkey, Mahony, Peat, & Sheely, 2007), has given rise to the almost universal adoption of learning management systems (LMS) .

The integration of Internet and communication technology (ICT) into learning and teaching has accelerated in the past decade (Macfadyen & Dawson, 2010). E-learning refers to the use of technologies to support learning and teaching (Ellis, et al., 2007) and is rapidly becoming the dominant delivery mode for distance education. In fact the Bradley review (Commonwealth Government of Australia, 2008) includes “An accessible and sophisticated online learning environment” as one of the 12 components of a quality student experience. E-learning via an LMS provides universities with an unprecedented capacity to control and regulate teaching in order to meet increasing demands for access to higher education (Coates, James, & Baldwin, 2005). This has led to the situation where LMS provide value to institutions by supplying the ability to deliver large-scale online programs in conjunction with the managerial requirements to control and regulate teaching (Coates, et al., 2005; Sawyer, Johnson, & Holub, 2009). However, while there is almost universal adoption of LMS in higher education, it has occurred in a vacuum of research into their learning and teaching effectiveness (Lopes, 2008).

Associated with the ubiquitous adoption of LMS in higher education is their ability to track and store vast amounts of data on student and designer behavior (Heathcoate & Dawson, 2005). The process of analyzing institutional data captured by an LMS and other institutional information systems for decision making and reporting purposes is called academic or learning analytics (J. P. Campbell, Oblinger, & DeBlois, 2007). The use of learning analytics has been shown to be directly relevant to student engagement, evaluating learning activities and can usefully answer other important questions (Dawson, McWilliam, & Tan, 2008). The analysis of LMS captured data has the potential to qualitatively change learning and teaching as it takes advantage of what computers are good at, gathering and sorting data (Black, Dawson, & Priem, 2008). Further to this, it has been suggested that academic analytics has the potential to improve learning, teaching and student success through an awareness of patterns in the data and the application of predictive modeling techniques (J. P. Campbell, et al., 2007). Learning analytics talks strongly to managerialism due to its potential to facilitate data-driven decision-making and to complement existing institutional business intelligence areas. This is evidenced by the practice of situating learning analytics within existing business intelligence units who are typically tasked with providing institutions with strategic information based on retrospective student data.

Insight gained over the last four years exploring learning analytics at one university suggest that the assumptions embodied by managerialism may be an inappropriate foundation for the application of learning analytics into tertiary learning environments. It appears likely that any such application will place significant limits on the potential uses of learning analytics to inform and improve learning and teaching. This paper starts by exploring the hidden complexity behind some simple examples of learning analytics and highlights some dangers presented by the hidden complexity when applying a managerialistic mindset. The paper also examines the managerialistic perspectives with the intent of demonstrating their limitations when associated with learning analytics. The paper then describes complex adaptive systems as a theoretical perspective that may be more appropriate for the task of applying learning analytics. Finally, some implications for learning analytics work that arises from a complex adaptive system perspective, identifies some ideas for future work and draws some conclusions.

The hidden complexity behind simple patterns

Since 2007, the Indicators project at CQUniversity has explored the use of learning analytics to better understand what is happening within CQUniversity's e-learning environments. The project has been able to draw upon the accumulated data from three learning management systems and over 80,000 individual students across over 11,000 course offerings. The project has investigated a range of correlations within the data, such as staff adoption of LMS features over time (Beer, Jones, & Clark, 2009), student engagement (Beer, Clark, & Jones, 2010) and the effect that staff engagement has on student engagement (Clark, Beer, & Jones, 2010). One example of this early work has been the exploration of the relationship between student use of the LMS and their resulting grades. The following chart shows the relationship between student forum contributions and their resulting grades for over 30,000 distance students using the Moodle LMS.

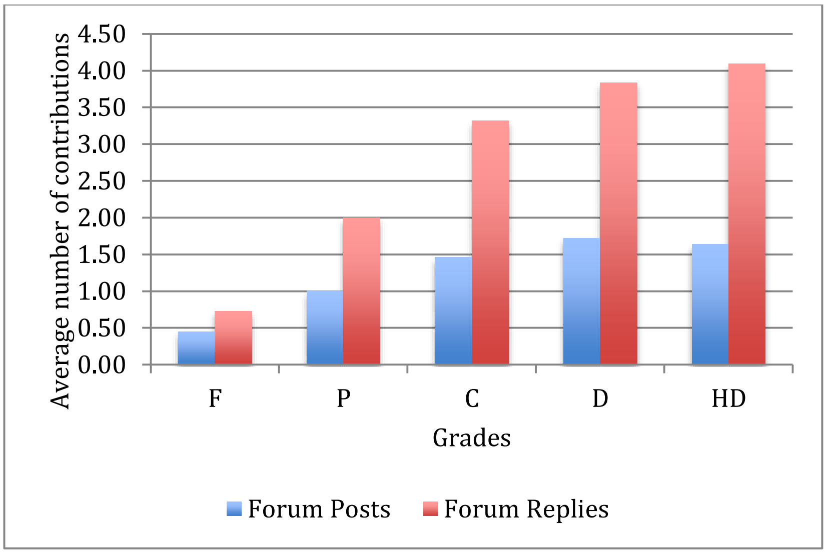

Figure 1. Average forum posts and replies grouped by grade

Figure 1 shows the average number of student forum posts and replies for each grade grouping for distance students using the CQUniversity Moodle LMS since term 2, 2009. On the surface, the linear trend in Figure 1 would indicate that, on average, the more students engage in discussion on the Moodle discussion forums, the better their resulting grade. The 6453 students who received a fail grade averaged 0.4 forum posts and 0.7 forum replies, while the 5693 high distinction students averaged 1.6 forum posts and 4.1 forum replies. This appears to align with Macfadyen & Dawson (2010) who suggested that student contribution to discussion forums was significant in terms of predicting their success in a biology course. However, a danger exists where the interpretation of such patterns and the associated development of institutional interventions, is oversimplified without regard to the complexity occurring within individual courses and programs. The following figure exemplifies the underlying complexity that is occurring within individual courses.

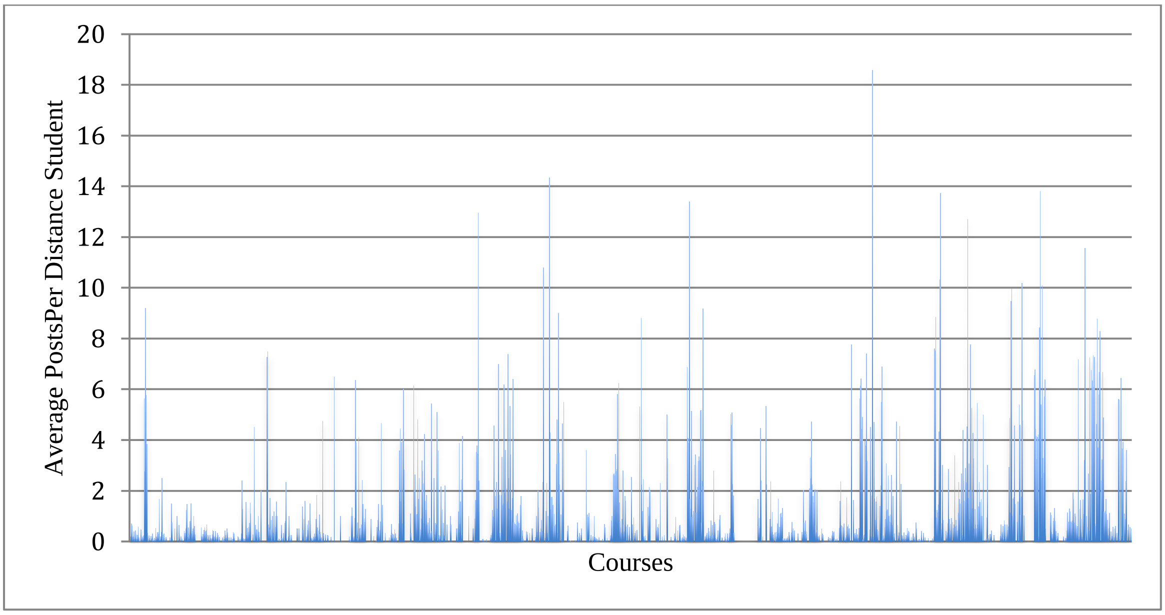

Figure 2. Average distance student forum posts across 1441 courses in 2010 and 2011.

Figure 2 is showing the average number of posts made by distance students across 1441 Moodle courses at the university during 2010 and 2011. The inherent variation is indicative of the plethora of factors that influence how staff and students are using the Moodle discussion forums. Factors such as differing educational philosophies, staff and student familiarity with the technologies, staff and student educational backgrounds, course design, the teacher’s conception of learning and teaching, the level and discipline of the course, institutional policies and processes are just some of the factors that are contributing to the variation apparent in

Figure 2. While learning analytics provides an unprecedented opportunity to observe how staff and students are using the LMS, associated interpretations and interventions need to be carefully considered due to the underlying complexity of the learning environment. This is of particular concern when considered in parallel with the teleological management approaches that are prevalent in modern universities.

Symptoms of the simplistic

As a result of decreasing public funding, universities are increasingly managed by their leaders as if they were businesses in a competitive marketplace. In most universities, accountability for the use of public funding requires both rational allocation of resources and intentional management of change (Russell, 2009). Correspondingly there is a reduction in diversity brought about by this rational allocation of resources (Andriani, 2001). The modernist, teleological manner of university operation also requires that they follow a purpose driven approach to strategic direction (McConachie, Danaher, Luck, & Jones, 2005) which requires goals and objectives to be centrally set and achieved (Lucas, 1996). This teleological approach perhaps links with the rapid adoption of LMS in that they provide universities with an orderly mechanism for control over their online learning strategy and direction (Coates, et al., 2005). A key problem arising from teleological management approaches of learning environments is the assumption that the system's behavior is stable and predictable (Lucas, 1996). Universities and their learning environments on the other hand, have been described as "supercomplex" (Barnett, 2000).

As an example of the tension between managerialism and the complex nature of learning and teaching, in 2009 CQUniversity adopted Moodle as its single LMS. Associated with the adoption of the new LMS and recognition of the importance of student engagement, a set of minimum service standards for course delivery were adopted to guide the course design and planning processes (Tickle, Muldoon, & Tennent, 2009). These standards mandated that every course offer a space for spontaneous student interactions that, within Moodle, was primarily facilitated using discussion forums. However, of 1252 Moodle courses delivered during 2010, 39% had less than five forum contributions by either staff or students. This would suggest that the organizational goal of promoting staff and student interaction within the LMS discussion forums through the teleological imposition of minimum standards has failed to a degree. A factor contributing to this failure is an incorrect assumption by the organization that the underlying system is causal in nature, and the effect of interventions like these minimum standards are predictable and linear.

Organizational leadership has been strongly influenced by Newton's "clockwork universe" where the belief is that big problems can be broken down into smaller ones and solved through rational deduction (Plsek & Greenhalgh, 2001). The "machine model" of organizations lets us down badly when no part of the equation is constant, independent or predictable (Plsek & Greenhalgh, 2001). Universities fit the definition of a complex system where the plethora of interacting and interdependent agents and structures includes teachers, students, community stakeholders, community leaders, the state and its education departments, economic structures, technologies, business organizations and so on (Mason, 2008a). Furthermore, complex systems like universities are unlike simple systems in that they consist of very large numbers of constituent elements or agents that that are connected to, and are interacting with each other in many different ways (Mason, 2008b).

Complex systems, such as university learning environments, are open to and interact with their environment, which includes other complex systems (Jordan, 2010). This can lead to problems if they are managed as simple systems. Snowden and Boone (2007) suggest that different management approaches are needed based on the system type. With simple systems, cause and effect are evident and this means best practice can be applied. Complex systems are not causal, patterns are emergent and there exists no single correct solution. Managing complex systems requires an evolutionary approach as small changes can have disproportionate and non-linear consequences. Applying decision making processes appropriate for one particular system type to another, will lead to problems. Similarly, using learning analytics as if a university is a simple context will lead to limitations and problems.

Problems and limitations of the simple to the complex

Using insights from complex adaptive systems and experience over four years with learning analytics, it is possible to identify a number of likely problems that could arise when the implementation of learning analytics is simplistically applied within a complex context like a university. Some of the likely problems, based on the experience of the Indicators project, are summarized below.

- The hidden complexity behind simple patterns

- Abstraction losing detail
- Organizational decomposition preventing action

- It is not a causal system
    - Confusion between correlation and causation
    - An assumption of causality

Abstraction losing detail

Gardner Campbell (2012) suggested during his presentation to the Learning Analytics and Knowledge Conference 2012, that the nature of learning analytics and its reliance on abstracting patterns or relationships from data has a tendency to hide the complexity of reality. This is exemplified in Figure 2 that shows the variation in student posts and replies and shows an underlying complexity that is not apparent in the linear relationship suggested by Figure 1. This hidden complexity is particularly profound when the data is used for decision making by people who are not directly engaged in the reality (G. Campbell, 2012) and this aligns with complexity science which suggests “bottom up” and emergent change in complex environments (Palmberg, 2009). A 2010 study that used learning analytics to analyze the patterns of particular teacher’s behavior within an LMS, found widely varying results across three courses which were all located within a single discipline and were all delivered by a single academic (Clark, et al., 2010). So even though the three courses were within a single degree program and were delivered by the same teaching academic, the variation noted would have made decisions based on learning analytics information difficult by someone divorced from the context.

Decomposition difficulties

The concept of universities and their associated learning and teaching environments as complex systems appears to conflict with typical university organisational structures and teleological management approaches, where it is assumed that organizational performance is a direct product of rational, macro-level control from above (Goldspink, 2007). This creates a fundamental problem for those seeking to draw upon learning analytics to improve online learning and teaching across an institution, as organizational structures are often representative of teleological thinking. The organization’s structures are rationally decomposed into specialized units with rigid command and control processes, and limited scope for cross unit interaction.

As mentioned previously, the LMS is most often central to online learning within universities and responsibility for the installation, maintenance and support of these systems typically falls to the information technology areas. LMS are learning and teaching systems under the control of IT departments who often have little or no knowledge of their pedagogical application to learning and teaching. Conversely and equally typical, academics and their learning support areas are often bereft of information technology expertise and have little or no technical knowledge of enterprise systems such as an LMS. Consequently, these areas are often segregated within the organizational structure and this can constrain knowledge sharing and cooperation between the areas. Learning analytics, for example, requires significant interaction and collaboration between the information technology areas and the other organisational areas that interpret and act upon the information it provides. This is one simple example of how institutional knowledge sharing can be constrained by rigid organizational structures.

An example of this is the experience of the Indicators project researchers at CQUniversity who required access to the databases associated with the current Moodle LMS and the Blackboard LMS it replaced, in order to explore the potential of learning analytics. As the LMS is the responsibility of the Information Technology Department (IT) and the Indicators researchers were in a different organizational unit, access to data was made difficult due to the overarching organizational structure. A number of questioned were raised when non-IT people requested access to data for the first time. Who owns the LMS data, who should be able to access the data and how will the data be accessed were some of the issues that had to be negotiated in order to instigate a learning analytics project. The decomposed conceptual model of organizations is based on the assumption that the system is like a machine with replaceable parts and predictability can be inferred based on historical performance data (Boustani et al., 2010). Causation in learning and teaching is far more complex as outcomes are not determined by single causes but by multiple causes which means the system is fundamentally unpredictable (Mason, 2008b). This presents a problem as rigid organizational structures inhibit the cross-unit cooperation and collaboration required to adapt and respond to needs an evolving learning and teaching paradigm.

This highlights another potential issue associated with decomposed organizational structures. That is the increasing tendency for universities to have business intelligence areas based in IT that are responsible for developing “dashboards” that give insight into the strategic data. A danger exists where learning analytics is incorporated into these “dashboards” simply to fit the organizational structure. While the strategic data that the “dashboards” provide is important, it could be argued that learning analytics data is tactical data that needs to be located where the students and teachers are interacting. In most universities with online students, the interaction point will most likely be the LMS and not the institution dashboard.

Confusion between correlation and causation

The maxim “correlation does not equal causation” is probably familiar to all researchers. This maxim becomes something more fundamental in complex adaptive systems (CAS) as they are not causal systems. Observed patterns within a CAS may be different next time due to small and unpredictable variations in agent behavior. Correlations arising from learning analytics projects are relatively easily measured which fits current organizational paradigms that value efficiency and compliance (Kenny, 2009). A danger exists where correlation may be interpreted as a universal constant despite the complex nature of the system and this can lead to problems similar to those experienced in health systems, where attempts to rigidly control complex systems worsens the targeted problems and leads to unintended negative consequences (Boustani, et al., 2010).

Earlier, Figure 1 showed a distinct correlation between student participation in LMS forum discussion and their resulting grade. Figure 2 demonstrated significant variations in the way that discussion forums were used between courses indicating that the correlation shown in Figure 1 might be sheltering some underlying complexity. The following figure further points towards the problems caused when the worldview underpinning the adoption of learning analytics is based on causation.

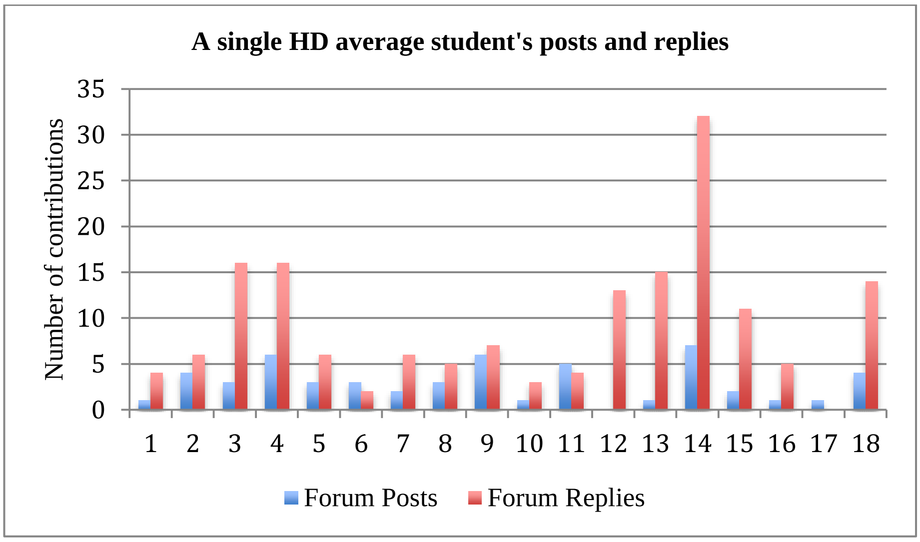

Figure 3. Forum participation for a single student across a degree program

The student represented in Figure 3 has received high distinctions for all of their courses. Figure 3 highlights the large variation in the number of discussion forum posts and replies that a specific student makes across their courses. While Figure 1 showed a correlation between discussion forum participation and student success across a large student population, Figures 2 and 3 suggests that this is may not be a universal constant. Each course is different both in pedagogical intent and in the way that different teachers service their courses. Additionally each student will exhibit different patterns of behavior within each course based on a range of variables internal and external to the student. This aligns with the definition of complex adaptive systems that are comprised of semi-autonomous individuals who interact in non-linear ways while faced with internal and external stressors (Boustani, et al., 2010).

An assumption of causality

The previous section showed the danger of confusing correlation with causation in the interpretation of learning analytics data. However, a broader problem may be the tendency for management to assume causality (D. Snowden & Stanbridge, 2004). The often cited, and somewhat facetious example is if the CEO of a successful company plays golf, then there is a causal link between the company’s success and the CEO playing golf. Of course this is not the case as the reality is vastly more complex. However we can see elements of this basic error in logic in the ways that companies approach best practice and organizational structure (D. Snowden &

Stanbridge, 2004). The danger for learning analytics is if the correlations exposed by the data are seen as causative or universal constants, and this leads to strategic decision-making that assumes the data is reproducible. An example might be where learning analytics information is used as a performance indicator by the organisation. We noted something similar previously in the example where management mandated the presence of LMS discussion forums across all courses to promote staff and student interaction. While arguably a noble goal, it seemingly failed as 39% of the courses had less than five forum contributions.

Complex adaptive systems: An alternative lens

Complex adaptive systems (CAS) are a variation on complex systems and have been described as systems that involve many components that adapt, learn or change as they interact (Holland, 2006). Each agent within a CAS is nested within other systems, all evolving together and interacting so that we cannot understand any of the agents or systems without reference to the others (Plsek & Greenhalgh, 2001). Changes in outcomes from a CAS are not proportional to changes in input, as the interacting systems behave in non-linear fashions (Shiell, Hawe, & Gold, 2008). In summary, Boustani (2010) postulated:

> A CAS is a dynamic network of semiautonomous, competing and collaborating individuals who interact and coevolve in nonlinear ways with their surrounding environment. These interactions lead to various webs of relationships that influence the system's performance.

In order to harness learning analytics for the betterment of an institution's learning and teaching, interventions will be required based on the information provided by the learning analytics. Associated with complex adaptive systems are the difficulties involved with making interventions within systems bereft of causal relationships. Interventions implemented in complex systems are likely to have diverse, far-reaching, unpredictable and non-linear effects (Shiell, et al., 2008). The potentially disproportionate ramification of interventions made within a complex system is known colloquially as "the butterfly effect" and can inhibit the predictability of outcomes arising from the intervention. Goldspink (2007) suggested that change within the complex system should come from the 'inside out' and that micro-level interventions are to be preferred to macro-level interventions or system-wide prescription due to the potential for disproportionate ramifications. This raises some questions about the teleological management of learning and teaching and even the deep-root assumptions about teaching that are based on causality and independence (Davis & Sumara, 2007). From a learning analytics perspective, it begs the question about where, and who within the organization is best placed to receive and respond to the information it provides.

Implications for learning analytics

It has been said that learning analytics can improve learning, teaching and student success through an awareness of patterns in the data and the application of predictive modeling techniques (J. P. Campbell, et al., 2007). As touched on previously, there is a danger that within the current organizational management paradigm, learning analytics results will be interpreted as universal constants by which decree and regulation will be applied to meet the organization's goals. Considering learning analytics as indicators resulting from the activity occurring within a CAS enables us to evaluate and respond to the realities of the present rather than target an idealistic future state. So while macro-level learning analytics can help describe historical contexts, such as how LMS features usage evolves over time, the inherent complexity in behavior by agents within the system make predictions and statistical modeling difficult and cautions a more evolutionary approach to implementation. The traditional scientific perspective that predictability arises from combining a law with a set of initial starting conditions to deduce an outcome (Hempel, 1966), cannot be applied due to the continuing evolution and interactions of agents within a CAS.

Agent behavior within a CAS is emergent and based on a context that evolves according to the interactions of agents within the CAS (Jansen, Cammock, & Conner, 2011). The behavior patterns of agents within a CAS change exponentially and unpredictably as they interact and adapt and this stands in contrast with causal systems where change is linear and predictable (Mason, 2008b). The inherent unpredictability of agents within a CAS suggest that the most appropriate place to situate learning analytics tools and resources designed to inform and improve online learning and teaching, would be within the micro-level context. In the university context this would appear to be at the course level where the various agents are interacting and adapting. This allows the agents interacting within the complex system to evaluate the significance of the learning analytics information based on their knowledge of the context. In the case of a typical LMS delivered university course, the agents who are interacting and adapting are the teachers and students and the CAS perspective suggests that these people are the most appropriate recipients of learning analytics information.

While it could be argued that providing learning analytics derived insights to students is important (Purdue University, 2009), it's likely to be the teacher who has the right mix of closeness and expertise with the learning context. This is especially pertinent given the decomposed organizational models in higher education have contributed to development of information silos that constrain the teacher's access to data. Not to mention the fact that teacher engagement with students in web-based learning environments is perhaps the number one factor in any discussion around improving learning and teaching (Fresen, 2007; Radloff, 2008). Additionally, it is not unusual for the teacher to be responsible for the design and delivery of LMS courses. This well positions the teacher to respond to situations that emerge as a result of what is transpiring within the course's context. For example, the teacher may notice questions about a particular concept within the discussion forums, and can respond by adding a resource that explains the concept in more detail. An example involving learning analytics might be that the teacher is notified that a student has not accessed the LMS course site at the end of week one, and also failed an important preceding course last term. The learning analytics application is linked to the LMS and the student administration system and brings this student's situation to the teacher's attention so that an intervention can be facilitated and monitored.

Conclusions

This paper is an initial attempt to consider learning analytics against a backdrop of complexity science and more research is required to fully realize its potential. It has suggested that there are going to be limitations for institutions attempting to use learning analytics to inform and improve their learning and teaching due to teleological management approaches and corporate structures and the complex, diverse behaviors of agents within online learning and teaching systems. These limitations stem from organizational silos that constrain knowledge sharing and collaboration as well as a fundamental misalignment between the nature of the university learning and teaching and the way that it is managed.

This paper also provided some insight into potential problems for learning analytics implementation based on over four years experience with learning analytics at a particular institution. These included the hidden complexity behind learning analytics data where abstract representations and interpretations can veil the complexity of behavior occurring within the learning environments. The paper also looked at decomposed organizational models and how this can present problems with the interpretation of learning analytics data and associated responses. It was also suggested that learning analytics is data that stems from a non-causal system where the assumptions of causation and confusion between correlation and causation may cause problems for organizations seeking to gain advantage through the use of learning analytics.

This paper suggests that complexity science and in particular, complex adaptive systems might provide a more appropriate lens by which to consider learning analytics, if the goal is to inform and improve learning and teaching. Complex adaptive systems exhibit apparent order at the macro-level despite the vast diversity of behaviors exhibited at the micro-levels. Complex adaptive systems are about emergence and evolution, which contrasts with teleological management approaches based on targeting idealistic future states through strategic goals and visions.

Many would agree with the notion that learning and teaching environments are complex and require different management approaches. Complex adaptive systems theory provides a lens that allows us to sense and respond to the variety of data that learning analytics provides. While there may be the potential for learning analytics to conflict with management approaches based on reductionist thinking, there exists an opportunity to provide students and educators with an unprecedented view of what is transpiring within their learning environments. While some might argue that the application and presentation of learning analytics needs to be simplified, perhaps it should be "complexified".

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The challenge for static online resources: The future is dynamic

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More universities are providing online courses in response to demands for greater flexibility which consequently places pressure on learning support services, such as, academic skills centres, to follow suit. The increasing numbers of students are stretching the existing capacities of such centres to adequately address student learning needs in traditional ways, and therefore more flexible offerings through an e-learning environment are required. Nonetheless developing online resources and learning activities require significant development time, and it is not clear whether these resources are effective, since very little research examines what or how learning may be achieved. To explore this issue, this paper reviews the available literature on the topic with the aim of identifying ways to evaluate such resources, and considers the sustainability of pursuing static texts. The paper proposes combining knowledge of best practice with an evaluation research framework, and urges the design of more dynamic resources.

Keywords: online resources, effectiveness, pedagogical usability, evaluation framework

Context

Most universities have academic skills centres, often referred to as Academic Language and Learning (ALL) centres, with sites dedicated to providing academic skills information to students. The information typically applies to the development of writing, thinking, researching, and speaking skills in the sense of what is X and how to do X. The information may be packaged as downloadable documents, or presented as online tutorials, podcasts, or videos. Over the last five years, some sites have changed from being repositories for information to addressing student engagement through interactivity. Leslie-McCarthy and Tutty (2011) claim that ALL sites 'have a more complex context and broader scope than is the case for a course-based online learning site' (p. A-24) because of the different purposes and audiences. Their study of ALL sites in Australia revealed that the main purpose of such sites is to provide resources to students. Other purposes include an administrative function, a marketing function (telling people about the centre) and serving the needs of academics (Leslie-McCarthy & Tutty, 2011). As part of the same study, ALL practitioners were asked who used their sites, and two thirds of those surveyed did not know exactly. This highlights gaps in our knowledge about users. Other gaps exist, including a lack of information regarding the usefulness of resources for learning, and if students were able to find answers to their questions. Overall then, it appears that resources are developed for a broad student cohort without clear evidence regarding effectiveness.

Typically, the effectiveness of learning within a particular course is measured by student performance. However, this is not a measure for evaluating the learning effectiveness of material on ALL sites, mainly because of the general nature of the material. In contrast, a course has a set of learning outcomes, and assessments which measure the success in achieving those outcomes. Other factors, such as, student motivation in learning content and improving performance for a course are very different from the motivation in accessing ALL sites for generic skills assistance. Nonetheless, as some library studies have shown, it is possible to evaluate resources through surveys, focus groups and interviews (Blummer & Kritskaya, 2009). University libraries have sites similar to ALL sites in that there are generic resources provided for skill development, and much effort is required in creating the resources. Other information is available that could help guide the creation of resources for online consumption that include the concepts of usability (does it function as it is supposed to?), and evaluation guided by good teaching principles in higher education (Ramsden, 2003). It is possible that since these methods require resourcing, little evaluation of ALL resources has occurred. However, without evaluation, there is no knowledge about their effectiveness.

Literature review

Reviewing the literature reveals a complexity in terminology and approaches to evaluating the pedagogical effectiveness of online sites. This is due to the changing nature of the area, the diverse range of disciplines and backgrounds, and therefore the different interpretations of researchers. The intersection of a number of disciplines has resulted in the development of a variety of e-learning frameworks incorporating website usability, human-computer interaction, instructional design and pedagogy each with different emphases, interpretations and methodologies. As an example, the various terms for online resources include: digital learning material, web-based learning tools/resources/materials, and learning objects. It is also the name of the environment to which they relate that varies, sometimes called online learning environment, e-learning, web learning, communication and information technologies, virtual learning environment, technology-based learning. Sometimes an online resource is also a learning system. Following Phillips, McNaught and Kennedy (2012), the term e-learning is used here which Littlejohn and Pegler (2007, p. 15) define as 'the process of learning and teaching with computers and other associated technologies, particularly through the use of the Internet'.

In higher education, courses are often evaluated using student performance and peer review, while websites are typically evaluated through usability studies. For an e-learning site, these evaluation types are combined, which has given rise to the term pedagogical usability. 'Pedagogical usability is used to denote whether the tools, content, interface and tasks of the online environment support learners to learn in various learning contexts according to selected pedagogical objectives' (Cuturic 2011, p. 26). Pedagogical usability developed by Nokelainen (2006, cited in Hadjerrouit, 2010) expanded usability to account for learning and usefulness of educational software. Using a set of ten criteria, this expanded on the traditional concept of website usability which has focused more on technical and navigational elements as highlighted by usability expert, Jakob Nielsen, among others. The aim of conventional usability is to reduce any potential for increased cognitive load when using software without diverting attention unnecessarily. Cognitive load is minimized when there is consistency, small number of user actions, minimal memory load, and reduction of complexity (Hadjerrouit, 2010). Hadjerrouit (2010) further expanded the criteria for pedagogical usability. A number of other approaches using the term pedagogical usability include Muir, Shield, and Kukulska-Hulme (2003), with two different approaches reviewed in Zaharias and Koutsabasis (2012), and others mentioned in Jeffels (2011).

For the novice, the field can be confusing, particularly since little information is given about the type of research or disciplinary approach. Citing Conole and Oliver (2007) and Friesen (2007), Phillips, McNaught and Kennedy (2012) classify e-learning research into four types: pedagogical, organisational, technical and socio-cultural acknowledging that there are overlaps of the types. From this perspective, pedagogical usability combines both technical and pedagogical aspects, but to evaluate the effectiveness of resources, the emphasis may be better placed on pedagogy. This is indeed the emphasis in the framework proposed by Phillips, McNaught and Kennedy (2012) which consists of the learning environment (including curriculum design, the learning design and the design of any e-learning artefact, such as, a learning management system, computer games or a single learning activity), learning processes (the ways or how learning may occur), and learning outcomes. Their framework, also known as LEPO, is concerned mainly with pedagogy taking a holistic view of learning environments and the way tools are used to enhance their effectiveness.

Phillips, McNaught and Kennedy (2012) acknowledge that any e-learning artefact needs to be designed and undergo the appropriate design process. This process is a design-based research approach that analyses problems, develops solutions, and evaluates these through iterations of testing and refinement. Reflection and feedback help to improve the design principles. This process is similar to the plan, act, reflect cycle that is the core of reflective practice used in education environments, and it is also similar to iterative usability approaches. Figure 1. below illustrates the process.

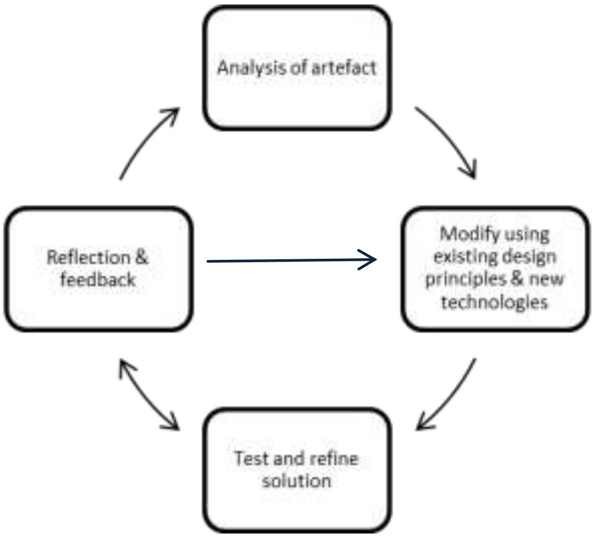

Figure 1: Design life cycle for existing e-learning artefact (modified from Reeves, 2006)

The LEPO framework appears to focus more on learning in comparison to some other models since key learning factors, that is, learning process and learning outcomes, form the foundation of the framework (Phillips, McNaught and Kennedy, 2012). The LEPO framework is broader and contextualises learning using clarity in terminology for processes, products and outcomes, as well as clarity about the framework itself. Another benefit of the framework is that it is a pragmatic model allowing for other approaches in evaluating and researching the effectiveness of e-learning artefacts from a pedagogical perspective, recognising that some are more appropriate than others, depending on the item being evaluated or the research question. In sum, trialling this framework and following the evaluation research design life cycle approach is recommended.

There are some factors around usability and e-learning that is already known and can be utilized. For instance there is information from website usability studies about how people read online, or about navigation. Recent eye-tracking studies (Rakoczi, 2010) highlight the importance of the structure of teaching materials. This is confirmed by readability analyses (Lim, 2010) and focus group feedback (Bowles-Terry, Hensley & Hinchliffe, 2010; Nagra & Coiffe, 2010). We also know that students in general want flexibility, and that they have less study time available than ten years ago (Crisp et al., 2009). All this information can be used to ensure that as much as possible the e-learning environment and associated artefacts address needs and satisfy known criteria, so that the focus is on the learning outcomes or on the specific question to address. The next step is to evaluate using data collected from a range of sources, since it is known that this improves the quality of information. For example, to determine if resources are working as designed and meet the needs of users, data from observations and interviews, among other sources, provide the depth that is missing from surveys. An example of a possible evaluation matrix for an evaluation is given in Table 1. Other information from studies on library resources could help to inform the design of the evaluation or the set of guidelines.

Table 1: Evaluation matrix for e-learning artefacts (modified from Phillips, McNaught & Gregor, 2012)

Criteria	**Data sources**					
	activities	*interviews*	*surveys*	*observation*	*usage logs*	*think aloud*
Evidence of learning	x	x				
Influence of environment on learner's engagement				x	x	
Behaviour of learners if artefact was designed to be engaging				x	x	x
How is the artefact being used?				x	x	
How useful is the artefact?		x	x			

The findings of evaluations can be used in refining the design of artefacts. The question is whether this is enough given the generic quality of the artefact and the broad range of users, particularly with demand for learner-centred, personalised, flexible as well as authentic, learning materials. Perhaps a more sustainable alternative is to design artefacts that are dynamic, based on a diagnostic to determine learner needs for a specific purpose, for example, the learner has to write an essay, it is the first one she has written, and it is for political science. This could be combined with any feedback from previous assignments, helping to ensure that the information presented is personalised and authentic. Somewhat similar to advanced searching, it would be possible to say what is not wanted as well. Such a dynamic system would require a kind of adaptive technology which exists in search engines and in technologies, such as speech recognition. This could mean that a generic static text could evolve into a context-dependent and learner specific text. Some aspects of evaluation could be automated to collect information that might help refine and improve such texts for the next time.

Conclusion

The challenge for ALL sites is to provide effective resources both now and in the future. Given the nature of e-learning, determining the methods for evaluating online study skills resources can be difficult. However, using a framework for evaluation research where the focus on pedagogy is appropriate due to the focus on learning. In addition, conducting iterative usability analyses will help to refine resources as part of the design process. Supplementing these analyses with data from a range of sources, both quantitative and qualitative, can help determine what is learned and how, and therefore, what is effective. There are questions about the sustainability of designing and evaluating the current static nature of resources, when in fact resources developed dynamically, through diagnostics and sophisticated searching, may lead to more pedagogically effective solutions. Here learning for the future is about adapting content and activities for specific purposes and specific learners.

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Planning to teach with ICT: Some insights into university teachers' knowledge

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In this study we explored the nature and types of knowledge that university teachers draw upon when they are making decisions related to the use of Information and Communication Technology (ICT) in their courses. The data were obtained using a 'think aloud' protocol. Shulman's (1987) and Mishra & Koehler's (2006) frameworks were used as an initial basis to classify teachers' knowledge. The mental resource perspective was adopted as a general lens to obtain an insight into the nature of teachers' knowledge. The results showed that teachers' decisions were based on different types of knowledge. When teachers planned to use ICT in their courses, they combined different knowledge types with context-specific experiences and projected situated actions. In this paper we illustrate three qualities of teachers' knowledge that underpinned core teachers' planning decisions: a) the linking role of pedagogical knowledge; b) relational nature of teachers' design thinking; and c) the experiential basis of teachers' anticipations.

Keywords: course planning, ICT integration, university teaching, teachers' knowledge.

Introduction

Planning a university course, especially one that will incorporate Information and Communication Technology (ICT), requires the integration of different types of knowledge. This knowledge, which teachers use during planning, is both wide ranging and diverse (Kreber & Cranton, 2000; Shulman, 1986). In order to make informed decisions about appropriate pedagogical deigns for teaching in a specific context, teachers should be able to fluently switch between, and combine, various types of knowledge and ways of knowing (Goodyear & Markauskaite, 2009). Researchers have attempted to identify the kinds of knowledge that underpins teachers' expertise (Calderhead, 1996; Carter, 1990; Shulman, 1987). For example, Shulman (1987) identified seven types of knowledge which include knowledge about curriculum, general pedagogy, disciplinary content, discipline specific pedagogy, students, and institutional arrangements. He emphasised one specific type of teachers' knowledge - Pedagogical Content Knowledge (PCK) - that teachers should use when considering how specific content could be taught effectively. He noted that PCK could not be dissected into content knowledge and pedagogical knowledge as separate entities, suggesting that some kinds of teachers' knowledge are closely coupled and form distinct areas of expertise.

Teachers are increasingly, and frequently, facing the challenge of integrating technologies into their disciplines and pedagogical repertoire. Mishra and Koehler (2006), extending PCK, suggested that teachers need a specific type of knowledge that they called 'Technological, Pedagogical And Content Knowledge' (TPACK). They emphasised that isolated skills associated with ICT are not sufficient for successful ICT use in teaching. Rather, teachers should be able to consider content, pedagogy and technologies together. Studies on TPACK have investigated broad types of knowledge that emerge at the intersections of content, pedagogy, and technology, as well as additional kinds of knowledge such as those that are associated with learner characteristics and context (Archambault & Barnett, 2010; Yardakul, Odabasi, Kilicer, Coklar, Birinci, & Kurt, 2012). Findings from these studies generally suggested that ICT integration requires teachers to have a strong knowledge base in a variety of areas, such as subject, themes and sub-themes of content, organisation of subject matter, relationships among concepts, pedagogical approaches, techniques and principles, and knowledge of the learners' needs and abilities. The TPACK theoretical framework acknowledges a context dependent nature of teachers' ICT-related knowledge, however, in many empirical studies, TPACK is often regarded as a generic and well-articulated construct; one that could be measured using general self-reported questionnaires with multiple-choice scales.

Further, many studies of TPACK have focused on the kinds of teachers' knowledge that are required for integrating ICT into classroom practice, and relatively few have explored those kinds of knowledge that teachers need for ICT-related planning and design (Angeli & Valanides, 2009; Kadijevich, 2012). Calderhead (1984) emphasised that course design and planning, while often invisible, is an important part of teachers' work and needs to be explored and understood much better. This study is concerned with the nature and types of knowledge associated with this 'hidden' part of teachers' practice. We specifically focused on investigating the knowledge that university teachers draw upon when planning and revising courses before the start of a semester, concentrating on the core decisions made concerning the use of ICT in teaching.

Designing and planning for ICT integration: Teachers' knowledge bases

With the role of ICT and eLearning in higher education increasing, focus has shifted from "teaching-as-interaction" to "teaching-as-design" (Goodyear & Retalis, 2010). Teachers are increasingly engaged with planning and designing 'learning spaces' and tasks (Laurillard, 2012). However, the kinds of knowledge that underpin the teachers-as-designers' practice are still little understood. Shavelson (1976) argued that the decisions teachers make, in planning their instruction, parallel decisions made by instructional designers. Further studies suggested that expertise in teaching and design are both required during course planning and, while they are often integrated, they also remain distinct. For example, some university teachers work in teams with professional e-learning designers when they design e-learning sites (Ward, West, Atkinson & Peat, 2012). Markauskaite, Bachfischer, Goodyear, & Kali, (2011) explored the knowledge bases that such teams draw upon in their collaborative e-learning design process. They found that the teams' knowledge base included TPACK, but also extended it to include design-specific knowledge and teamwork-related skills. Further, other studies showed the nature of teachers' pedagogical knowledge and how teachers ground their ICT-related teaching decisions in experiences and specific contexts (Goodyear & Markauskaite, 2009; Markauskaite & Goodyear, 2009). This suggested that a much closer look at the situated, empirical grounding of teachers' knowledge is needed in order to obtain an insight into the teacher-as-designer expertise. In this study we distinctively focussed on the situated nature and types of knowledge that underpin teachers' planning for ICT integration.

Theoretical framework: Mental resource perspective

We broadly adopted the mental resource perspective (diSessa, 1988; Hammer & Elby, 2002) to investigate the knowledge that teachers draw upon when making ICT-related decisions. In contrast to the more traditional theoretical frameworks of human cognition that see expert conceptual knowledge as well integrated, generally coherent, and abstracted from contexts, the mental resource perspective considers knowledge as more fragmented, sensitive to contexts and comprising various knowledge constructs ranging from small intuitive mental "pieces" to explicit, integrated "coordination classes". These constructs include fine-grained context sensitive knowledge elements that are activated when the situation "feels right". This perspective, therefore, allows us to obtain a more nuanced insight into the nature of the knowledge involved in making specific teaching and planning decisions. In our study we aimed to obtain an insight into the various facets of knowledge that may form the foundations of teachers' TPACK when they design and plan courses. We adopted the TPACK framework to classify types of knowledge, but did not consider each TPACK domain as one generic construct. Rather, we aimed to explore the nature of teachers' knowledge elements at a fine-grained level.

Methodology

The study participants were four university teachers with responsibility to coordinate and teach different subjects to pre-service teachers. Their courses were specifically focused on the application of ICT in teaching and learning. The data were collected using a 'think aloud' method (van Someren, Barnard, & Sandberg, 1994) when teachers were planning and revising their units before the start of a semester. Rather than asking participants to consciously reflect on, and explain, their thoughts, the participants were asked to verbalise their thoughts in real time during their routine course planning. This technique provides the possibility to obtain a closer look at the nature of the knowledge that is called upon during a natural thought process. The planning sessions lasted from 45 minutes to 1 hour; each entire session was video recorded.

Chi's (1997) method for analysing verbal data was used to analyse the 'think aloud' recordings. Initially, the sessions were transcribed verbatim. Then, the transcripts were divided into the utterances, where each utterance formed a coherent unit of meaning. The transcripts were then re-read several times in order establish the meaning of each utterance. This was achieved by taking into account the meaning expressed directly in the statement and also in the surrounding context of the thought process. The utterances were then labelled to identify their content, meaning and relationship to the context. Shulman's (1987) knowledge bases and Mishra

& Koehler's (2006) TPACK categories were used as an initial basis to classify the knowledge elements into types. These were then further refined to take into account the nature of the knowledge, the blends of knowledge that were created, and the relationships between different knowledge types.

Results and Discussion

The initial analysis of the data indicated that the knowledge that teachers used during the planning of their courses is both wide-ranging and diverse. The teachers rarely drew upon individual kinds of knowledge when they made their decisions, but combined and linked different knowledge elements together. In this section we discuss three main qualities of teachers' knowledge that were characteristic of the teachers when they were thinking about their projected use of ICT.

Linking role of pedagogical knowledge

Pedagogical knowledge was prevalent in most of the s' thought processes and decisions. In most situations pedagogical knowledge elements were activated together with other elements, such as knowledge of content, technology, management, and students' learning and assessment. Teachers sometimes combined their knowledge of pedagogy with their knowledge of technology. For example, one teacher described why she needed to allocate time for introducing a wiki by stating *"I really need to give them a better introduction that why to use wiki and what's expected"*. This illustrates that the teacher's focus was on using a wiki, however, she needed to provide students with an explanation of the rationale, which indicated an aspect of her pedagogy that related to her use of ICT in this course. Data also showed that, in some instances, teachers combined more than two knowledge types to take pedagogical decisions. For example, one teacher verbalised, *"I'm thinking to teach fractions in the next week 'cause students 've already developed their knowledge of mathematics, so using just simple learning objects for fractions 'd be a good way to go*". In this episode, the teacher combined her pedagogical knowledge (when to teach) with knowledge of content (fractions), management (in which week to teach), students (what students already know), and TPACK (knowledge about available learning objects for teaching this particular topic). In this episode, as in many other observed situations, teachers appeared to combine various knowledge elements that were firmly linked to specific contexts and situations such as time and specific students.

Relational nature of teachers' design thinking

Data also revealed that each knowledge type consisted of a *variety of sub-types* which, when combined, formed complex, fine-gained relationships. Content knowledge involved further sub-types such as content knowledge of the teachers, relationships between the content and students' learning, the teachers' past experience of the content, and organising the content into different themes and sub-themes to make it accessible to the students. For example, *"In week one eh in week one, our content focus is fractions and I've access to several learning objects that talk about fractions. I'll use one of those in lecture and talk about multiple representations as part of that topic in lecture"*. In this episode, the teacher's focus was primarily on content knowledge - fractions. Simultaneously, she focussed on "multiple representations" that formed fine-grained relationships with each other. Further, she linked content knowledge with her knowledge of the organisation and management (when to teach, and what to demonstrate in lecture) and technological pedagogical content knowledge of the learning objects suitable for teaching the content.

Experiential basis of knowledge

Another finding from the data was that the teachers' made constant reference to their *past experience*. This was present in almost all types of their knowledge, and included past experiences with content, pedagogy, technology, management, and students' learning and assessment. For example, there were many references to content they taught last year, such as,*" Last year I taught them about evolution, using a reading which talks about Darwin but this year I've found another, which is about Darwin and Australia. This sounds really interesting and I want to use it this year 'cause its about Australia not just about Darwin.".* Overall, teachers' past experiences, related to the content, was one of the main inputs for decisions about course redesign. It was related to such aspects as which topic of the content they had taught in past, and whether that content was useful or needed to be changed in order to make it more useful.

Conclusion and Future Directions

The analysis throws light on the nature and types of the knowledge that teachers used during course planning. It indicated how blended forms of knowledge were created through combination of different knowledge types. The findings point to three important qualities of teachers' knowledge upon which they draw making decisions about ICT: a) the dominant and linking role of pedagogical knowledge; b) relational nature of teachers' design thinking; and c) experiential basis of teachers' anticipations.

First, pedagogical knowledge appeared to serve a dominant role when teachers were involved in planning their teaching. Teachers' decisions were often based on small context-sensitive elements of pedagogical knowledge that were linked with other types of knowledge. Second, teachers' knowledge, related to different domains of TPACK (pedagogy, content and technology), did not appear as large units of abstract knowledge. Each knowledge type could be viewed by considering sub-types of knowledge, which were linked to other knowledge types and sub-types in fine-grained, complex and context sensitive ways. Third, in many situations, the teachers drew upon their past experience when making decisions regarding how ICT could be used in their teaching. Teachers' reflections on ICT integration decisions taken in the past, along with the outcomes experienced, were particularly influential; these formed a strong basis for planning future actions.

TPACK theoretical literature often pointed out the relational dynamic nature of teachers' technological knowledge(Mishra & Koehler, 2006). However, a range of empirical studies drew upon unitary conceptualisations teachers' knowledge, and often measured TPACK using inflexible, and little sensitive to the context, general instruments and scales. The findings of this study show that teachers, when they make course planning decisions, simultaneously draw upon, and combine, different kinds of knowledge. The knowledge elements upon which they draw are generally grounded in their experiences and specific contexts. This indicates that teachers' ICT-related knowledge is unlikely to form a generic well-articulated construct (such as TPACK) that can be understood outside specific contexts, experiences and situations. The mental resource perspective (diSessa, 1988; Hammer & Elby, 2002) offers a flexible theoretical and analytical framework for understanding the nature of such knowledge. In our future studies we intend to explore how knowledge elements of various types and sub-types interact and form more coordinated constructs that enable teachers to make decisions that are both fluent and sensitive to the situation.

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Learning for the future: Online student evaluation of generic and context-specific library skills tutorials

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This paper reports on a project stimulated by two major challenges facing higher education in the twenty-first century; massification and the citizenisation of academies. This empirical study reports on the use of emergent technologies, in the acquisition of information, for diverse cohorts of students enrolled in two scientific subjects (n=47). A generic online library skills tutorial (LST) in one subject is compared to an embedded virtual, context-specific LST in another. Student attitudinal evaluation, both affective and cognitive, was measured by an 18-item online survey. The rich qualia showed a ten-fold difference which adds to a body of knowledge which was reinforced by an objective measure, a graded assignment. As consumers, the students have been valued and voiced their demands. Lecturers and librarians need to lead in this climate of change to develop a creative and emergent, reciprocal non-linear mechanism to build on this trajectory and plan a future for learning.

Keywords: acquisition of information, library skills tutorial, online student evaluation

Background

Two international drivers for future transformational change within contemporary discourse in global higher education are massification and the citizenisation of academies, each of which have national advocates. In parallel, government social and economic objectives drive investment and construction of network infrastructures to offer all citizens high speed connectivity.

Future orientated academics must be cognisant of this phenomenon as tertiary education is no longer perceived as an endeavour of the elite but is being transformed into a universal system designed for the masses (Fisher, 2006). This trend towards education of the masses requires innovative future-orientated solutions. Consistent with Gallagher (2001) who suggests the growth of online learning is inextricably linked to the commodification of knowledge, Holt and Challis (2007) consider decision makers at Universities should respond to contemporary societal demands and become more industry and customer focused. Leading in a climate of change, the hierarchy of this small regional University in Australia made a decision to offer online learning in response to increased economic pressure, to reduce costs. In turn the lecturers, who adhere to social constructivist epistemologies had to develop new pedagogies through projects of digital inclusion.

Australian Universities have also followed the lead of Anglo-American tertiary institutions, which privilege the notion of training future work-ready citizens by embedding generic skills relevant for the new knowledge economy. Generic skills equip a person to achieve their full potential in employment, life and community. They are highly-valued by employers for their role in enhancing the capacity of employees to respond, learn and adapt when workplace demands change. These skills, including information literacy, are developed throughout a person's life and in multiple settings, including work and life settings and educational contexts. According to Blewitt (2010) sustainable and lifelong learning and the attributes graduates should be embedded in undergraduate learning activities (Kennedy & Innes, 2005) which can be facilitated by new technologies.

Thus, academics, in higher education, find themselves located in this complex social reality of a nascent digital culture. They need to conceive of imaginative and innovative responses to future orientated challenges to ensure large, diverse student cohorts are fully prepared to meet the demands of a new knowledge society with respect to information literacy. Lecturers and librarians, in higher education, strive to design 'learning for the future' curricula, and act as facilitators enabling students to become self-regulated learners, with respect to information literacy. According to Cochrane (2006) optimum development and implementation of innovation in teaching and learning are informed by a pedagogical framework which should be based on alignment of interactive learning experiences and authentic assessment tasks that enable student achievement of learning outcomes.

In this study, for the students enrolled in two first year science subjects, the authentic assessment task culminated in a piece of summative academic writing, a research report. To be able to write a research report is considered a generic and transferable skill for a science graduate, as they are learning for the future, and one step to success is for the student to acquire knowledge by developing their information literacy skills. Interactive learning experiences for information literacy are increasingly developed and delivered by expert librarians in generic online packages available on-demand (Wesch, 2009). The benefits of skills specific training delivered by library experts versus general training may impact upon the developing skills of future work ready graduates. This study reports the outcomes of a quasi-experimental study to compare a traditional generic package with a collaborative project between a discipline-specific academic and an expert from the library to deliver information literacy learning experiences to diverse cohorts of students.

Library Skills Tutorial (LST)

The nature of the library and information skills is changing rapidly as technologies emerge. Undergraduates struggle to identify, retrieve and evaluate academically acceptable sources of information in challenging science-based writing assignments (Flaspohler, Rux, & Flaspohler, 2007). This is magnified in a diverse student cohort where some can navigate online with ease whereas others are completely mystified (Martin-Kniep, 2000). Cliff and Hanslo (2009) in South Africa, reinforce the challenges facing the educationally diverse backgrounds of the first-year undergraduate students including the academic reading and writing demands. The massification drive for larger student numbers, with no corresponding increase in staff numbers, have reduced opportunities for formative support (Nicol, 2009) for such a pivotal stage in the learning experience. A further risk manifests for students with poorly developed authorial identity who may be at risk of unintentional plagiarism. Elander, Pittam, Lusher, Fox & Payne (2010) report a beneficial intervention which assisted 364 UK first-year undergraduate psychology students avoid unintentional plagiarism. Flaspohler et al. (2007) report the provision of enhanced library-based instruction to biology students improved their library search capabilities and reduced incidents of plagiarism. The literature presented so far makes a case for the inclusion of library skills instruction to first year science undergraduate students. What follows is a discussion about who should deliver the instruction and an evaluation of the optimum methods of delivery.

First year science students need to locate, access, retrieve and utilise information in an effective and ethical manner and master their genre of academic research report writing. Science lecturers may not have the time nor the expertise to support and mentor students through the process (Strauss, Goodfellow, & Puxley, 2009). In her review of Irish higher education practices McGuinness (2009) reports the use of generic library tours and print based guides, one-off lectures, demonstrations, and possibly hands on laboratory sessions delivered by library specialists to small cohorts, in face-to-face ‘internal mode’. Recently this support has been extended to ‘external mode’ students using communication tools, e.g. asynchronous chat, in an online learning management system. However, university librarians often develop and deliver these library skills sessions in a standalone format, using non-integrated methods. Strauss et al. consider this to be problematic as students require specific background information during this pivotal stage of acquisition of information. Thus librarians should collaborate with academic teaching staff to embed context-specific LSTs. In this study, a traditional online generic LST offered to students enrolled in one science subject will be compared to a compulsory, embedded virtual, context-specific LST in another science subject. Subjective student evaluation of the LSTs and the objective impact of the LST on the student learning experience will be measured.

Subjective Student Evaluation

Tensions between financial imperatives and delivering a quality learning experience continue. As a receiver of publicly raised monies, Universities are required to be more productive and more efficient with concurrent accountability for quality. Fisher (2006) proposes the potential consequence may be ‘a reduction in the experience of learning’ (p. 1) so careful monitoring of the perceived student experience over time will provide data which may refute Fisher’s proposition. Student evaluation should not be seen as a cause of anxiety (Donovan, Mader, & Shinsky, 2010) but as a reliable and valid way to learn from the student experience and improve the learning experience for subsequent cohorts of students.

Researchers in education have used various methods to elicit student evaluation of programs. Hendry, Bromberger and Armstrong (2011) combined focus group discussions with self-report questionnaires derived from their qualitative data. This 'triangulation' or a mixed methods approach ensured rigour and trustworthiness of their findings. Hendry et al.'s research was conducted on campus and Anderson, Cain and Bird (2005) note the benefits of online student evaluations over paper based surveys include time efficiency for academia in terms of deployment and analysis. This method of garnering student evaluation also provides the student with a level of control. Students can chose when to participate and for how long. Accordingly, there are more thoughtful and longer remarks for open-ended questions which provide formative, or useful information for the instructor on what was effective and what should be changed (Donovan et al., 2010). Interestingly, Donovan et al. reported no difference between the quantitative ratings between paper based and online evaluations, despite prior perceptions of a higher percentage of negative responses.

Pragmatically, this study will use online student evaluation to compare the effectiveness of a generic versus a context-specific LST. In their recent review of library instruction and information literacy, Johnson, Sproles and Detmering (2010) list only three journal articles that report student evaluation. An exception is Figa, Bone and Macpherson's (2009) study on faculty-librarian collaboration which reports the use of a student survey. As there appears a dearth of literature and tools for capturing student evaluation of an LST, a unique measuring instrument has been devised to elicit both quantitative and qualitative data. This innovative metric, an 18-item online survey, has been designed to measure student attitudes, their personal beliefs about way of knowing (cognitive) and feeling (affective) in relation to perceived usefulness of the LST outcomes in their future learning. A feedforward approach will be taken in the analysis to inform future iterations of LSTs and enhance the experience for future learners.

Objective Performance

Student attitudinal evaluation, both affective and cognitive, will not be the sole measure of the relative effectiveness of the two LSTs (generic and specific). An objective measure will add to and potentially reinforce the findings reported in the subjective student experience. The learning objectives for the students in both science units included a requirement to write a scientific research report. Two science subjects, at a regional Australian University, have encouraged scientific writing early in undergraduates' academic career to improve their working knowledge of theories, concepts and techniques that are extensively reported in scientific publications (McClure, 2009).

An academic science report relies on prior preparation and the application of the skills learned and practiced in the LST. Students are expected to identify, retrieve and evaluate academically acceptable sources of information which they cite in the 'Introduction' to construct a coherent argument and develop their research hypotheses. Then after the 'Method' and 'Results' section, they should refer again to some of their citations in the 'Discussion'. Finally, they should consolidate all citations in a terminal 'References' list in the appropriate style for the discipline. For an objective measure, the final grade for the submitted research report is assumed to measure the performance of the student in an authentic assessment which incorporates the skills they acquired and practiced during their LST.

Research Aims

Formal student evaluation of information literacy teaching is not commonly carried out in higher education institutions (Johnson et al., 2010; McGuinness, 2009) and the aim of this study is to gather evidence, to inform a bottom-up change initiative, for the redesign of subsequent virtual, context specific LSTs to improve learning for the future, that is, academic writing in first year science students. There appears to be a dearth of research that documents such a specific skill development in the learning cycle in science undergraduates and this research study will add to literature about transforming education through supporting collaboration, connection, and customisation and individualisation of virtual non-linear, creative and emergent digital environments. Thus the significance is to enhance the future learning experience of large cohorts of science students and to ensure work ready graduates with respect to information literacy.

The main aim of this study is to use student evaluation to compare generic versus context-specific library skills tutorials. The primary research hypothesis is 'students receiving a generic library skills tutorial will rate the tutorial lower than students receiving the context-specific library skills tutorial'. A subsidiary aim is to use an objective measure to determine the efficacy of the library skills tutorial offered in each science subject. The secondary research hypothesis is that 'students receiving a generic library skills tutorial will receive a lower grade in the assessment task than students receiving the context-specific library skills tutorial'.

Method

Participants

The study participants (n=47) included all students enrolled in two, first year, science subjects at a regional Australian University that submitted a research report for grading (N=426). Table 1 shows the demographic data for students from each science subject (psychology and anatomy & physiology).

Table 1: Sample Size and Demographic Variables for the two Science Subjects

Variable		Science Subject	
		Psychology	Anatomy & Physiology
Sample	n	28	19
	%	17.4%	7.17%
Age	mean	35.5 y	26.9 y
	SD	12.5 y	9.5 y
Gender	male	17.9%	26.3%
	female	82.1%	73.7%
Mode of study	internal	21.4 %	55.6%
	external	78.6%	44.4%

Design

This mixed methods study is considered to be an independent quasi-experimental design. Independent group allocation was contingent upon the science subject in which they were enrolled. Due to departmental constraints all psychology students (internal and external) received a generic online tutorial, whereas, the internal anatomy & physiology students were exposed to a face-to-face workshop delivered by the librarian. All anatomy & physiology students had access to the enhanced embedded, virtual, context-specific LST designed for the external student cohort, in collaboration with the lecturer. This was a synchronous Collaborate session using the Learning Management System which was archived for subsequent access by both modes of students.

Materials

A survey was specifically designed to measure the students' self-reported attitudes (affective and cognitive) of the effectiveness of the library skills tutorial. The 18-item survey consisted of two sections, a demographic and library skills tutorial evaluation section. Eight demographic items elicited data about the student, including age, gender, course, number of semesters studied, their mode of study and student identification number. The latter item was to enable data linkage with the assessment grade (the objective measure).

Of the remaining 10 evaluative items, one required a response about the duration of the LST. The tutorial lasted for one hour and students were asked if this was appropriate, and if not, what length of time they considered would be adequate. The library skills tutorial scale (LSTScale) consisted of 7-items and elicited specific attitudinal responses to a statement. These were measured on a 5-point Likert scale, thus the sum of LSTScale for an individual respondent would range from a minimum of 7 to a maximum of 35. Cronbach's alpha is an index of consistency or reliability across items constructed to measure a construct. For the 7-item LSTScale alpha = .88 which can be considered adequate for exploratory research purposes.

Within this scale were two subscales. The affective subscale of 3-items provided a measure between 3 and 15. It included statements about their feelings, or confidence levels. The 4-item cognitive subscale might produce a value between 4 and 20. This subscale included statements about their knowledge and understanding. Finally, two open-ended items were included to generate a textual response and were designed to elicit information beyond the scope of the researchers' predictions.

Procedure

Early in a 12 week semester the authentic assessment task, a research report, was set and students were advised to take part in an LST to assist in their academic writing. The assignments were due in week seven, and graded and returned to the student by week 10. The activities described so far were part of the normal student learning experience. In week 11, after obtaining ethical approval from the university human research ethics committee, an invitation was posted in the learning management system for students to access an external website that hosted the confidential survey. This ensured that students had access to link to the site at a time and place of their choosing. This design enhances validity (truthfulness) of responses as they could seek privacy when completing the survey. The ethical issues of informed consent and right to withdraw were taken into account. After reading the information sheet potential participants could choose to continue, skip a question, or withdraw at any time by merely closing their internet browser.

Results

The online survey was available for three weeks at the end of semester and 11% of the target population completed in this time period. The primary research hypothesis relating to subjective student evaluation was tested by examining the outputs from the online survey. The secondary research hypothesis required a comparative analysis of the student grade in the assessment between the science subjects (that is, between the LSTs).

Quantitative Analysis of Subjective Student Evaluation

Regarding student evaluation of the duration of library skills tutorial, 83% *(n = 41)* considered the one-hour library skills tutorial was suitable. The remaining minority requested longer tutorials in future; generic LST *(Mean time = 2.17 hours),* and context-specific LST *(Mean time = 2 hours).* Descriptive analysis is presented in Table 2. For inferential analysis, non-parametric tests for mean difference (*Mann Whiney U*) were conducted as the samples were not normally distributed. There were differences, but these were non-significant differences, for the main LSTScale and both the affective and the cognitive subscales. The generic LST group rated each measure lower than the context-specific LST group.

Table 2: The measure values, mean, standard deviation and range for each LST group

Measures	Range for Value	Generic LST			Context-Specific LST		
		Mean	SD	Range	Mean	SD	Range
LST Scale	7 to 35	24.9	4.7	13-32	27.4	4.1	16-29
Affective subscale	3 to 15	10.8	2.2	5-14	11.7	2.0	7-15
Cognitive subscale	4 to 20	14.1	2.9	7-18	15.6	2.5	8-20

Scrutiny at the item level showed significant differences for two cognitive self-report items between students in the two LST groups. The item ratings for *'I understand what is considered appropriate evidence in my subject'* for the generic LST group (*Mean Rank = 19.82, n =28*) were significantly lower than those from the context-specific LST group (*Mean Rank = 29.22, n =18*). *U = 149.00, z = -2.547, p = .011,* two tailed. This effect (r = .38) can be described as 'medium' (Cohen, 1988). Similarly, the ratings for the item *'I know how to evaluate the quality of a book or journal article or internet source'* for students in the generic LST group (*Mean Rank = 20.27, n =28*) were significantly lower than those in the context-specific LST group (*Mean Rank = 28.53, n =18*). *U = 161.50, z = -2.291, p = .022,* two tailed, also a 'medium' effect (r = .34).

A *post-hoc* analysis reveals an interesting mode of study effect. A Mann-Whitney *U* test indicated that the library tutorial ratings by 'internal' students (*Mean Rank = 31.25, n =16*) were significantly higher than those of the 'external' students (*Mean Rank = 18.45, n =29*). *U = 100.00, z = -3.147, p = .002,* two tailed, with a medium effect size (r = .47).

Qualitative Analysis of Subjective Student Evaluation

Sixty percent of respondents chose to add a textual statement into one or both of the open-field items to provide a rich evaluation about the library skills tutorial. The length of these statements ranged from four to 136 words *(Mean = 44.6; SD = 43.5 words).* Phrases were read and reread and classified into four mutually exclusive categories, the mean values and an exemplar for each category are shown in Table 3. There was some variability within respondents, but not between the different LST groups, except for negative statements.

Table 3: Category Mean Phrase Value for each LST group and Qualitative Exemplars

Category	Exemplar	Mean Phrase Value	
		Generic LST	Context-Specific LST
positive	*try out skills ... in the process of learning them*	1.9	2.1
negative	*I just found I was getting confused*	**0.9**	**0.1**
formative	*... make relevant to particular study*	0.9	0.8
summative	*I think it is quite comprehensive*	0.4	0.3

Content analysis at the phrase level for the LST groups, enabled the determination of two ratios. Firstly, the ratio of positive to negative comments, which revealed a large ten-fold difference between the two LST groups; generic ($\text{ratio}_{pos:neg}$ = 2.11), and context-specific ($\text{ratio}_{pos:neg}$ = 21). Secondly, the ratio of formative to summative comments did not show such a difference; generic ($\text{ratio}_{form:sum}$ = 2.25); context-specific ($\text{ratio}_{form:sum}$ = 2.67).

A thematic analysis of the two most useful feedforward categories (positive and formative) follows. Three emergent themes from the positive category include statements related to the delivery style, content and how the student felt supported in their present and potential future skills related to information literacy. Phrase exemplars below derive mainly from the context-specific group. The style of delivery theme is represented by: *concise; step-by-step; use of simple English; easy to use; easy to understand; and, collaboration sessions were good to be able to hear what problems other students may have*. Content phrases are exemplified by: *summon search database very useful; information on detecting bias; examples of referencing styles; and, kept relevant to anatomy & physiology*. Perceived support statements included: *helps learn how to find quality references in an efficient way; gave me an ability to research and collate material properly; online delivery which enabled you to try out skills as you were in the process of learning them; during the tutorial, I managed to get 2-3 sources already - which I had used in my final report; allowed student contributions; own pace; and, [future] help was available if needed.*

Thematic analysis of the formative category reveals two themes; delivery style and content, relevant to feedforward. The representative phrases show little difference between the two LST groups and derive from both. Style of delivery phrases include: '*make clear what is required; recognise the need for students to revisit the tutorial more than once; I prefer hearing someone talking to me ... I learn better this way; [need to] experience the library research skills themselves; and, by giving an activity after tutorial so that they can learn by doing as well'*. Regarding content a student would like: '*more detailed information on using keywords; more examples on how to reference; and make relevant to particular assignment'*. The final phrase offered below did not fit either theme but is worthy of inclusion. A student from the generic LST group suggested *'make it compulsory'*.

Analysis of Objective Measure

The overall grade (as a percent) for the students in each science subject who participated in the online survey comprises the data for analysis in this section. It is assumed that this is an indirect measure of their LST efficacy. Table 4 shows the mean and standard deviation (the descriptive statistics) for each science subject, gender, whether this was the students first semester of study, and the mode of study (internal versus external).

Table 4: Research Report Grade for Science Subject, Gender, Semester and Mode of Study (N=47)

Variable	Research Report Grade (%)		Science Subject (n)	
	Mean	SD	Psychology	Anatomy & Physiology
Science Subject				
Psychology (n=28)	49.04	16.69	28	-
Anatomy & Physiology (n=19)	83.24	13.38	-	19
Gender				
Male (n=10)	59.20	24.58	5	5
Female (n=37)	59.59	22.60	23	14
Semester				
First (n=26)	67.08	23.17	12	14
Subsequent (n=21)	57.64	21.83	16	5
***Mode of Study**				
Internal (n=16)	70.94	20.00	6	10
External (n=30)	58.69	23.38	22	8

**one A&P student chose not to respond*

For inferential analysis, a parametric test for mean difference (unequal variance, independent *t* test) was conducted. There was a significant science subject difference in mean grade for research report, $t(45) = 7.45$, $p < .001$ (one tailed). No significant difference gender difference was found, $t(45) = -.95$, $p = .347$ (two tailed). Overall the semester of study was not significant, $t(45) = 1.31$, $p = .197$ (two tailed) although a mean difference of nearly 10% favouring first semester, novice students was reported. Further analysis of these novice undergraduates showed a statistically different mean report grade between the science subjects, $t(24) = 5.39$, $p <.001$. The mode of study did not show a significant mean difference, $t(44) = 1.41$, $p = 0.83$ (one tailed) despite a mean difference of 12% benefitting the internal mode. However, if the external mode data is analysed separately, there was a significant difference between the mean science subject grades, $t(28) = 6.29$, $p< .001$. An interpretation of the results follows in the discussion.

Discussion

This empirical study has examined the use of emergent technologies, in the acquisition of information, for diverse cohorts of students enrolled in two scientific subjects. Departmental issues constrained a generic online LST in psychology, whereas, the anatomy & physiology lecturer collaborated with an expert librarian to devise and embed a virtual, context-specific LST. In relation to the first a priori hypothesis, the quantitative data for the LST scale does not fully support the primary research hypothesis. Thus there is no significance difference in the quantitative student evaluation of the LST between those receiving the generic version compared to those who received the context-specific version. However, the direction of the difference in the mean values as a percent of the maximum sum of the scale does provide evidence of some support for the hypothesis; generic (71.1%) compared to context-specific (78%). Interestingly, there was also a slight difference between the two subscales, with the affective rating being above the cognitive rating for both generic and context-specific LST groups. This was an innovative measurement tool and the study was exploratory, so the importance of, and the differential between, the two subscales remains to be verified.

There were some statistically significant differences between the two groups. Cognitively loaded items did produce significantly higher ratings from the context specific LST group compared to the generic LST group. These items measured student knowledge of 'appropriate evidence' and 'how to evaluate quality of source'. Also, a post-hoc analysis showed a medium effect difference between the rating for the LST between internal and external mode students, the latter rating the LST as higher. This may provide an insight into a different 'lived' experience for students between the two modes of study and is worthy of further investigation. Only 17% of the sample suggested a doubling the duration for LST from one to two hours, which reinforced the present designed time. These results based on a reliable survey instrument add to the knowledge about student evaluation of LST which, according to Johnson et al., (2010) and McGuiness (2009), was lacking in the literature.

The most compelling results derive from the rich source of information from an emic perspective, that is, the qualia, the subjective or qualitative textual statements from the students. The large (x10) positive: negative ratio difference between the generic (2.11) and context-specific LST groups (21) reveal the lived experience for the latter group far exceeded the former in terms of positivity. This refutes Fisher's (2006) proposition that massification might cause a reduction in the student experience. Without providing a limitation, to restrict student responses, it was interesting that thematic analysis provided a framework (style of delivery, content and support) to inform feedforward planning to redesign LST for learning for the future. Like Donovan et al. (2010) the authors of this paper do not perceive student evaluation as a threat, but wish to learn from the students to improve the learning experience for subsequent cohorts.

The secondary hypothesis has been supported by the results. Students receiving a generic library skills tutorial did achieve a lower grade (psychology: 49.04%) in the academic writing task than students receiving the context-specific library skills tutorial (anatomy & physiology: 83.24%). The value and validity of this metric will be examined in the section on limitations. Subsidiary analysis reveals interesting insights into the patterns of the mean grade achieved by subsets of the sample. Novice students gained significantly higher grades for their research report than students who had studied before. This seems counter intuitive and perhaps might be explained by the ideas that 'experienced' and 'external' students feel they do not need to be shown again how to use databases, etc. Certainly one qualitative comment from a student (external; generic LST) in the online evaluative survey testifies to this effect *'I did do this tutorial for [named subject] and it was informative but took me hours'* and is dismissive. Also, these students might be repeating the same subject and bring their associated issues of progress.

The non-significance difference for mode of study was interesting as it might be interpreted that face-to-face (internal) LST had not impacted favourably upon the student's academic writing when compared to an online (external) LST. However, the significant difference between the two science subjects, for students studying only in external mode, privileged the context-specific LST over the generic LST. A cogent comment from a student (external; generic LST) stated that we should be cognisant of the advantage of the archived online tutorial as the student may *'revisit the tutorial more than once'*. This reinforced Wesch's (2009) concept of developing generic online packages available on-demand.

This comparative study has shown differences in student ratings (and performance) of generic online non-integrated instructional LST with an enhanced fully integrated context-specific (course embedded) LST which was student-centred and applied social constructivist learning principles. The generic tutorial has provided a clear algorithm, a step-by-step instructive process, to search library databases using generic keywords and phrases. However, the context specific tutorial transforms the process through supportive collaboration, connection and customisation (Gilliver-Brown, & Johnson, 2009). It provided meaningful activities in an almost individual learning environment that were fundamental in supporting students to bridge learning gaps (Brew & Ginns, 2008) and complete their assigned tasks.

The complex problem of redesigning generic LSTs for all subjects is now manifest. Blewitt (2010) and McWilliam and Dawson (2008) consider creativity as central to teaching in higher education. That the complex questions of the future will demand creative and forward-looking individuals who are not constrained by the functional fixedness of their role and can perceive of non-linear and emergent solutions. As lecturers and librarians we are challenged by the consumers to consider new approaches to teaching information literacy by examining methods of online instruction that can transform the future learning experience, promote self-directed learning (Ellis, 2004), be sustainable, and be relevant for the context (subject), even the assignment. This will provide an opportunity to use the emerging space of digital infrastructure, to underpin the development of digital literacy skills, and provide affective and cognitive support to first year students.

Important perspectives into the emic perspective of cognitive access and digital literacy have been discussed. While understanding the process of their engagement in their learning the higher affective responses and qualia from the students reveal that the relationship with a supportive and inclusive learning tutor is fundamental. It sets a base for lifelong learning (sustainability), being able to, with confidence, identify, retrieve, and evaluate sources of information, write with authority by citing/referencing appropriately and be able to use, synthesise and construct knowledge.

Limitations

All research design is compromised and in this study the major threats to internal and external validity are evaluated. External validity is threatened by sampling errors. A reason for the small response rate (11%) may be explained by the timing of the survey deployment. The invitation was issued in the last weeks of semester when the student priority is their preparation for final examinations. Regarding the objective measure, a critique of the sample, the nature of respondents, may have potentially biased this result. The sample who responded may not be representative of larger target population, for each science subject, with respect to their assessment grade.

The psychology respondents recorded a lower mean research report grade than all the psychology students. The anatomy & physiology respondents recorded a significantly higher (nearly 14%) mean than all anatomy & physiology students. These bias samples from each science subject are interesting and is worthy of further investigation. Further questions might enable an understanding into the possible motive for students in completing an online evaluation survey. On face value the differential calibre of the students who respond might enrich our data set and inform appropriate action to design more targeted interventions for the future of learning.

Student evaluation can empower students if they are made aware that as a result of their feedback subsequent changes have been put into practice. This feedforward process enables them to become part of their learning community and to maximise their educational opportunity (Donovan et al., 2010). Johnson (2002, as cited in Donovan et al., 2010) noted an increase in annual response rates from 40%, then 51%, 62% and finally 71%. Although this study is starting at a lower initial rate, it is the first in a planned series of student evaluations. The size of the sample (n=47) may be small but this is not deemed important when considering: the exploratory nature of the study; the sample was representative of the target population demographics; statistically significant difference were reported; and, rich qualia was obtained. The latter comment suggests student evaluations in the future might ask more open-ended questions, perhaps even use focus groups, even virtual focus groups.

Design error threatens internal validity. This was not a pre-test, post-test survey based on an intervention for a single cohort of students who might be their own controls. Rather the quasi-experimental design exploited an existing difference between two scientific subjects creating an independent design. Psychology offered the generic LST, and anatomy & physiology mandated a context-specific LST. Despite the HREC suggesting random allocation to the two LST groups within one science subject, the authors considered this contrary to natural justice. Also, outcomes from the study can now inform a course development cycle in psychology which is currently undergoing reaccreditation. However, the LST was part of a similar piece of academic writing, a research report

Further threats to internal validity include measurement errors. The Likert scoring for the LSTScale used a middle value; in future it may be better to use a tipping point, even-numbered, scale to create a difference. Although consistency between the seven items showed good reliability (alpha = 0.88) it does not imply that this is a valid measuring tool. Also, a self report survey, of an event that happened weeks ago, can be contaminated by retrospective memory. Students may also be reporting in a perceived socially desirable manner to please their lecturer. Regarding quantitative analyses, the non-parametric tests are not as sensitive at detecting an effect of independent variable (type of LST) on the dependent variable (score on the LSTScale), however, as the effect sizes reported are medium this can be considered acceptable. Bias may have occurred in thematic analysis of the qualia by the primary author; however, this effect was reduced by independent checking by the co-authors and others.

Another measurement error exists and will need to be addressed if the study is repeated. The objective measure of the final grade for the student research report is considered an indirect but assumed measure of the efficacy of the LST. This is a crude overall measure and is not sensitive to show only the skills gained from the LSTs. It reflects more than the student's ability to use databases to identify, retrieve, evaluate and cite academically acceptable sources of information. It shows their ability to develop a coherent and holistic approach to academic writing; including developing hypotheses, planning a method, analysing and interpreting results. A more sensitive assessment rubric for the research report might reveal a submark for these particular skills. Or a new task, such as, developing an EndNote library to use for a specific topic might be developed and graded separately as a milestone to report writing. However, that may seem removed from such an authentic task as a scientific research report.

Learning for the Future

This experimental development research evaluating LST has been innovative and findings of this study are currently being put into practice for semester two. The online evaluation provided an administrative convenience for timely student feedback. Institutions are concerned with the macro-level delivery (massification and the citizenship of the academies). However, it is the authors, as lecturers and librarians, working at the micro-level, that the details of the skills and competences are delivered. Innovative practices and procedures need to be developed to maximise the efficiency of lecturers and librarians in delivering to a large, external student cohort. Furthermore, librarians may have little or no instructional design training, and institutional support needs to be made for their professional development, as embedding an LST may create workload efficiency gains for the future.

The authors are collaborating to develop creative, reciprocal and non-linear LSTs through formative feedback. We are building on this trajectory and planning a future for learning, particularly knowledge acquisition in undergraduate science students. An emerging issue from the student perspective was support, which can be achieved by the use of multiple resources and social software tools. A final quote reveals the need for vicarious social learning in a collaborative situation and reinforces concepts of social constructionism and digital inclusion. The last words are reserved for an external, context-specific LST student.

> It gave me an ability to research and collate material properly; otherwise I think I would still be all at sea. The collaboration sessions were good to be able to hear what problems other students may have. However, this never beats face to face situations and it is something all external students especially those in an isolated area must come across.

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Outside in: Beyond blended learning

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A review of the teaching spaces at Charles Darwin University merged top-down directives with bottom-up requirements from user groups (students, academics and support staff). The space of tension between the three top-down drivers from outside and within the walls of a regional Northern Australian university had to be managed and prioritised to ensure the needs of local stakeholders were met as far as economically and practicably possible. By going beyond blended learning the aim is to provide a deeper level of engagement and collaboration to create synergies designed to bring the distant external students into the classroom. This will be mediated by the use of web-conferencing within the teaching spaces. The change process is examined with respect to five issues identified as relevant for this teaching mode to improve the sustainability of our teaching practices.
Keywords: teaching spaces, learning spaces, blended learning, web-conferencing.

Introduction

To initiate and facilitate an innovative upgrade of the video conferencing infrastructure at Charles Darwin University (CDU) a step-wise design process had to be developed. First, a comprehensive review of the centrally managed teaching spaces, and their use, was undertaken by members of the Office of Learning and Teaching (OLT) (West, Billany & Garnett, 2012). Five design factors were identified and examined. Second, recommendations from this review had to be prioritised and operationalised in sequence to create usable outcomes in a climate of change. One design outcome of note is a number of *Collaborate Rooms* which has raised a further five issues which are discussed.

Design Factors

The West et al. (2012) review identified a number of dependent factors that informed the design principles that were applied. These five factors can be categorised as either strategic or humanistic. The three strategic top-down influencers comprise two national and one local strategy, and the humanistic bottom-up influencers are both local based factors. These are:

- Strategic National: Benchmarking with the Association of Educational Technology Managers (AETM)
- Strategic National: Teaching spaces projects funded by the former Australian Learning and Teaching Council (ALTC)
- Strategic Local: CDU strategic plan
- Humanistic Local: CDU students
- Humanistic Local: CDU academic and support staff.

National Top-Down: Benchmarking with AETM Standards

The AETM is an Australasian organisation that represents the audio visual professionals of the tertiary education sector in the promotion, development and deployment of audio visual technology in the teaching space. The audio visual design guidelines (AETM, 2010) for tertiary teaching spaces are intended as an independent benchmark. The AETM defines a teaching space as having eight elements: lectern and control; lighting; information technology and computing; projection and display; other sources; audio; recording; and, video conferencing. The specifications are extensive; however, the primary focus is on internal teaching with remote access and control of lighting, recording equipment and teaching materials. CDU’s teaching spaces were benchmarked against these guidelines, a number of other Australian universities, and findings from previous ALTC funded teaching spaces projects.

National Top-Down: Prior ALTC Funded Teaching Spaces Projects

From these projects a range of resources exist that synthesise pedagogical considerations with the principles of teaching space design (Keppell, Souter & Riddle, 2012; Mitchell, White, Pospsil, Killey, Liu & Matthews, 2010). In a previous ALTC funded project one of these was particularly pertinent for CDU. Mitchell et al.

(2010) specifically examined the retrofit of university learning spaces and suggest eight key pedagogical principles be taken into consideration when redesigning existing teaching spaces. These are:

Principle 1: Spaces should support a range of learners and learning activities
Principle 2: Spaces should provide a quality experience for users
Principle 3: Spaces should help foster a sense of emotional and cultural safety
Principle 4: Spaces should enable easy access by everyone
Principle 5: Spaces should emphasize simplicity of design
Principle 6: Spaces should integrate seamlessly with other physical and virtual spaces
Principle 7: Space should be fit-for-purpose, now and into the future
Principle 8: Spaces should embed a range of appropriate, reliable and effective technologies

As a result of this prior project at CDU a number of specialist teaching rooms were modified and are being used very successfully. However, these are heavily booked and not available to most of the teaching staff. It is considered a pilot project and its evaluation informs the CDU strategic Learning and Teaching Plan and hence this present project in a form of a cohesive project with ongoing quality assurance.

Local Top-Down: The CDU Strategic Plan

De Gregori (2011) links the eight general principles listed above to a specific context and this concept is reinforced by Reushle (2012) in the PaSsPorT learning space design model. De Gregori argues that the physical space must be connected to the specific model of learning and teaching adopted by an institution. This somewhat simple principle, while appearing obvious, is often overlooked. However, visionary managers at CDU have chosen to apply these principles in the Learning & Teaching Plan 2012 -2014. Of the strategic areas stated in that Plan one includes improving internal and online student satisfaction with teaching spaces by incorporating digital technology into teaching spaces whether physical and/or virtual.

Thus the CDU self assessment portfolio (2011) is committed to bringing in a ‘Fleximode’ approach which incorporates the concept that “students may engage with their programs using the combination of methods that is most suitable for their needs, rather than being constrained by imposed study mode parameters ... fleximode aspires to address, in a manner seamless to the student, at least the following variables:

- asynchronous and synchronous engagement by students
- students and staff who are physically present and physically distant, ... and
- individual learner engagement and learner group engagement” (CDU, 2011, p. 30).

This time of change has significant implications: the configuration of the teaching spaces (physical and virtual), curriculum design, how teaching is performed in these new spaces, and how CDU students are expected to learn in these spaces.

Bottom-up: The CDU students

In the last decade CDU has moved increasingly to external delivery, and is “one of only a few Australian universities at which more than 50% of the student population is enrolled in some form of distance education” (CDU, 2012, p. 5). The process of externalisation to meet market forces has created a paradigm shift in how these students are served. The traditional distance education model with hard copy packages has been superseded by technology mediated delivery of units with electronic resources available 24/7. The percentage of external students has grown from approximately 20% in 2001 to 62% in 2010. This has been achieved primarily through the development of online learning systems that are proving equally beneficial for on-campus students.

For a unit of study, both internal and external cohorts of students normally have access to the same teaching resources in a ‘blended’ site in Learnline (CDU’s Learning Management System, powered by Blackboard v9.1). A surface perception of this blended delivery might be that the internal students have gained access to resources designed for the external student in virtual teaching spaces. Blended delivery has blurred the temporal and spatial patterning of traditional learning for the internal student. Now, the teacher, peers and resources are available 24/7 and the place is no longer confined to a university building. This project is designed to redress this imbalance and to provide the external student with an internal experience. For the future, in **beyond blended learning** we are reviewing the teaching spaces at CDU with an aim to upgrade the technologies beyond normal video conferencing. It is hoped that a deeper level of engagement will create synergies that emerge from increasing engagement and collaboration as we bring the **outside in**.

Bottom-up: The CDU staff

In 2009, CDU academic staff participated in an anonymous survey (Voice Project Staff Survey). One item required a textual response about how CDU might be improved. A search of the qualitative responses elicited 35 phrases containing one or more of the following keywords: lecture theatre; classroom; tutorial room; seminar room; a/v; audio; video; audio/visual; educational technology; equipment; physical; resources; and, environment. The comments were generic and often requested 'better' and 'up-to-date equipment' in 'teaching rooms'. To determine specific requirements from academic staff, a number (N=5) were arbitrarily selected from different Schools and based on experience. These were invited to be interviewed about their experiences of using the rooms in the central teaching building, including any constraints in their approaches due to the technology and layout. Also, to gain an insider view on what they, as users, believed should be included in a future upgrade.

From the initial selection a snowballing of participants occurred, as staff were keen to be involved, and saturation (no new information was being gathered) was reached after eight participants. Thematic analysis of the notes taken by the interviewer was undertaken. This was checked by an independent academic to reduce any potential subjective bias during the interpretation stage. All staff members stressed and commented on the following themes/issues:

1. Reliable internet connectivity for staff and students.
2. Standardised presentation computers need to be in placed in all rooms with audio and video capability.
3. Presentation screens need to be better positioned, the correct size for the room, and preferably, moveable.
4. Incorporating methods for Fleximode delivery to allow recording of activities/demonstrations for easy transfer into Learnline, and use of web-conferencing to bring external students into the classroom.
5. The rooms need to be inviting to enhance the experience of being in the space.
6. The furniture, generally small rectangular tables, whilst being easily moveable and adaptable to different teaching situations could be improved for group work.

The five design factors discussed have led to several outcomes. It was proposed that all teaching rooms be equipped with a set of standard equipment as a minimum basic level of technology to be thereafter built upon for specific requirements and to a more advanced level. One of the specific requirements was a number of rooms, *Collaborate Rooms*, which are now being designed to support the use of web-conferencing software Learnline Collaborate.

Outcome: A new room design

The rooms chosen for this design are mostly flat seminar style rooms which will be fitted out between November 2012 and February 2013. This web-conferencing tool is now incorporated into Learnline and brings external students into a live lecture or tutorial. This new room design raises five issues: 1) The types and layout of technology in the room; 2) The interaction between the student groups; 3) The multiple roles of the lecturer; 4) The pedagogical strategies used in the room; and, 5) The support requirements.

The types and layout of technology in the room

In the recent past some lecturers have used web conferencing software with the traditional layout. That is the data projection screen behind the lecturer and in front of the internal students. This has caused problems as the external students are, in effect, behind the lecturer. A lecturer has to pivot from facing internal students to then view external students, who then see the back of the lecturer. The dance continues with no group entirely satisfied with the experience. Example layouts of spatial settings to suit differing educational interactions are discussed in Keppell et al. (2012).

The interaction between the student groups

Even though both groups of students are present for a common purpose, some initial pilot sessions with the traditional setup has shown that there can be some irritation from either or both groups, as each doesn't easily accept the other in what they regard as their teaching space and time. West et al. (2012) report that distance students in the online environment often appreciate the opportunity for interaction with on-campus students. Also, extra time spent on adjusting and monitoring the technology has been reflected in some evaluative comments from students. Strategies will need to be developed to address these and for the lecturer to explicitly communicate the value-add for all the students.

The multiples roles of the lecturer

Lecturer roles; pedagogical, technical, social, and managerial, were described by Berge (1995) and are still widely quoted. More recently, these multiple roles have been further defined by Baran, Correia and Thompson (2011) who critically analysed the literature on online teaching practice. They add the roles of instructional designer and facilitator. Being both an internal and an online teacher blurs roles in time and place. Understanding these roles is important in the professional development for lecturers of the future. Harden and Crosby (2000) summarise six key areas of activity for the teacher. As: 1) information provider; 2) role model; 3) facilitator; 4) assessor; 5) planner; and, 6) resource developer. A key role of the staff from the OLT is to support the lecturer in decisions related to the pedagogical strategies that can be used in the rooms.

The pedagogical strategies used in the room

Emerging for the multi-role lecturer are six key principles which have been identified at CDU as a current focus for learning and teaching. First, to promote *'active learning'* the learning materials should be designed to encourage active engagement. Second, in *'structured learning'* the learning materials should provide a sequence of learning resources and activities informed by the intended learning outcomes. Third, students should be given effective and prompt *'feedback'* on their learning progress, including formative self-assessment exercises. Fourth, there should be a *'teacher presence'* including responding promptly to student queries and actively participating in learning activities. Fifth, '*collaboration'* opportunities should be provided for student interaction and to generate a sense of belonging to a community of learners. Sixth, learning should be *'inclusive'*; designed to allow for diversity in culture, learning styles and abilities.

The support requirements

CDU has just implemented a rapid response team approach to supporting staff with technology in these teaching spaces. Direct phone lines for lecturers to contact support staff will be placed in these teaching rooms.

Conclusion

This has been a review of teaching spaces and a description of the ensuing design process of retrofitting teaching spaces to suit the changing requirements of the university, the students, the staff, and current thinking in educational interactions. CDU is currently purchasing the equipment and redesigning a large number of teaching rooms with specific emphasis on *Collaborate Rooms*, designed to bring the external students into direct live contact with the lecturer and internal students in the teaching space.

Providing the new spaces as one of the foundations of CDU's Fleximode strategy and the challenge for CDU's central Office of Learning and Teaching will be to work with staff and students in using these new spaces to their most effectiveness. In conclusion, learning for the future at CDU will involve addressing the five, not mutually exclusive, issues: 1) The layout of technology in the room; 2) The interaction between the students; 3) The multiple roles of the lecturer; 4) The pedagogical strategies used in the room; and, 5) The support requirements.

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Using Scenario Planning to Inform Pedagogical Practice in Virtual Worlds in Schools: Collaboration and Structure

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The learning affordances of virtual worlds have long being trumpeted; the barriers to the "take up" of virtual worlds in mainstream education have also been explored, with emphasis being placed on technical problems, lack of time and money. Yet, a challenge for future learning is how one *teaches* in a virtual world, and what research has been undertaken has focused largely upon tertiary education. Much less is understood about how school teachers should structure virtual lessons, and what level of collaboration or independent work is necessary to guide students towards attainment of learning outcomes. This paper will provide a theoretical review of teaching and learning in virtual worlds, and offer an initial discussion of the role and importance of structure and collaboration in virtual worlds in a school-based environment. This has been validated through four case studies using scenario-planning methodology, and drawing upon real-world practitioner-based examples.

Keywords: affordances, collaboration, pedagogy, schools, structure, teaching, virtual worlds.

Introduction

Virtual worlds are multi-user creative spaces that are ideally suited to learning activities such as simulations, artistic performances, modelling and role play, and can lead to increased motivation, engagement and collaboration (Senges & Aller, 2009; Dalgarno & Lee, 2010). The design of the virtual environment is only limited by imagination and technical skill; examples include virtual university campuses to fantasy landscapes (Prasolova-Førland, 2008). In these 3D spaces a person has a virtual embodiment in the form of an avatar. As identified by Warburton (2009), the key element to successful learning in virtual environments is the ability of both teachers and students to project themselves, *via* their avatar, into the world and become immersed in a shared learning space. In short, by using a virtual world and adopting an avatar, there is sense of "being there" in a shared 3D space and the ability to experience the immediacy of interactions which take place between users and objects in real time.

Researchers and practitioners have focused on defining the learning which takes place in virtual worlds and simulations (Bares, Zettlemoyer & Lester, 1998), pedagogical approaches for the use of Second Life (SL) in the classroom and resources to support immersive activities and ways of exploring the potential of virtual worlds. Others have investigated ways to measure the changes in learners' attitudes, interests, attention and behaviour (Molka-Danielsen, 2009). Where research has been conducted in an education setting, the focus has been upon tertiary education, teaching undergraduate courses and the development of skills such as problem-solving (Lee, Dalgarno & Farley, 2012 offer an Australian perspective).

With a few notable exceptions (Twining, 2009) less attention has been paid to the affordances of virtual worlds in a secondary and primary-school setting, and how a teacher should structure and lead (or not) their teaching in these spaces. David Deeds, an IT and language teacher in Changchun American international school in China, however, does offer some practical guidelines and notes that since introducing OpenSim into his classes, the results have 'been nothing short of phenomenal' (Deeds, 2011, p.7). Indeed, to date there is 'no primer for how to teach in a virtual world', despite extensive research been undertaken on both teaching and learning in this area (Thackray, Good & Howard 2010, p.140; Chandler, Collinson, Crellin & Duke-Williams, 2009; de Freitas & Veletsianos, 2010). This presents a major challenge to practitioners and might inhibit the future uptake of teaching in virtual worlds in schools.

This paper investigates structure and collaboration in virtual worlds, and how these should aid the design of teaching curricular interventions in-world in a school-based context. However, it must be stressed that we do not intend to offer a "one-size-fits-all" model or value judgement of different teaching styles – we argue that when teaching school children, a degree of flexibility is required and that one scenario or technique will not always be appropriate in all situations. Moreover, further research remains to be undertaken, and we offer here our initial findings based on a review of the current literature and validated through the observations of four scenarios based on the methodology of scenario planning (Snoek, 2003; Snoek et al., 2003). The paper is organised as follows: we first review the literature and set out our research questions; the second part discusses the methodology and application of scenario planning; the third section outlines four scenarios and case studies; the fourth part reviews the evidence and offers a discussion.

Research Questions and Literature Review

It has been argued that virtual worlds offer an ideal platform for the 'engagement of learners in constructivist-focused educational practice', and that student-centred learning, as opposed to teacher-led lessons, is appropriate in these contexts and environments (Moschini, 2010, p.34). Others have argued that teaching in such an environment should emphasise active collaboration and co-operative learning, interaction and activities to encourage immersion and presence (Lim, 2009; Roussou, Oliver & Slater, 2004). Further, research has demonstrated that 3D learning environments that blur the distinction between education and entertainment have the potential to produce learning experiences that are motivating and enhance student learning (Bares et al, 1998).

Dalgarno and Lee (2010) have also identified the learning affordances that virtual worlds can bring about, and how virtual worlds are suited to collaborative learning, communication and co-operation. They note that virtual worlds afford five types of learning tasks (see Table 1): (1) spatial knowledge representation; (2) experiential learning; (3) engagement; (4) contextual learning; and (5) collaborative learning. Hew and Cheung (2010) have also identified three uses of virtual world environments which are specific to learning: (1) communication spaces (that is, a place where people can communicate information in both verbal and non-verbal forms); (2) simulation spaces (a place where simulations and re-enactments can take place); and (3) experiential spaces (an environment where students can learn by doing and observe their outcomes and reflect on their own learning).

Table 1: Learning Affordances and Key Words from Delgarno and Lee (2010)

Affordance	**Key Words**
1. Representation/Fidelity	Enhanced Realism, Sense of Presence, Spatial Knowledge
2. Learning Tasks	Embodied Learning, Risk, Cost, Abstract Representations
3. Motivation and Engagement	Personalisation, Individual Goals, Game-Based
4. Interfaces	Context, Interactivity, Situated Learning
5. Collaboration	Collaborative Learning, Discourse, Communication, Co-Operative

Yet, as Dreher, Reiners, Dreher, & Dreher (2009) have identified, it is not enough to sit students in front of technology to enable them to learn. As Mcloughin and Lee (2008, p.17) acknowledge, 'the technologies themselves do not directly cause learning to occur but can afford certain learning tasks that themselves *may* result in learning or give rise to certain learning benefits'. Dalgarno and Lee (2010, p.25) call for more data to redress the fact that 'efforts in this field are largely hit-and-miss, driven by intuition and "common-sense" extrapolations rather than being solidly underpinned by research-informed models and frameworks'. Questions remain about the extent to which existing pedagogical frameworks and virtual world scenarios formed from observations and research in tertiary education are relevant to, and are suitable for, teaching school children in compulsory school settings. For instance:

1. *How far do teachers structure learning in 3D virtual worlds in Schools?*
2. *What are the Implications of Students Learning Collaboratively or Individually within a Virtual World?*

In other words, what degree of structure should be pre-designed into the virtual environment and the specific tasks set for learners; should collaborative learning always be the default option for school teachers; and to what extent should emergent learning be facilitated as opposed to prescribed learning which is more common in face-to-face contexts (Williams, Karousou & Mackness, 2011)? In their study of virtual worlds for learning communities, Senges and Alier (2009) identified that with the first generation of these worlds**,** educators did what came naturally: they 'replicated' their real world classroom teaching to the virtual world. Teachers often drew upon traditional teaching models and relied on prescriptive learning outcomes and expectations. However, it is best if content is co-constructed with learners rather than simply delivered to them. In short, teaching methods should be focused on collaboration, group work and shared contextual tasks (Molka-Danielsen, 2009; Moschini, 2010).

Yet, it does not follow that this is the only approach that should be adopted and that structured lessons might not be more suitable for certain students and particular tasks; more research needs to be undertaken concerning individualised learning, and learning which takes place outside of the classroom and the teacher's presence in virtual worlds and how this contrasts with more formalised settings. In fact, the requirement of a teacher's presence in a virtual classroom is a pertinent issue that has yet to be fully resolved. As discussed by Crook (2008), power structures in Web 2.0 technologies are still being evaluated, and it would appear that the authority of knowledge is being transferred from teachers to students; teachers are fast losing their status as all-knowing experts.

To conclude, our survey of the literature has identified key research questions that focus on how a lesson should be structured, and the importance of collaboration and co-operative learning *vs.* individualised and personalised learning. What is more, the key affordances of virtual worlds as set out above appear to align with these research areas. The next step is to frame these questions into a research methodology, and to validate this with real-world scenarios.

Methodology and Making of Scenario Writing

The research methodology adopted here was based on a review of the literature on virtual worlds (see above), and scenario-planning methodology. This draws on the work of Snoek (2003), Snoek et al (2003) and Cautreels (2003), and the critical and theoretical reflections of Linde (2003). Such a methodology has been used in business planning to enable large-scale organisations to plan for different possible futures and to take an active part in designing the future they think is desirable (Snook et al, 2003; Benammar et al, 2006). In an educational context, Snoek has argued that the making and use of scenarios stimulate the imagination of people involved, increase awareness of decisions and important factors that influence education, and enable teachers to be pro-active (Snoek et al, 2003).

It is important to reinforce that in designing different scenarios for teaching in virtual worlds, that no one scenario will emerge in a 'pure' form; and that the scenarios selected and keywords characterising each scenario are described in their extreme in order to underline differences and reinforce variables. Further, as suggested by Snoek (2003), in undertaking scenario planning we have not attached a value to each of the different scenarios - we have not assumed that one scenario is more preferable or 'better' than another. In other words, each scenario carries equal weight.

To develop and write the scenarios for teaching in virtual worlds the research team followed Snoek et al (2003) by taking four main steps. These steps took place in four Google+ video chat meetings and e-mail exchanges in 2012 between experts in the field who included staff in Academy 360, Sunderland (an all-through school in the United Kingdom), the University of Hull (United Kingdom), Department of Education and Communities, New South Wales (Australia) and Macquarie University (Australia).

<u>Step 1</u>: we drew upon our experiences of teaching and researching in virtual worlds, and our discussions with teachers who had taught a lesson or course in a virtual environment. At this stage we were interested in how to embed more fully the use of virtual worlds in schools, and to identify the main affordances and challenges of teaching in a virtual world.

<u>Step 2</u>: we reflected upon the literature review and the experience of practitioners. Following this, we followed the advice of Snoek who recommends listing of the most significant drivers dictating how teaching in a virtual world might occur, labelling these the 'push-pull' factors. *Push* factors include Social Learning, Individual Learning, Learning Outcomes and Freedom of Teaching Style, and *Pull* factors Technology, Time, Assessment and Resources.

Step 3: we concentrated on which of these factors had the most impact on teaching in a virtual world, those which were most unpredictable and those that could be used to differentiate between different scenarios. In the discussions that followed we selected two of the most import factors which could be each represented on a continuum with two possible extremes to emphasise the differences between the scenarios. For the 'x' axis we selected the continuum between teacher-centered and student-centred classes; and for the 'y' axis, the continuum between collaborative and individual learning. This then enabled us to identify four different scenarios, each scenario representing one quadrant of the two-dimensional matrix. Again, in line with the work of Snoek et al (2003), these two dimensions were not considered as opposite to each other. From this four keywords were selected to characterise each scenario (see Fig. 1):

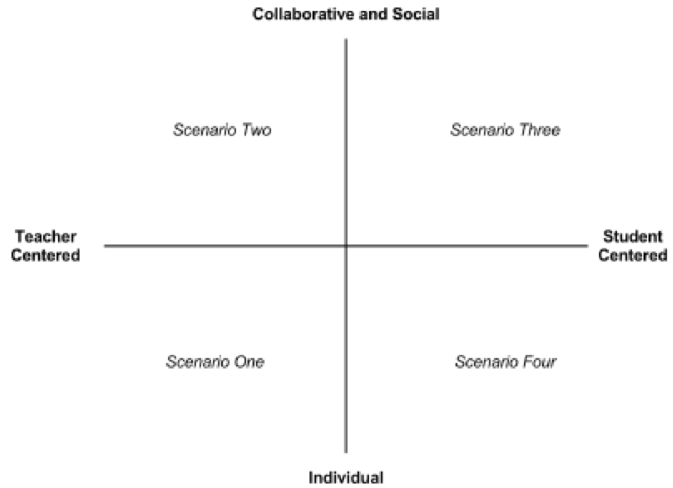

Fig. 1: Two-Dimensional Matrix Representing Four Different Scenarios

Step 4: finally, we worked on bringing the scenarios to life. In a slight departure from the methodology of scenario planning, we decided to illustrate scenarios with real-world examples that are already happening today. However, it is important to note that each of these examples do not represent a current trend amongst practitioners; they are 'one-offs', experimental and collectively do not represent a single pathway into the future. Consequently, although drawn from the present, they nonetheless permit us to offer a projection into the future; and as Snoek himself found (2010, p. 12), 'probably elements of different alternative scenarios can be found in reality', and in planning scenarios one can better reflect on current trends. To ensure consistency between each of the four scenarios, a format was made: Scenario; Discussion; and Affordances and Limitations. Each of the four scenarios, and their real-world counterparts, are described below.

Scenario One: Teacher-Led Individualised Learning

Scenario

Scenario one examines the work of Derek Robertson, National Adviser of New and Emerging Technologies, Scotland. This scenario called CANVAS (Children's Art at the National Virtual Arena of Scotland) was a teacher-asciliteled project in a virtual environment, created by Second Places. The intention was to exhibit and celebrate student created artwork in the form of still or moving images. Each artwork was accompanied by an audio recording of the learner explaining his or her concept and/or design. Thirty-two Scottish local authorities participated in this project, led by the Consolarium (Education Scotland, 2006).

Discussion

CANVAS was hosted on the Education Scotland's servers. This allowed full control over who was able to enter or view the virtual world. Teachers from each Local Authority were given the same brief for this project:

> We believe that the participative nature of the (CANVAS) design will offer a context in which young learners experiences, thoughts and understanding of their own work and development can be enriched and enhanced by the proposed opportunity for dialogue and discussion that the world offers. (Robertson, 2009)

Canvas was designed so that learners would work individually, but could interact through text chat with each other and with selected audiences, who would visit the virtual art gallery through their avatars. Learners could study the exhibition design and make deliberate choices with their teacher and peers on the appropriate placement of artwork for display. Teachers set up the initial virtual environment, and were 'present' in-world with students but adopting a supervisory role. Teachers provided opportunities for learners to critically reflect on their art making process by creating accompanying audio recordings. The objectives of the project were based on structured activities with minimum in-world collaboration opportunities. Teachers were not required to have deep technical knowledge of OpenSim and concentrated on helping students to achieve learning outcomes. The goal of Learning and Teaching Scotland was for larger scale implementation of OpenSim.

Affordances and Limitations

This scenario affords student creativity in one space. Robertson's goal was to provide opportunities for students to experience being in a virtual world while being observed by a teacher; a shared space for groups of students to exhibit, critically reflect and have a dialogue with their audiences was also offered. The artworks were created by students in real-life but exhibited in a pre-designed virtual world. The main success was that many school districts could participate in this project and teachers were able to implement this technology with a small learning curve. The innovation lies in the idea of: creative participation in one space, enabling learners to engage with dialogue about their own artwork and the work of others within a dynamic and contemporary digital setting; permitting students to curate their work knowing that this would be accompanied by a video and give the viewer information about their piece and their progress as an artist; to develop an awareness of practical and purposeful use of a range of digital tools and be part of a collegial learning community. The main project limitations included the difficulty of maintaining continuity because of firewalls. Chat functions and certain avatar customisation features were disabled due to concerns about inappropriate use by learners. Therefore, the full rich experience of a virtual world was not available to learners in this scenario. Large-scale implementation proved to be too challenging when trying to change the mindset of teachers to be responsible to maintain and populate their galleries. The intention that learners should engage with their audiences in a virtual world was clearly specified, but there were more challenges associated with this than envisaged.

Scenario Two: Teacher-Led Collaborative Learning

Scenario

Scenario two examines River City, a multi-user virtual environment aimed at developing learners' expertise in socio-scientific inquiry. This virtual world was designed by a team of academics and implemented with over 15,000 school students (Clarke & Dede, 2009). River City provides learners with a simulation of an industrial nineteenth century city, including a hospital, hotel, university, shopping, residential areas and a river (Clarke & Dede, 2009). Through interactions with residents, parts of the environment and embedded data, learners work in groups to conduct a scientific inquiry into the spread of disease throughout the city. The socio-scientific inquiry involves students: making observations; posing questions; examining books and other sources of information to see what is already known; using tools to gather, analyse, and interpret data; planning investigations; reviewing what is already known in light of experimental evidence; proposing answers, explanations, and predictions; and communicating the results (Ketelhut, Nelson, Clarke & Dede, 2010). The narrative is non-linear, with learners deciding their own trajectory in terms of what contexts they visit, to whom they talk, and what data and tools they use. The learners engage with the simulation across four time scales (seasons), allowing them to construct understandings of how the problem changes over time. To finish their inquiry, students write a letter to the Mayor of River City, which includes an authentic lab report (Ketelhut, Nelson, Clarke & Dede, 2010). Students then compare their research with other groups, to discuss and reflect on the 'many potential hypotheses and causal relationships embedded in the virtual environment' (Ketelhut, Nelson, Clarke & Dede, 2010, p.60).

Discussion

Learner experiences in River City are tightly controlled by the design of the virtual world, with students' intended learning trajectories and outcomes being broadly predetermined by the academic design team. Learners work in groups, allowing them to experience scientific teamwork and to complete more extensive challenges than would be possible individually. Cross-group collaboration is also used at the end, to give students insight into the different interpretations and results obtained by each group.

Affordances and limitations

This type of scenario allows educators to carefully design a learning experience for students (*cf.* Squire, 2006) which targets learning outcomes relating to teams and collaboration. In this scenario, the collaboration adds an element of authenticity, allowing students to experience conducting scientific inquiry in teams, including problem solving in groups and social negotiation. As the design of the virtual world is predetermined, appropriate scaffolding can be considered prior to learner engagement, as can rigorous assessment of learning. The design is also re-usable, and can be regularly evaluated and refined based on learner outcomes and feedback.

Many interactions within the virtual world are predetermined, including the provision and use of tools and the conversations that may be performed. This allows the narrative to respond to students' actions and represent the consequences. One limitation of this design, however, is that students make decisions from the provided options rather than experiencing the complexity of generating their own choices. To mitigate this limitation, some learner activity may be conducted 'outside' the world using alternate technologies or blended approaches.

Scenario Three: Student-Led Collaborative Learning

Scenario

Scenario three examines Marianne Malmstrom's work at the Elizabeth Morrow School in New York (United States), and student-led activities in Minecraft - a massively multiplayer online role-playing game. An eighth-grade student who had been using Minecraft both in school and at home instigated the scenario. The student requested if the class could role-play the young adult novel *The Hunger Games*; students worked in pairs and groups to fight to the virtual death in an arena, until one student remained as victor. The rules for the virtual game were set entirely by students; so too was the planning and organisation. The teacher was invited to act as an in-world overseer of the games. As a result of the activity's success, the students organised an after-school social event for grades five to eight, designing posters and flyers; this is the first time, Malmstrom recalls, that students entirely conceived, initiated and executed such an event themselves.

Discussion

Students, who worked together and shared knowledge in order to make meaningful interpretations, organise and communicate ideas, led the scenario. They had to contribute significantly to the trajectory of the scenario, plan and communicate roles and responsibilities. Students also had to create their own resources collaboratively to support tasks. The teacher was only present in-world in order to observe and to ensure e-safety. In short, an authoritative adult 'voice' was absent, tasks were open-ended, the lessons left unstructured in order to enable experimentation, and students worked collaboratively on a shared task.

Affordances and Limitations

Malmstrom reflected on the affordances of unstructured collaborative learning in a virtual world, noting that:

> Students love the opportunity to stretch their imagination and show what they have created … it is amazing to watch how freely they share their newly gained knowledge. … The community only thrives when each member contributes his/her area of expertise to the group. Arising conflicts and disagreements become part of the learning process, as students negotiate and resolve their own problems (Malmstrom, 2011, p.3).

The success in this area has also led to the school running a summer camp, during which goals are suspended and the school explores new platforms, tests ideas in learning theory and investigates new curriculum (see student work at KnowclueKidd, 2011). In terms of limitations, another Minecraft teacher in New York, Joel Levin (2012) has blogged on the limitations of unstructured tasks for some learners, noting that some of his children 'feel overwhelmed by the sheer number of options available to them in an open world, and need constant direction'. He recommends that 'the best designed lessons and activities provide options and multiple paths to success, catering to various play styles. This lines up nicely with traditional classroom practices of embracing a wide variety of learning style'.

Scenario Four: Student-Centred Individualised Learning

Scenario

In this scenario a single student at Elisabeth Morrow School, New York, elected to work alone in the immersive game Minecraft. Despite the collaborative nature of this game, the player demonstrated high levels of independence, persistence and resilience to build an entire world and characters. In his personal log, recorded as a machinima, he discussed working through his summer holidays to complete the world, frequently setting himself seemingly impossible high goals to achieve (e.g. completing a full scenario in a single day). Although there are occasional prompts and advice from outsiders, such as his class teacher who asks him to incorporate more screen shots in his log, this is minimal and most of the construction, activity and learning is undertaken alone. There is, therefore, little evidence of social contact and interaction in this scenario: the student works almost alone on an immersive task which is engaging and engrossing. All of the activity and learning occurs away from, and beyond the sight of, formal education, although in this case it is recognised by the class teacher who has identified this form of learning as worthy of further investigation:

> The one thing you are not covering in your paper (and what I'm personally finding the most compelling these days in terms of kids learning) is the learning that is happening beyond the classroom. We run a 24/7 server to give our kids a safe place to play after school. That is where the really cool things are happening. We are have done this for over a year for grades 5-8. We are just about to wipe their work of the last 6 months to start over with 3 fresh worlds they have designed because we are allowing students from grades 3 & 4 to join the server. This is due to student and parent request. (Malmstrom, personal correspondence, May 2012)

Discussion

Like the previous example (see above), this scenario is distinctive for the lack of a traditional authority figure or authoritative voice that is normally that of the teacher. It bears many resemblances to the previous scenario, lacking formal and predetermined input from a teacher. Hence there are no assigned learning outcomes, targets or set activities driving the learning and it is highly emergent rather than prescribed (Williams, Karousou & Mackness, 2011). However, in this scenario there is no requirement to collaborate or share with other students, and this shifts responsibility and indeed motivation entirely to the individual player. This scenario requires high level of independence, self-regulation and resilience to succeed, and for some learners this is an ideal environment or context to demonstrate their own capability without the hindrance of others who may be less inclined to work in this manner.

Affordances and Limitations

This scenario exploits the affordances of motivation and engagement whilst minimalising the collaborative affordances so often signalled as hallmarks of immersive world learning (Delgarno & Lee, 2010). It highlights learner dispositions and characteristics, such as resilience, persistence and self-regulation, which are highly desirable but often bemoaned for their absence in formal learning (Heikkilä & Lonka, 2006). The absence of a formal authority figure such as a teacher will lead many to question the value and validity of this scenario since it has limited immediate application in formal school contexts. However, this may be changing as educators such as Malmstrom begin to explore and highlight the value of these contexts and the intensity of learning related activity often undertaken in them by lone students.

Discussion

In reviewing the scenarios set out above, we do not intend to offer here definitive statements on structure and collaboration in virtual world lessons. Instead, using scenario planning has enabled us to examine alternative teaching models, and to offer suggestions to help plan for future challenges in learning and teaching in a virtual world. However, we acknowledge that our findings are based on narrow observations, taken from selective examples, and further research is required in this area. We offer a set of suggestions for further research; a starting point to better understand, reflect and inform an ongoing strategic conversation about the future role and importance of structure and collaboration in virtual worlds in a school-based environment. On the basis of scenario planning we suggest that a better way of looking at our original research questions of (1) *How far do teachers structure learning in 3D virtual worlds*?, and (2) *What are the Implications of Students Learning Collaboratively or Individually within a Virtual World?*, is through a theoretical perspective – a lens which focuses on a central issue: the teaching model(s) adopted by teachers in 3D worlds. In line with our scenario matrix, this has two axes: the Teacher-Student axis, and the Collaborative-Individual Learning Axis.

Teacher-Student Axis

First, our findings have demonstrated that teachers are best advised to adopt, as they already do in the 'real world', a 'best-fit' approach to the structure of lessons in virtual worlds, adopting a flexible approach dependent on the nature of individual students, the class, the teacher and the ethos of the school. For instance, scenario four worked because there was a teacher who had the experience and confidence to allow a highly unstructured approach to learning – but such a scenario would not suit everybody. Teachers, for example, who initially adopt teaching in virtual worlds are by their nature 'risk takers' and are perhaps are more confident to adopt lessons which are more unstructured; in contrast, teachers who are more resistant to technology and change might require more control initially. Indeed, teachers (and other stakeholders) may need to revise their attitudes and beliefs about prescribed and emergent learning as many of the apparent learning gains in immersive worlds occur when there is less prescription and teachers are happy to go with the flow; this of course raises the conundrum of how do you plan for emergent learning!

Furthermore, research should be undertaken which questions to what extent the term 'structure' actually transfers from the world of face-to-face teaching to the virtual world. For example, in the 'real world' spatial structures, such as walls, chairs and equipment, and temporal structures, such as fixed lesson times, influence how teachers plan and deliver lessons. In a virtual world, temporal structures are, perhaps, more transferable as a server can be turned on and off, and the environment can be changed from day into night. However, space is probably harder to structure in a virtual world – there are issues surrounding class room management, and 'control' of avatars in a space in which they walk, talk and fly. A 3D virtual space, it goes without saying, is not the same space as a physical classroom, and teachers will need to plan accordingly. In short, there is probably no one ideal solution to structure – as each scenario demonstrated, each has positive and negative values for teaching as it currently stands, although some are far more likely to be appropriated and assimilated into formal learning than others.

Collaborative-Individual Learning Axis

The findings from the four scenarios demonstrate that both individual and collaborative tasks have the potential to lead to rich learning experiences, depending on the students and teachers' abilities to use a virtual world effectively. We suggest that although an enriched and motivated learning experience can be achieved in each of the four quadrants, teachers need to be aware of a number of critical issues. First, the teacher needs to take into consideration students' personal ability and motivation to use virtual worlds, and learn either individually or collaboratively. Watulak (2012) notes that students who have lower abilities and less interest in technology may feel anxious and ostracised when a high level of importance is placed on it by their educational institution. Therefore, those students who have an initial low-level of technical ability might struggle if their first lesson is highly unstructured, collaborative and the teacher is 'absent'; in such cases the teacher should ensure that each student is sufficiently supported in developing the necessary expertise to effectively participate in the learning. As a point of good practice (Gardner et al, 2010), it is recommended that teachers use formative assessment to adjust teaching and to allow students to have an understanding of their strengths and next steps, as is appropriate in face to face teaching. As teachers have found in the classroom, one of the best ways to engage students in the virtual world is to begin the sequence of lessons (even when they do not intend to be present) with a 'tutorial' type introduction in a similar style to computer games, as this will address the issues of the basic technological skills which allows students time to become acclimatised to the new environment (Malmstrom, 2011; Levin, 2011).

In addition, student motivation to learn in virtual worlds should also be taken into account. Shen and Eder (2009) used the Technology Acceptance Model (TAM) to identify the receptivity of users to using virtual worlds in teaching and learning. For acceptance to take place, they measured the combination of 'perceived usefulness' and 'perceived ease of use'. Further, Calongne (2008, p.38) identifies that it is important to capture the student's imagination with the possibilities of what the technology can achieve and use 'cool technology, exciting research, entertainment, and great visuals to inflame students' imagination.' Before embarking on any type of teaching in a virtual environment, be that individual or collaborative, teachers might find that it is important for students to have a good understanding of how using technology can enhance their overall learning, and in turn that they reflect on themselves as learners and on the learning process.

As a final observation, a teacher does not need to be present in a virtual world for learning to take place. Yet, teachers need to be aware of the different pedagogical affordances of virtual worlds in order to maximise the use of these spaces for teaching and learning. It is perhaps reassuring, therefore, to end the paper with the observation that a teacher is required, even in a very decentralised, student-centred environment, in order to recognise the learning which takes place, to support learners and to undertake assessment.

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Do Open Educational Resources represent additional challenges or advantages to the current climate of change in the Australian higher education sector?

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This paper briefly reports on a number of Open Educational Resources (OER) initiatives in Australia, including some government programs and funding, then explores several of the challenges and advantages of adopting OER at institutional and individual (educators and learners) levels. This paper also discusses some of the preliminary findings of a centrally funded research project that investigates the state of play of OER in Australia. This project surveyed the higher education sector and interviewed key stakeholders. According to participants, the use of OER has the potential to lead to new pedagogical practices, can improve the quality of educational learning materials, and promote social inclusion across the Australian higher educational sector. However, there are still challenges to be overcome such as current academic culture, lack of awareness and issues related to finding quality materials. The above could represent additional challenges to the current climate of change faced by the higher educational sector in Australia.

Keywords: open educational resources, advantages and challenges, OER in Australia.

Introduction

Open Educational Resources (OER) represent an emergent movement that is re-shaping learning and teaching in higher education worldwide. Claimed as one technology to be closely consider by higher education institutions, OER are already influencing the way institutions worldwide offer education and market themselves (Johnson, Levine, Smith, & Stone, 2010). In fact, the growth of the open educational trend "is a response to the rising costs of education, the desire for accessing learning in areas where such access is difficult, and an expression of student choice about when and how to learn" (Johnson, et al., 2010, p. 6). In addition, OER has the potential to meet the growing demand for higher education worldwide, and to close the gap between formal, non-formal and informal education (Kanwar, Kodhandaraman, & Umar, 2010; Pereira, 2007). The OER movement "is a technology-empowered effort to create and share educational content on a global level" (Caswell, Henson, Jensen, & Wiley, 2008, p. 2). Since being first coined by UNESCO during the Forum on the Impact of Open Courseware for Higher Education in Developing Countries hosted by UNESCO in 2002, the term "open educational resources" has been re-defined several times to meet the fast evolving pace of the movement and to fit into the diverse range of contexts that it has been applied.

Some of the definitions available are:

- "Open Educational Resources (OER) are teaching, learning, and research resources that reside in the public domain or have been released under an intellectual property license that permits their free use or re-purposing by others. Open educational resources include full courses, course materials, modules, textbooks, streaming videos, tests, software, and any other tools, materials, or techniques used to support access to knowledge" (Atkins, Brown, & Hammond, 2007, p. 4).
- "Open Educational Resources (OER) are teaching, learning, and research materials in any medium that reside in the public domain or have been released under an open license that permits their free use and re-purposing by others" (Creative Commons, 2012).
- "Open Educational Resources (OERs), are educational materials which are licensed in ways that provide permissions for individuals and institutions to reuse, adapt and modify the materials for their own use. OERs can, and do include full courses, textbooks, streaming videos, exams, software, and any other materials or techniques supporting learning" (OER Foundation, 2011).

- "Digitised materials offered freely and openly for educators, students, and self-learners to use and reuse for teaching, learning, and research. OER includes learning content, software tools to develop, use, and distribute content, and implementation resources such as open licences" (OECD, 2007, p. 10)

The definition by the Organisation for Economic Co-operation and Development (OECD) also suggested that OERs might also include three separate types of resources:

- Learning Content*:* Full courses, courseware, content modules, learning objects, collections and journals.
- Tools: Software to support the development, use, re-use and delivery of learning content including searching and organization of content, content and learning management systems, content development tools and on-line learning communities.
- Implementation Resources: These include intellectual property licenses to promote open publishing of materials, design principles of best practice and localization of content (OECD, 2007, p. 30).

It is stated in the WikiEducator online training website "Open content licensing 4 educators", that "there is growing consensus that a definition of OER ideally needs to incorporate three interrelated dimensions:

- Educational values: OER should be free;
- Pedagogical utility: OER should embed the permissions of the 4Rs (reuse, revise, remix and redistribute); and
- Technology enablers: Technology and media choices should not restrict the permissions of the 4R framework" (WikiEducator, 2012).

Currently, many universities around the globe have launched OER projects. Millions of learners have benefited from learning through OER materials, and many educational institutions, including distance education providers, have obtained significant rewards in terms of enhancing their reputations, increasing student enrolment and developing innovative ways to produce distance learning materials (Wiley & Gurrell, 2009). Also, OER have contributed significantly to the proliferation of virtual communities of learning, where students, teachers and experts in their fields can discuss, make contributions and learn with each other through online collaboration (D'Antoni, 2008). However, the OER movement is facing many challenges. It is still grappling with issues such as resistance to giving away information and knowledge for "free"; at no cost and free to use and re-use. Licensing, intellectual propriety and copyright of OER are also matters that remain ambiguous to educational institutions. In a similar fashion, many questions associated with policy development, sustainability and quality of OER continue to be unanswered and under researched. In fact, according to UNESCO (D'Antoni, 2008, p.11), the above concerning matters are listed amongst the 14 priority issues that deserve attention for further development of OERs, with "awareness raising and promotion" being the first priority. Despite these issues, the OER movement is growing and gaining importance within the higher education landscape in many developing and developed nations. However, in Australia there is still a limited number of OER initiatives and programs at higher education levels compared with other developed countries such as the US, UK and some other European countries (Bossu, Brown, & Bull, 2011).

This paper begins by briefly reporting on some OER initiatives in Australia, including some government programs and funding. The authors then explore some of the remaining challenges and advantages of adopting OER at institutional and individual (educators and learners) levels. This paper proceeds to discuss some of the preliminary findings of a centrally funded research project that investigates the state of play of OER in Australia and which surveyed the higher education sector and interviewed key stakeholders. The research findings revealed that there should be greater strategic direction from government bodies and institutions to regulate and foster the adoption of OER in Australia. According to participants, the use of OER has the potential to lead to new pedagogical practices, can improve the quality of educational learning materials, and promote social inclusion across the Australian higher educational sector. However, there are still challenges to be overcome such as current academic culture, lack of awareness amongst educators and learners and issues related to finding quality materials.

OER Movement in Australia

Some of the most popular OER initiatives at institutional level are:

- Macquarie University with its Macquarie E-Learning Centre of Excellence (MELCOE), which specialises in developing open source software tools and open standards for e-learning (OECD, 2007);
- The University of Southern Queensland (USQ), which remains the only Australian member of the

OpenCourseWare Consortium (OCWC) (Bull, Bossu, & Brown, 2011);

- USQ, and more recently the University of Wollongong, are the only two Australian universities members of the OER university initiative (Thompson, 2011);
- The College of Fine Arts (COFA), with the University of New South Wales (UNSW), developed quality video and text resources to assist educators to teach online (COFA, 2011); and
- The University of Canberra RecentChangesCamp2012; an annual meeting of interested Open Space. This free gathering has taken place for the third time in Australia and is focused on wikis and online collaborative practices. "The aims of these events are to draw together people interested in worldwide iterative knowledge involvement or wikis, to discuss and share knowledge, and eat and socialise in a friendly face to face setting" (RCC2012, 2012, para. 1).

Also, a few Australian universities have released some of their teaching materials through iTunesU. Others have created repositories of learning objects. Unfortunately, some of these repositories can only be accessed by the universities' staff and students. Even though some of these repositories support the Creative Commons license, very few allow for redesigning and repurposing of the content, which therefore limits the value of these resources.

In addition to the institutional initiatives mentioned above, there have been programs and policy developments at the governmental level in Australia. For example:

- The Australian Government's Open Access and Licensing Framework (AusGOAL), which provides a set of guidelines "to government and related sectors to facilitate open access to publicly funded information" (AusGOAL, 2011, para. 1);
- The Australian National Data Service (ANDS), which is a database containing research resources from research institutions in Australia (ANDS, 2011);
- The Guide to Open Source Software for Australian Government Agencies, which is a policy that requires that government agencies first consider open source software options when requesting tenders (Gray, 2011); and
- Government 2.0, which is an Australian government initiative focused on the "use of technology to encourage a more open and transparent form of government, where the public has a greater role in forming policy and has improved access to government information" (Australian Government, 2012, para. 1).

Despite the fact that the above Australian government developments are on par with a number of developments in the UK, the US and also in some European countries (Helsper, 2011), they are mostly concentrated on government bodies. The opposite can be said in relation to policies and developments with an educational focus, as Australia seems to be behind the mentioned countries (Bossu, et al., 2011). If the Australian government wishes to take advantage of the benefits of open educational resources and practices, it will need to adopt strategies that take this movement out of the shadows and place it in a more prominent position within the educational mainstream. Such strategies could assist the government to effectively achieve some of its current agenda, such as to increase participation and access to education to a more diverse student cohort, particularly working adults and those residing in rural and remote locations of Australia (Bradley, Noonan, Nugent, & Scales, 2008). However, despite the potential advantages of OER, many challenges remain, as fundamental changes in the higher educational landscape tend to take place slowly and attract many disbelievers. Some benefits and challenges of the OER movement are discussed next.

Advantages and Challenges of OER

Research shows that OER bring many benefits to educational institutions, educators and traditional and non-traditional learners. At institutional levels, OER can assist to reduce costs, improve quality and bring innovation to traditional educational material (Caswell, et al., 2008). Thus, assisting senior managers and educational leaders to lead in the current climate of change across the higher education landscape worldwide. OER can also be used as market tools by making educational resources publically available on the Internet. Other reasons why institutions should consider OER for teaching and learning are:

- They are in line with academic traditions of sharing knowledge and are a good thing to do;
- They enable institutions to give something back to taxpayers by allowing free sharing and reuse of resources;
- It is good for the institution's public relations to have an OER project as a showcase for attracting new students;

- Open sharing will speed up the development of new learning resources, stimulate internal improvement, innovation and reuse and help the institution to keep good records of materials and their internal and external use (OECD, 2007, p. 11).

Educators in general can also take advantage of OER. They can have access to a growing range of resources that can be built and/or used to update and revise existing learning content (Bossu & Tynan, 2011; Caswell, et al., 2008). Most importantly, OER can assist educators to reduce teaching preparation time, avoid duplication and concentrate their efforts on making students' learning a more rewarding experience (Johnson, et al., 2010; Willems & Bossu, 2012). Nevertheless, formal and informal learners can gain the most advantage from the adoption and use of OER because they are accessible; provide learners with flexibility to study anywhere and anytime; at no or low costs; and have the potential to contribute to informal, non-formal and formal education (Bossu & Tynan, 2011; Kanwar, et al., 2010; Panke, 2011; Schuwer & Mulder, 2009). Other benefits for learners are the interaction with content and the sharing of knowledge with other learners, "following personal learning goals and encountering different points of view" (Panke, 2011, p. 5).

In addition, OER can also be used by a whole range of professionals and their employers across different areas as free resources for professional development (Bossu & Tynan, 2011), as well as by governments to meet their current political agendas (Bossu, Bull, & Brown, 2012). Even though OER have the potential to benefit a whole range of stakeholders, from institutions to both formal and informal learners, the impact of OER on the higher education sector is not fully understood yet. In fact, research has shown that little is known about how teachers and learners use, repurpose and interact with OER (Panke, 2011). What is known, however, is that both educators and learners appear to have a limited understanding of OER for teaching and learning, whether formal or informal (Conole & Weller, 2008; Panke, 2011). This seems also to be the case in Australian higher education (Bossu, et al., 2011), which is discussed further in this paper.

The above is not the only challenge that the OER movement faces. Despite the continued growth, success and evident benefits of the OER movement, a range of issues remains unresolved. Some of these issues have existed since the early stages of the movement and are widely discussed in the body of knowledge regarding OER. Other issues have emerged recently, as the movement matures and evolves. Some challenges at an institutional level include copyright and intellectual property policies and a lack of awareness regarding OER. Institutional barriers also include a lack of incentives from institutions toward staff and their use and development of OER (Atkins, et al., 2007; Bossu & Tynan, 2011; Wiley & Gurrell, 2009). In addition, issues "regarding quality control, whether or not to support translation and localisation of resources, how to facilitate access for students with disabilities, and technical issues" need to be considered when developing an OER initiative. (Bossu & Tynan, 2011, p. 261). Many, however, believe that the sustainability of OER initiatives is perhaps the most significant issue for educational institution. Despite the fact that several sustainability models have been developed and discussed in the literature to date, there is no evidence yet of their successes. (Dholakai, King, & Baraniuk, 2006; Downes, 2007; Humbert, Rébillard, & Rennard, 2008; Lane, 2008; Schuwer & Mulder, 2009; Smith & Wang, 2007). As Smith and Wang (2007) point out, for an OER initiative to be sustainable in the long term it needs to create value for the host institution.

Some of the key challenges faced by academics in terms of the use and repurpose of OER include an evident lack of understanding regarding copyright and intellectual property issues, and where to find quality and relevant resources (Bossu & Tynan, 2011). For those who are more familiar with the licenses applied to OER, the adoption of OER into traditional educational contexts would still require academics to "pay attention to a layer of their instruction beyond what is simply pedagogically sound" (Caswell, et al., 2008, p. 8). The non-invented-here syndrome is another problem, as some believe that "material developed or chosen by someone else is commonly judged to be inferior" (McGreal, 2010, p. 3). As for learners, contextual barriers can pose a substantial challenge to the adoption of OER due to different students needs and capabilities (Kanwar, et al., 2010; Willems & Bossu, 2012). Additionally, adequate access to Internet connection, computer skills and relevant OER are all challenges faced by many learners worldwide (Willems & Bossu, 2012). For an OER project to be successful the above and other issues must be taken into account.

It can be seen from the discussion above that there are advantages, but also challenges still to be overcome by the OER movement, which is still in its infancy in Australia. Attention to the issues mentioned above needs to be paid by educational institutions and government bodies in order to appropriately adopt OER in Australia, so they can bring educational benefits to educational institutions, educators and learners.

The remainder of this paper will present some of the preliminary findings on the benefits and challenges of OER of a research project funded by the Office for Learning and Teaching (OLT) titled “Adoption, use and management of Open Educational Resources to enhance teaching and learning in Australia”.

The Research Project

This is the second year of a two-year research project. The first year involved a comprehensive analysis of the relevant literature surrounding OER internationally and nationally, the collection of institutional and national educational policies and frameworks that enable OER practices and development. Also, an online survey and subsequent interviews were conducted targeting a whole range of higher education stakeholders across Australia. We are currently conducting a analysis of the data, which will provide the basis of a “Feasibility Protocol” to enable and facilitate the adoption, use and management of Open Educational Resources (OER) for learning and teaching within higher education (HE) institutions in Australia. The Feasibility Protocol will prompt questions and raise issues that need to be considered by institutions wishing to enter the OER movement. With narratives and discussions from the data analysis, examples of practices and literature review, this protocol aims to assist senior executive managers and others to make informed decisions within their institutions regarding how to approach the adoption of OER.

Research Findings

Data Sample

The online survey was distributed to all major higher education organisation mailing lists in the Australasian region. Personal invitations were also sent to the PVC’s/DVC’s at all Australian universities and to other professional contacts. Each team member also forwarded the invitation to known colleagues within the sector.

The survey resulted in 101 valid responses from across 37 educational institutions, with representation from all states and territories in Australia, and from the stakeholder groups related to this research. There was also a balanced gender distribution amongst the respondents: 48% male and 51% female. The sample also had a good representation of university stakeholders groups, from senior executives (23 participants) to managers (13), educators (28), curriculum designers (14), professional developers (6), library professionals (4) and copyright officers (2).

From the 101 survey respondents, 24 offered to be interviewed. The 24 interview participants were from 18 different Australian institutions. The table below shows the stakeholder groups who participated in the interviews.

Table 1: Stakeholder groups who participate in the interviews

Stakeholder groups	Number of participants
Copyright officer	2
Educator (teacher, lecturer, tutor or trainer)	5
Technologist	1
Other Manager or Administrator	9
Executive (eg. DVC, PVC)	4
Instructional / curriculum designer	3

Current state of play of OER in Australian higher education

The reasonable number of survey respondents have been aware of the OER movement from two to five years (41%) and rated their knowledge of OER as intermediate (51%). However, the majority of participants have rarely or never used OER. As for those who have adopted OER, learning objects have been the most preferred type of resources applied in teaching and learning. Also, most participants declared that they are not involved in collaborative OER initiatives either nationally or internationally. However, they indicated that they would like to be involved in OER activities in the future if the opportunity arises. The lack of adoption and participants’ involvement in such activities could be due to the fact that OER practices and initiatives are not included in the current strategic plans of most participating institutions, as declared by the participants. In addition, survey data also revealed that government policies are necessary to regulate the adoption of OER in

Australia and that dedicated OER public policies could encourage the growth, development and institutional adoption of open educational resources and practices across the sector in Australia. Even though the efforts of some individual OER initiatives have succeeded at the institutional level in Australia, as mentioned previously, the movement has expanded faster and more effectively in countries where support was provided at the national level. Particularly in Australia, this support could come in the form of more flexible policies. According to participants, the Australian government should also support higher educational institutions through grants or financial awards to encourage the development of OER, together with a culture of open practices (Bossu, et al., 2011).

As for institutional policies, they were considered an important factor to promote the effective use and adoption of OER. According to the participants, educational institutional should develop policies and activities to promote OER awareness and to clarify issues related to intellectual property and quality assurance. Institutions should also promote and recognise OER initiatives, and this could also occur through financial initiatives. This was also true in studies undertaken in Europe and other parts of the world (OECD, 2007; OPAL, 2011). In fact, many have alerted institutional policy-makers of the existing institutional strategies to the adoption of OER, and that these strategies could be implemented through appropriate internal regulations and guidelines (Atkins, et al., 2007; Downes, 2007; Kanwar, et al., 2010).

In the interviews, participants' level of understanding of OER within the sample group was high, but it must be taken into account that the sample was obtained from volunteers who completed the online survey and were comfortable to be questioned about issues surrounding OER. Thus, this level of understanding was to be expected. Likewise, most of interviewees (with the exception of two) were aware of the Creative Commons licenses. It appeared that many university employees from various institutions were using these licenses, but these practices were not formally endorsed, or were not specified within current policies. Most interviewees (62%) use OER for both personal and professional purposes. It was of interest to note that this usage was not widely adopted in any of their institutions. Very few participants make their resources available, and even fewer specifically create OER. Most respondents were aware of only a handful of colleagues using OER within their institutions. When asked what they thought were the main concerns of those people not using OER the main responses were potential loss of intellectual property, fear of exposure and lack of awareness.

> One concern is that openness obviously exposes poor practice and you won't find many people admitting to that concern but I daresay it is a major concern.
>
> Educator

Advantages and challenges of OER in Australian HE

Advantages
In terms of the benefits that OER can bring to education and training in Australia, the majority (highest to the lowest) of survey participants' views are that:

- Educators can save time and avoid duplication of effort.
- OER can improve the quality of educational learning materials.
- OER have the potential to increase collaboration within an institution and internationally.
- OER help to enhance quality of teaching and learning in higher education.
- An OER project is a good marketing strategy to showcase the institution and attract new students.
- An OER project will raise the international profile of an institution within the global community.

Also, they believe that OER use is a catalyst for institutional innovation (53) and that the use of OER has the potential to lead to new pedagogical practices (44) within higher education institutions in Australia. Interviewees pointed out (62%) that social improvements and "access to education for all" are potential benefits of OER. Other potential benefits identified by respondents include increasing efficiency in time and/or money (50%) and improvement of the quality of teaching resources (42%). They stated that teaching materials undergoing a review process could only improve in quality. Increasing collaboration was also mentioned by over a third of the respondents as another benefit of OER (37%).

> It could provide a built-in quality assurance model. I mean people don't want to put their name to crap, so if they're going to create it, they're going to create it to be reviewed by their peers, so it's going to be good.
>
> Educator

> I'm excited about the prospect of sharing resources with other academics and other faculties within Australia and overseas. I think that not only encourages better collaboration, encourage a new way of thinking for academics.
>
> Educator

> The total would be much greater than the sum of its parts.
>
> Manager

Challenges

When asked to indicate the potential barriers to the use of OER, survey participants pointed out that the lack interest in creating and using OER and poor quality of OER were considered as important factors by the majority of them. Survey respondents also identified that insufficient institutional support, and the lack of institutional policies to address OER developments, as barriers to the growth of the OER movement, amongst other barriers (Please see figure 1).

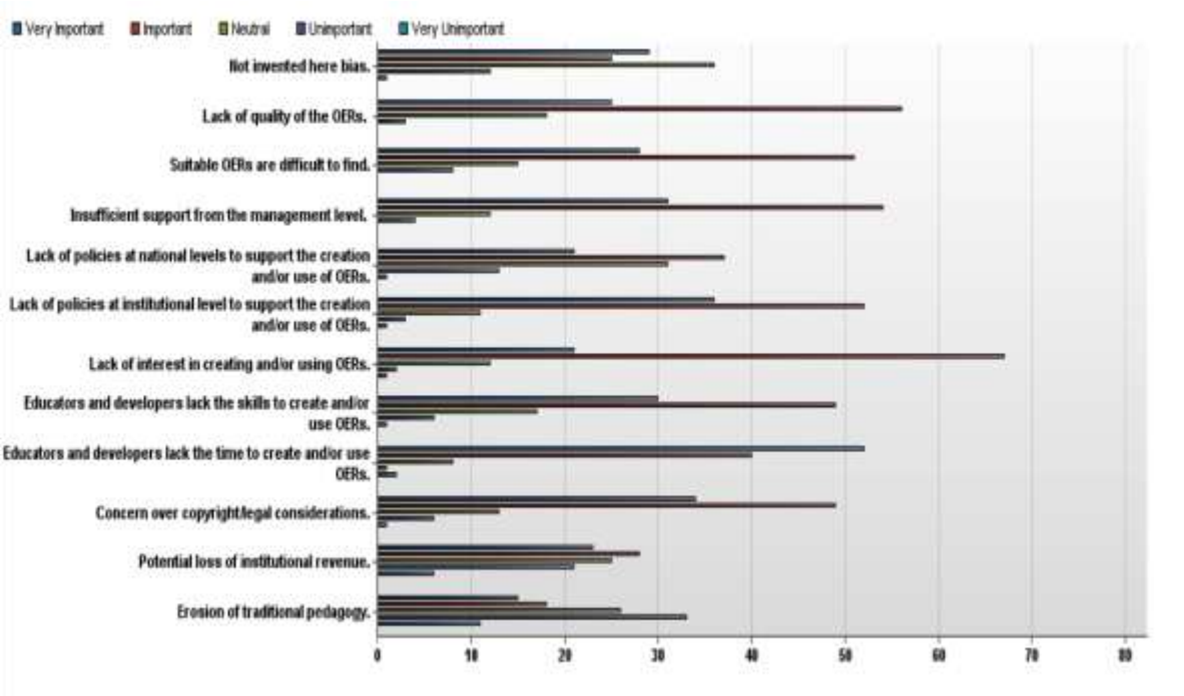

Figure 1: Potential barriers to the use of OER

Common barriers to OER use identified by the interview participants were issues related to intellectual property policies and the lack of a national framework to support these. Problems surrounding quality, current academic culture and lack of knowledge were among the other significant barriers identified. When questioned further, participants stated that limited funding, difficulties in changing academic culture and discoverability of OER were considered to be the major challenges. Several of the respondents suggested that adopting a standardised metadata for OER and/or a national or institutional repository as potential solutions to assist with the discoverability issue. In fact, 70% of the interviewees believed that OER could be more widely used within universities if appropriate support regarding where to find quality OER, and how to use them adequately, were to be provided. Implementing some sort of recognition for those who use/create OER was also identified by 33% as a way to encourage the adoption of OER, followed by the development of policies.

> So if I knew there was somebody who was the "go-to person" to ask that would be helpful.
>
> Educator

> …someone able to tell staff and teach them about licensing and give them options and all the other little things that you would need to do to embed it [OER] and embrace it more fully.
>
> Director

Discussion and Conclusion

This paper explored some recent OER developments within higher education institutions in Australia, as well as several attempts to make available publicly funded research, resources and government information through federal open access policies. Unfortunately, the adoption of OER within mainstream education in Australia appears to be limited, perhaps due to the lack of educationally focused policies and initiatives, as demonstrated by the research described here.

It can be seen by the findings presented here that some of the advantages and challenges of the OER movement reported in the literature are similar to those raised by the participants in this study. It is interesting to note, however, that even though most participants were aware of the movement, very few actually adopt OER. The lack of OER uptake by the participants could be closely related to their lack of interest linked to their busy workload and lack of institutional support. For academics OER could represent another activity added to their already heavy workloads. In order to encourage the adoption of OER, educational institutions need to provide support and develop new reward systems, where academic staff can receive recognition for their involvement with OER.

However, it is known that fundamental changes in the higher educational landscape tend to occur at a gradual pace and attract many sceptics. Despite the benefits that the OER movement can bring to higher education in Australia, there are still several challenges to overcome. Delay in the introduction of OER in mainstream education in Australia, could slow educational collaboration and innovation. One can then conclude that OER represent both additional challenges and advantages in the current clime of change of higher education sector in Australia.

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Use of media-rich real-time collaboration tools for learning and teaching in Australian and New Zealand universities

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This paper provides an overview of media-rich real-time collaboration tool use for learning and teaching in Australian and New Zealand universities. These tools, which include video conferencing tools, web conferencing tools and virtual worlds, afford students and teachers the ability to synchronously represent concepts, and enable them to interact with one another to negotiate meaning and develop a sense of connectedness. A survey of 750 higher educators revealed that while desktop video conferencing and web conferencing use display an upward trend, virtual worlds are being used by substantially fewer educators, and have recently begun to experience a decline in usage. There are four major web conferencing products being used, whereas desktop video conferencing and virtual worlds are each being dominated by a single product. The 'best' uses of each technology as perceived by respondents with experience in a range of tools are examined, before the paper concludes with a discussion of implications for tertiary learning and teaching, along with an outline of the authors' future plans.

Keywords: video conferencing, web conferencing, virtual worlds, rich media, synchronous

Introduction

The study schedules of today's Australian and New Zealand university students typically have to compete with their intensive work, family and social commitments (James, Krause & Jennings, 2010). As a consequence, many students are finding it increasingly difficult to attend university campuses on a regular basis (Gosper, Green, McNeill, Phillips, Preston & Woo, 2008). In order to cater for these students, universities have turned to a range of online learning technologies, including enterprise learning management systems, such as *Blackboard*, *Moodle* and *Sakai*, as well as externally hosted Web 2.0 tools, such as *YouTube*, *Facebook* and *Wikispaces*. These technologies provide students studying in distance mode, as well as those enrolled in on-campus mode but not able to regularly come to classes, with access to resources like reading materials, lecture recordings and podcasts and give them the ability to communicate asynchronously with their lecturers and peers. However, these students miss out on the real-time collaborative learning opportunities availed to their face-to-face counterparts.

Media-rich real-time collaboration tools have the potential to help address this issue. Such tools, which include video conferencing tools (e.g. *Skype*), web conferencing tools (e.g. *Adobe Connect*, *Wimba*, *Blackboard Collaborate*) and virtual worlds (e.g. *Second Life*), are increasingly being used to bring together on-campus and geographically dispersed students, and are arguably already providing remote tertiary students with unprecedented flexibility to participate in on-campus collaborative learning activities. Stewart, Harlow and DeBacco (2011) believe these contemporary technologies are able to offer universities new solutions to existing problems, such as preparing students for the 21st-century workplace, attracting students to university (especially underrepresented populations of students) and providing opportunities for leader/expert collaboration. Initiatives such as the Australian National Broadband Network will only serve to increase the quality of experience and prevalence of media-rich synchronous tool usage.

There is a range of somewhat outdated and speculative data on media-rich real-time collaboration tool usage. US research on distance education courses identified that only 23% of courses used two-way interactive video and 31% used synchronous Internet-based technologies (Parsad & Lewis, 2008). Researchers in the Australian context acknowledge that while media-rich technologies that facilitate interactive communication between users synchronously or asynchronously offer great promise to enhance student–student and student–teacher communication, they are not as widely used as they could be (Smyth, Andrews, Bordujenko & Caladine, 2011). Because the literature in the area is, to a large degree, uncharted and unorganised, universities are tending to work in isolation – often without an understanding of current practice in other institutions, and with unnecessary duplication of effort – to make technology usage and selection decisions.

This paper presents selected findings from a 2011-2012 Australasian survey investigating the use of media-rich real-time collaboration tools in higher education, with the goal of offering a reference point for the selection and deployment of such tools. An up-to-date understanding of media-rich synchronous technologies and how they can be used enables educators to support contemporary learning and teaching approaches as well as become more innovative pedagogical leaders into the future. This research has been undertaken as part of a project funded by the Office of Learning and Teaching (previously the Australian Learning and Teaching Council) aimed at investigating how media-rich real-time collaboration tools can be used to synchronously bring together remote and face-to-face students (Bower, Kennedy, Dalgarno & Lee, 2011). Please refer to the *Blended Synchronous Learning* website at http://www.blendsync.org/ for more details about the broader project.

Media-rich real-time collaboration tools and their use in higher education

There are three main types of technologies that educators can use to offer media-rich synchronous learning experiences to remote and face-to-face students: video conferencing, web conferencing and virtual worlds.

Video conferencing

Video conferencing systems allow for synchronous audio and video feeds to be transmitted between sites so that each user or group of users can see and hear the other users. Traditionally, dedicated room or lecture theatre-based systems were required, and such systems have been used for some time to simultaneously deliver lectures to students based at multiple campuses. More recently, desktop video conferencing applications such as *Skype* have become available that allow for live audio and video interactions between remote participants using webcams and microphones attached their desktop or laptop computers. Such systems have gradually introduced additional tools, such as instant messaging, file transfer and sharing of desktop computer images.

The use of video conferencing is largely underpinned by the premise that “visual signals improve human interaction” (Fullwood & Doherty-Sneddon, 2006, p. 168). Video conferencing can facilitate informal communication, unplanned interactions at distance and an arrival at shared understanding by participants (Parker & Joyner, 1995). Students appreciate how video conferencing can reduce commute time and increase real-world skills (Koenig, 2010). Video conferencing provides an effective way to promote a sense of connectedness with overseas students as universities compete to internationalise their programs (Kan, 2011). Stewart et al. (2011, p. 358) contend that “productive learning occurs through conversations among students and faculty who create knowledge together, in real-time, without [necessarily] physically being together in the same place”. A variety of communicative patterns are possible with video conferencing, among which are ‘voice switching’ (a ‘free-for-all’ situation in which the ‘floor’ is passed to the person speaking at a given moment) and ‘chairing’ (where the ‘floor’ is allocated to an individual by the chair of the meeting) (Parker & Joyner, 1995). Where faculty were good communicators and able to keep students involved, the classes were deemed to be “equally as engaging as traditional classroom delivery” (Koenig, 2010, p. 2).

Web conferencing

Web conferencing tools allow groups of users to enter a shared online space where they can use features such as whiteboards, screen sharing, chat, voting, file sharing and collaborative authoring facilities together in real-time from within their web browsers. Almpanins, Miller, Ross, Price and James (2011, p. 317) describe synchronous web conferencing environments as a “virtual classroom” and “the digital version of a classroom meeting” (p. 317). Interaction is facilitated through different modalities such as text chat, audio streaming, video streaming and desktop sharing (Steed & Vigrass, 2011). Typical functionalities include the ability to display PowerPoint presentations, broadcast webcam video and voice, exchange files, vote, write shared notes, and collaboratively draw on a whiteboard (Bower, 2011). Screen sharing to display visual materials can considerably enhance the learning experience (Steed & Vigrass, 2011). Social presence and responses are facilitated by a variety of emoticons and voting features providing a mix of communication and participant management modes, with multiple group work instances supported by ‘breakout’ rooms (Todhunter & Pettigrew, 2008). There has been a gradual merging of functionality between web conferencing and desktop video conferencing systems, so that many of the features of one are now also found in the other.

The use of web conferencing systems is a response to the general need to engage students with rich and/or synchronous online learning settings (Spanier, 2011). Web conferencing creates opportunities for geographically dispersed peers or colleagues to communicate across space (Reushle & Loch, 2008). There is growing evidence of cohesive strategies to develop web conferencing approaches within and across institutions. In Norway, the *Adobe Connect* web conferencing platform has been made available to all educational providers through Uninett, the Norwegian Education Institutional Network. Proponents of web conferencing argue for broad and strategic adoption within universities that maximises potential benefits to the institution and avails students and staff lasting open access (de Groot, Harrison & Shaw, 2011). Notwithstanding the increased uptake and use of these tools in recent years, there remains a need for a deeper and more nuanced understanding of how to make use of them in pedagogically sound and effective ways (Munkvold, Khazanchi & Zigurs, 2011).

Virtual worlds

Virtual worlds are online representations of physical environments in which users can move around and interact with other objects and users, usually in three dimensions. Virtual worlds permit rich actions and interactions, including the ability for users to exchange messages and objects with other users, see one another’s avatars interacting with the environment, and ‘experience’ the world through touch, voice communication and engagement in quests (Messinger, Stroulia & Lyons, 2008). Hew and Cheung (2010) note the three defining features of virtual worlds reported in the literature and add a fourth. The first three include ‘the illusion of 3-D space, avatars that serve as visual representations of users and an interactive chat tool for users to communicate with one another’ (Dickey, 2005, cited in Hew & Cheung, 2010, p. 34). The fourth important feature adds the ability for a user to ‘act’ on the world by using object properties in the virtual world and, by implication, enable learning by doing rather than by listening or reading a possibility for students (Hew & Cheung, 2010). As well as free navigation in a first-person perspective, virtual worlds also provide natural semantics in the place of symbolisms, and the ability to vary physical size to experience micro or macro environments that are beyond the normal human range (Mikropoulos & Natsis, 2011).

Virtual worlds afford learning tasks that can lead to enhanced spatial knowledge representation and increased intrinsic motivation and engagement as well as learning that is experiential, contextualised and collaborative (Dalgarno & Lee, 2010). Lim (2009) has proposed a ‘Six Learnings’ framework that highlights the breadth of potential learning designs that can be instantiated in virtual worlds, including exploration, collaboration, role-play, building, championing and expressing. The digital replication of real experience creates immersive presence that can give rise to learning through situated experiences and multiple perspectives, thus leading to greater transfer of learning to other contexts (Dede, 2009). The ability to provide different levels of structure and scaffolding for tasks enacted in virtual worlds gives teachers a degree of pedagogical control (Jacobson, Kim, Miao, Shen & Chavez, 2010). While there are issues associated with the integration of virtual worlds in a higher education setting, including a range of technical, cultural, interactional, economic, scheduling, standards, scaffolding persistence, social and identity-related issues (Warburton, 2009), the overwhelming majority of virtual world educators found using virtual worlds positively impacted on their students’ learning (Dalgarno, Lee, Carlson, Gregory & Tynan, 2011b).

The literature relating to the use of media-rich real-time collaboration tools such desktop video conferencing, web conferencing and virtual worlds is not only fragmented between these sub-areas, but also within them. It is difficult to find data that present an overview of the different sorts of tools that are being used and the relative prevalence of each. The current survey was conducted in 2011-2012 to address this gap, particularly with respect to the Australian and New Zealand higher education sector. This paper shares results of the survey to document how educators in Australian and New Zealand universities use media-rich real-time collaboration tools, the particular tools they are using, and their perceptions of the ways in which these tools are best used.

Method

Materials

The survey designed for this investigation contained three substantive sections. The first section included general demographic questions as well as items relating to years of experience in teaching, in using computers and the Internet for teaching, and in teaching using media-rich real-time collaboration tools. This section also asked respondents to rate their expertise in using computers and the Internet and in using media-rich real-time collaboration tools on a five-point scale from ‘beginner’ to ‘expert’. The second section asked respondents which desktop video conferencing, room-based video conferencing, web conferencing and virtual world tools/platforms they had used and/or planned to use, as well as the circumstances under which they felt each type of technology was most appropriately used. In the third section of the survey, respondents were asked to provide detailed information about one subject or unit in which they had deployed media-rich real-time collaboration tools, with a focus on their use of the tools for synchronously uniting face-to-face and remote students, where applicable. The results from that section will be reported in separate publications.

Procedures

Respondents were recruited by advertising on national and international educational technology mailing lists (e.g. ascilite, HERDSA, ODLAA, DEANZ, ACODE, EDUCAUSE, ITForum) and through personal contact made by the members of the project team. A $300AUD shopping voucher was offered as an incentive to complete the survey. The survey was delivered online from early December 2011 to late February 2012. Upon closure of the survey, all data were extracted as Excel files and quantitative data was analysed in SPSS.

Open-ended responses to the questions about appropriate uses of desktop video conferencing, web conferencing and virtual worlds were also analysed in order to provide a grounded indication of the circumstances under which the respondents believed each tool can and should be used. A cluster analysis was performed and among other things revealed that one group of respondents distinguished themselves by using a broad range of technologies. Responses from 100 people in this group were selected for detailed qualitative analysis, on the basis that they had the range of experience upon which to base selection and usage decisions. This qualitative analysis involved an open-coding phase to determine preliminary analytic categories, an axial-coding phase to determine emergent themes, and a selective-coding phase to support the conceptual coding categories (see Neuman, 2006, for further details on this approach).

Respondents

A total of 1,748 survey responses were received. After removing responses that were largely incomplete, not from an employee of an Australian or New Zealand university, or from someone who indicated that they were not using any media-rich real-time collaboration tools, 750 responses remained. Of these 750 responses that were used for the current analysis slightly more were from females than males (females: 54.2%; males: 45.8%). There was a wide range of ages in the sample (from under 26 years of age to over 65 years of age) and the mean age of respondents was approximately 48 years (based on the midpoints of the response ranges). The distribution of ages is reflective of that of the university sector, which tends to be positively skewed (i.e. comprising an older demographic). Responses were received from 38 of the 39 Australian universities and all 8 of the New Zealand universities.

Of the 750 respondents, the majority had been teaching in tertiary/higher education for 10 or more years (58%), and had 10 or more years’ experience using computers and the Internet in their teaching (57%). On the other hand, only 14% of respondents had been using media-rich real-time collaboration tools for 10 or more years, and the majority (58%) had been using them for less than 5 years. A substantial number indicated that they had adopted these tools within the last year (24%) or in the past 1 to 2 years (14%). There were clear differences in the self-reported abilities of respondents when it came to using technology more generally for learning and teaching compared with using media-rich real-time collaboration tools. Over two-thirds of respondents (68%) indicated they had ‘advanced’ or ‘expert’ ability in using computers and/or the Internet for learning and teaching, while less than a third (31%) felt they had the same level of ability when it came to using media-rich real-time collaboration tools for learning and teaching. Conversely, very few respondents reported being beginners or novices when it came to using computers and/or the Internet for learning and teaching (3.3%), while a significant minority (34%) felt they were at the beginner or novice level in the use of media-rich real-time collaboration tools for learning and teaching.

Results

General use of media-rich real-time collaboration tools

Respondents were asked to indicate which media-rich real-time collaboration tools they had used in the past or were currently using in their teaching. (They were given a list of 38 tools to choose from, and also allowed to specify additional tools that did not appear in the list.) These responses were classified into four more generic categories or types of tools: desktop video conferencing, room-based video conferencing, web conferencing and virtual worlds. Across the 750 respondents, there were 2,926 instances of media-rich synchronous collaboration tool use, representing an average of approximately four tools per respondent. As can be seen from Figure 1, desktop video conferencing (39.4%) and web conferencing (38.6%) were the two tool categories that were most used. There were fewer instances of room-based video conferencing (11.7%) and virtual world (7.4%) use.

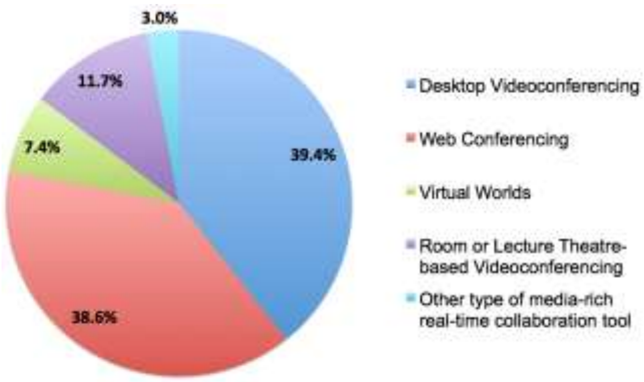

Figure 1: Percentage of uses of each type of media-rich real-time collaboration tool

In an attempt to track the use of media-rich real-time collaboration tools over time, respondents were asked to indicate the years in which they had used each of the four more generic categories of tool (see Figure 2). Figure 2 shows that the adoption of all media-rich real-time collaboration tools has increased significantly since 2000. But more interesting is the relative use of each type of tool. Room-based videoconferencing was clearly the dominant technology for media-rich real-time communication in 2000, and maintained this position at least until 2003. From 2004 to 2008 there was, broadly speaking, comparable use of room-based videoconferencing, web conferencing and desktop conferencing. From 2009 to 2010, web conferencing and desktop video conferencing tools were used by more respondents than room-based video conferencing. and the usage of these tools approximately doubled between 2008 and 2010. Moreover, while all four technologies have seen progressive growth in their user base, it is clear virtual worlds do not enjoy the penetration of the other three technologies, and even show a slight decrease in usage from 2010 to 2011. This may be in part be explained by the existence of a number of barriers to usage and institutional support issues associated with virtual worlds (see Dalgarno et al., 2011b) as compared to web conferencing in particular, which tends to be institutionally supported.

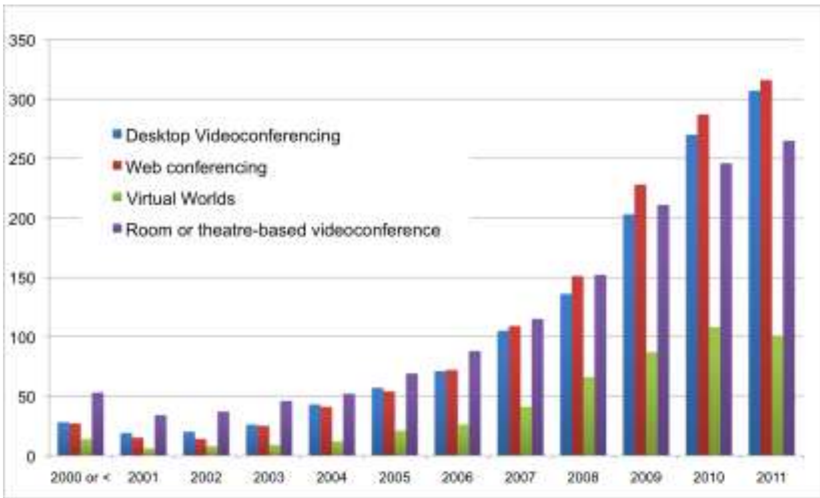

Figure 2: Use of media-rich real-time collaboration tools by year

Specific use of media-rich real-time collaboration tools

The next series of analyses examined the specific products that respondents were using with their students. Figure 3 shows the percentage of respondents in the sample that used specific web conferencing tools. It can be seen from Figure 3 that four tools in the web conferencing category are enjoying especially healthy patronage: *Elluminate* (30.9%), *Blackboard Collaborate* (30.6%), *Wimba* (20.8%) and *Adobe Connect* (20.5%). It is noteworthy that *Elluminate* was acquired by Blackboard, Inc. in 2010 and rebadged as *Blackboard Collaborate*. It is therefore likely that some respondents would have used *Elluminate* but not *Blackboard Collaborate*, some would have recently switched from *Elluminate* to *Blackboard Collaborate* within their institution, and others would have adopted *Blackboard Collaborate* without having previously used *Elluminate*. A consequence of this is that collectively, the proportion of people using either *Elluminate* or *Blackboard Collaborate* may well be substantially larger than 30%. Additionally, *Wimba* has been taken over by Blackboard, and although it continues to be supported as a separate product (see Wimba, Inc., 2010), it appears highly probable that there will be further consolidation of web conferencing platforms in the future.

Figure 4 displays the percentage of respondents using each of the tools in the desktop video conferencing category. Clearly *Skype* is the most popular tool, with 59.1% of respondents indicating they had used this tool in their teaching, which is double the number of users of the most popular web conferencing tool. *Windows Live Messenger* (16.0%), *Google Voice and Video Chat* (12.5%) and *Yahoo! Messenger* (9.8%) enjoyed moderate use. The proportion of respondents using each virtual world platform is depicted in Figure 5. It shows that use of virtual worlds is low compared to the other media-rich real-time collaboration tools. *Second Life* is the only tool with a significant user base, and even then it represents only 14.9% of the sample. It is noteworthy that with Linden Labs recent substantial increase in the cost of land in *Second Life* to educators, interest in *OpenSim* has grown, and a number of third-party grid providers have emerged (see Dalgarno et al., 2011a). Consequently, it could be assumed that the user base of *OpenSim* will continue to grow over the next few years.

Perceived 'best' use of media-rich real-time collaboration tools

Based on an initial analysis of the open-ended responses to questions asking respondents to list the best reasons for using each of the three main technologies (video conferencing, web conferencing and virtual worlds) for learning and teaching, some of the more common reasons for using the technologies are discussed in this section. Quotes from the actual responses are included to help illustrate the general categories of response identified. A more complete analysis of all responses will be reported in another publication.

Reasons for using desktop video conferencing often centred around location and group size. Desktop video conferencing was deemed useful when participants were "geographically dispersed" and the planned interaction was either "one-on-one" or for "small groups". There was widespread agreement that desktop video conferencing was ideal when participants "do not require much more than audio and video capabilities to support teaching and learning". Several respondents pointed out that desktop video conferencing was important when "visual interaction is required", for instance if "the subtle nuances of facial expression is important".

Some indicated that desktop video conferencing could be useful for developing a sense of "social presence and community", particularly "with off-campus students to give them a more inclusive and intimate experience".

Pedagogical situations considered by respondents to lend themselves to the use of desktop video conferencing included facilitating collaboration during project work, providing consultation hours, liaising with postgraduate and higher degree research students, and enabling online talks by guest speakers. The lightweight and easy-to-use nature of the software meant that some respondents felt desktop video conferencing was suitable for brief communication events and "informal" teaching situations, such as remedial instruction or question-and-answer sessions before exams, and checking in with students "in the field". Some responses underscored the pedagogical impact of using desktop video conferencing, including that it could be used to increase the level of interaction, engagement and motivation. Desktop video conferencing was viewed as a tool for facilitating "learning conversations" and "dialogic pedagogies". Several respondents alluded to the power of placing desktop video conferencing technology in the hands of the students to enable "student-to-student interactions".

Web conferencing was seen to cater to a far greater variety of group sizes – anywhere from small groups, to tutorial-sized groups, to larger classes of "up to 100". Several responses highlighted the flexibility of web conferencing; that it "can be used in almost any situation". One respondent identified web conferencing as being suited to "1) small group situations when the purpose is to engage in learning conversations and question and answer discussions after a short presentation using relevant slides, 2) guest presentations and webinars when the

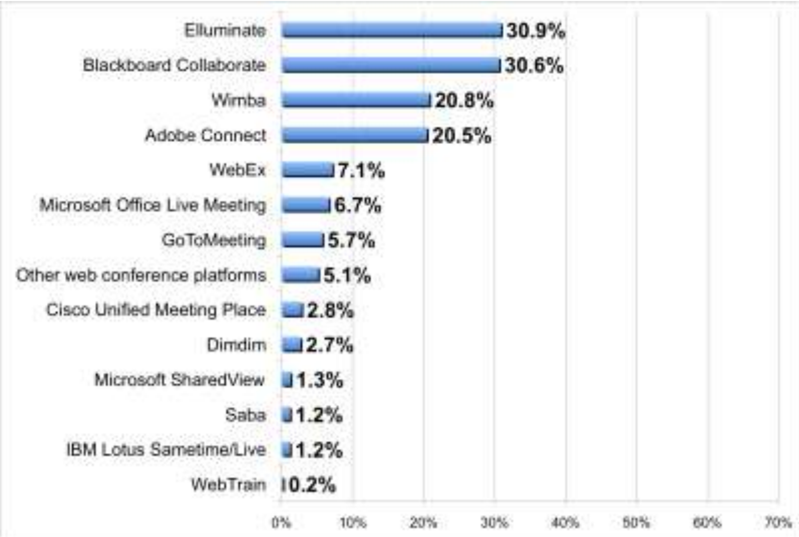

Figure 3: Percentage of respondents using a range of web conferencing tools

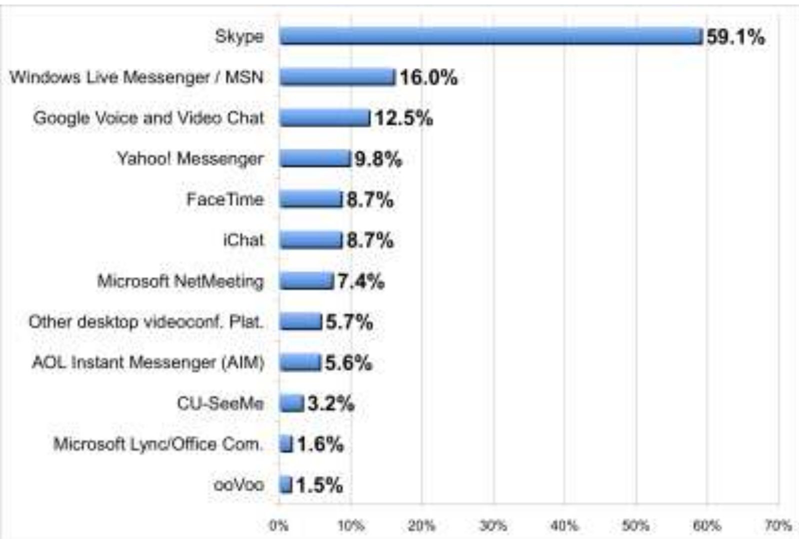

Figure 4: Percentage of respondents using a range of desktop video conferencing tools

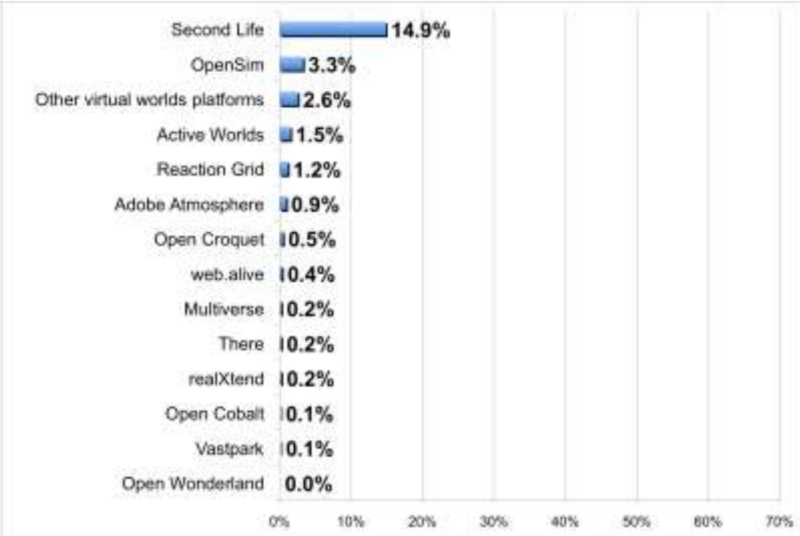

Figure 5: Percentage of respondents using a range of virtual world platforms

audience is geographically dispersed and they would be able to attend in person, 3) student presentations and small group work". Other uses perceived as appropriate included lectures, student project collaboration, student presentations, providing online consultation hours, and briefs to large distance cohorts on assessment tasks. Some respondents expressed a view that web conferencing had the potential to transform pedagogy, for instance by using the separate audio and text channels to "allow more tutorial-style chat rather than a straight lecture".

Several respondents related the selection of web conferencing to whether or not it afforded the required tools for the learning and teaching situation. For instance, one respondent indicated web conferencing was useful when "enhanced functionality such as screen sharing, voting, content sharing and collaboration are required". Other suitable uses included "sharing files, PowerPoints etc plus real-time discussion… developing shared understandings through whiteboard activities". Some respondents also identified the capacity to use "breakout rooms" as a distinct advantage for groupwork. Whereas desktop video conferencing was seen more as a tool that was used more incidentally, some people identified that for web conferencing sessions the presenter needed to be prepared. For instance, one respondent indicated that for large groups web conferencing "relies on well-organised and planned use by moderator", but that even small groups also require "planning and practice if a formal session". One respondent remarked that "the advantage of web-based conferencing programs is that the students can fully interact with the academic, other students *and the subject material*" (emphasis added). Like desktop video conferencing, web conferencing was also seen as a way to "enhance sense of belonging to group", where the persistent nature of rooms could provide "sustainable connections for communities of practice".

Virtual worlds were viewed by many of the respondents as a way to overcome limitations of the physical world, or in the words of one individual, "doing things that can't be done in the physical space for technical/legal/safety/practical reasons, e.g. simulate dangerous equipment, processes etc". Often, pragmatic reasons (such as financial considerations) were seen as a driver for choosing to use virtual worlds: "time, money and inability to do in real life are other excellent reasons to use a virtual world", an example of this being "exploration of environments not otherwise available due to size or cost or distance – e.g. exploring nano spaces or designing sustainable buildings or visiting virtual museums". In contrast to video conferencing and web conferencing, virtual worlds were seen as a way to provide a more "immersive" experience. One respondent saw as an advantage of virtual worlds the fact that students could choose to remain anonymous, and another felt virtual worlds could be used to nurture the social skills of some students who might lack confidence. Respondents rarely identified group size as a factor when deciding to use virtual worlds.

Some respondents felt that the range of uses of virtual worlds was almost limitless, with some of the many possibilities including "lectures, discussions, guest presenters, WebQuests, scenario-based training, simulations, role-plays, tours, excursions, bring[ing] people together from dispersed/remote locations, meeting experts from around the world, group work, collaboration, one-to-one [and] one-to-many synchronous work, asynchronous learning, only limited by your imagination". Other suggested uses included virtual field trips, demonstrations, conferences, decision-making scenarios, as well as problem-based learning activities. Virtual worlds were seen as useful to facilitate game-based learning, and for assessment purposes. Some felt that virtual worlds tended to be more "discipline based", for instance developing "clinical skills" in health-related disciplines, and in visiospatial disciplines such as creative arts and architecture. Virtual worlds were also seen as valuable for “language learning” and “cross-cultural collaboration”.

There was a range of comments relating to the technological requirements for and capabilities of each type of tool. The general consensus of these comments was that desktop video conferencing was easier to use than web conferencing, which in turn were seen as having a lower technical overhead than virtual worlds.

Discussion

Higher education institutions often make decisions about media-rich real-time collaboration technology deployment without any clear understanding of the tools that are available or how they are being used. Literature relating to these technologies is somewhat disjointed, meaning it is difficult to piece together a unified conception of the use of these technologies across the sector. This paper adds to the literature by providing an overview of how rich-media synchronous technologies are being used in Australian and New Zealand universities for learning and teaching purposes.

Based on the sample of 750 university teachers, desktop video conferencing and web conferencing are the most frequently used type of tool for learning and teaching purposes (approximately 39% each), with only 7.4% of tools identified falling into the virtual worlds category. The use of web conferencing and desktop video conferencing has more than doubled in the last four years; by contrast, the use of virtual worlds only increased by approximately 50% in the same time period, and actually declined from 2010 to 2011. The most frequently used rich-media collaboration product was the *Skype* desktop video conferencing tool, reported to have been used by 59% of respondents. The *Elluminate* and *Blackboard Collaborate* web conferencing systems were the most popular commercial tools, each enjoying 31% usage, followed by *Wimba* and *Adobe Connect*, each with 21% usage. The *Second Life* virtual world platform was the seventh most used of the tools (15% usage), slightly less popular than *Windows Live Messenger* (16%). The commercial and competitive nature of the web conferencing domain is likely to result in continued shifting of market dominance in the medium-term future, whereas desktop video conferencing and virtual worlds appear as though they will each be more or less monopolised by single products in a similar timeframe.

Responses from survey respondents with a broad range of experience teaching with media-rich real-time collaboration tools indicated that desktop video conferencing is generally most suitable for small-group and often informal sessions where audio and video are the modes of communication required. According to them, web conferencing adds the potential to cater to larger audience and enables more advanced modes of sharing (presentation slides, voting, drawing on a shared whiteboard, and use of breakout rooms for small-group discussion), but calls for greater levels of facilitator skill and preparation. Virtual worlds were essentially seen by these users as being useful as a simulation environment to overcome real-world logistics and to facilitate a more situated or contextualised and immersive learning experience.

Conclusion and future work

Eventually, improvements in telepresence technologies and associated hardware devices will mean that people from multiple locations around the world will be able to interact as though they are located in the same room. Until then, educators are tasked with the challenge of making the most of available media-rich synchronous technologies to facilitate real-time interaction between remote and on-campus learners and teachers. The findings from this study demonstrate that a range of web conferencing and desktop video conferencing tools are increasingly being used in Australian and New Zealand universities in order to achieve this interaction, with virtual worlds also being used in a smaller number of cases. It is intended that the findings from this study support higher educators and their institutions in making better-informed technology-selection decisions.

The authors plan to undertake further analysis of both the qualitative and quantitative survey data to yield deeper insight into the specific ways in which the tools are being used to simultaneously involve face-to-face and remote learners in real-time collaborative activities, as well as to identify determining factors for various clusters of users based on their tool use. The broader project of which this study forms a part is ongoing, with the project team working to develop a collection of learning design exemplars in the form of reusable templates encapsulating key pedagogical features and patterns, a technology capability framework to inform tool selection and use, and a set of practical guidelines to assist higher educators in designing media-rich real-time collaborative learning activities involving face-to-face and remote students. With reference to the survey data, six case-study implementations involving participating staff from several universities have been identified and are being followed and investigated through participatory evaluation. The project team is working closely with the case-study partners to encourage renewal and enhancement of their existing practice, with the processes and outcomes to be documented and shared for the benefit of the higher education community.

Acknowledgement

This study was supported by an Innovation and Development Grant from the Australian Learning and Teaching Council (ALTC), whose functions have largely been transferred to the Office of Learning and Teaching (OLT). The views expressed in this paper do not necessarily reflect the views of the ALTC and/or OLT.

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Assessment, Physical Education and Mobile Learning

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Margot Bowes is a lecturer in physical education at the Faculty of Education, University of Auckland. Her research expertise, publications and teaching are in three key areas: critical pedagogies for teaching and learning in physical education; high-stakes assessment in senior school physical education (SSPE), and teacher professional learning and development (PLD). Her thesis theorised enhancing teachers' understanding of critical evaluation using the Productive Pedagogies Research (Hayes, Mills, Cristie & Lingard, 2006). She use's qualitative, interpretive methodologies and socio-cultural theories of learning as conceptual frameworks to research in her three key areas. Her most recent research interest focuses on challenging the appropriateness of predominantly written language-based theoretical work, as valid forms of assessment for SSPE that serves to reinforce the scientism of mind/body dualism in physical education (Thorburn, 2007) and often disengage students. This interactive workshop will share innovative i-assessment opportunities that CEDD and Margot are exploring in teacher education as evidence for making non-written valid judgements for assessment in NCEA.

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Manager Centre for Educational Design and Development
University of Auckland

Lawrence May
Project Facilitator, Faculty of Education
University of Auckland

Intended audience and degree of expertise/past experience required

Education professionals with interests in authentic assessment and e-learning

Statement of objectives for the workshop

1. Explore and provide feedback on the innovative i-assessment strategies used in teacher education programmes
2. Share and discuss assessments that do not focus on written tasks for high stakes assessment in senior school physical education
3. Develop a professional learning community to further develop, trial and research i-assessments

Detailed description

Thirty years on from the introduction of assessed senior school physical education (SSPE) in New Zealand there appears to be a mismatch between what physical education claims to offer students with the reality for senior students and teachers around large assessment workloads, the hegemony of theory-based teaching practices and devaluing of practical teaching and learning in SSPE. This mismatch is especially poignant given the concurrent implementation of the New Zealand Curriculum (NZC) that sets challenges for teaching as inquiry and effective pedagogy. Self-directed and reflective learning that demonstrates complex, independent thinking of socio-cultural and bio-physical contexts is a desired outcome for students in Senior school Physical Education. This learning is enhanced by the curriculum objectives informing SSHPE. Hay (2006) argues that, in physical education, assessment for learning should be "based in movement and capture the cognitive and psychomotor processes involved in the competent performance of physical activities" (p. 316). This brings into question the appropriateness of predominantly written language-based theoretical work as valid forms of assessment for SSPE. NCEA and Scholarship Standards attempt to acknowledge the inter-relatedness of cognitive, physical and affective knowledge in physical education by requiring students to "apply bio-physical and socio-cultural knowledge gained through experiences in, through and about movement" (Ministry of Education, 2003, p. 1), but it could equally be argued that this form of assessment privileges written assessment over verbal and visual methods as valid forms of evidence for high stakes assessment.

This workshop will share a description of the issue of disengagement by physical educated students through the overuse of written assessment and briefly explore the theoretical underpinnings of this. The interactive workshop will explore and share innovative i-assessment, ideas using iPad applications, that we are exploring at the University of Auckland in Teacher Education, for repositioning physical education SSPE assessment as more relevant, more manageable and more engaging for physical education students and teachers. Both student and researcher perspectives will be shared with participants.

eLearning lecturer workload: working smarter or working harder?

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Lecturers who move into the online learning environment often discover that the workload involved not only changes, but can be overwhelming as they cope with using digital technologies. Questions arise, given the dissatisfaction of lecturers with lowering morale and increasing workload, whether future expansion of this teaching component in tertiary institutions is sustainable. The challenge facing lecturers now, and in the future, is about learning workload management strategies which effectively manage the workload they encounter in the online learning environment. This paper describes a case study (which is a work-in-progress) examining the perceptions of online workload cf. face-to-face teaching of lecturers who are experienced in e-teaching. As well, it identifies strategies the lecturers have developed or adopted to manage this element of their workload.

Keywords: lecturer workload, workload strategies, workload management , e-teaching, elearning

eLearning lecturer workload – an overview of the literature

Literature specifically about elearning lecturer workload is relatively sparse and inconclusive. There are a number of reasons for this. Firstly, there are no systematic, comparable models for allocation of academic workload within or across tertiary institutions either in New Zealand or internationally. In some New Zealand universities a 'rule of thumb' workload approach seems to be a workload ratio for academic staff of 40:40:20 i.e. 40% teaching duties, 40% research and 20% administration. Tynan, Ryan, Hinton and Mills (2012) recently found that Australian universities have broad guidelines on workloads, and most have a workload hours allocation formula. However, none have comprehensive, detailed workload allocation models or workload allocation models that take into account the range of tasks which e-teaching requires. This study also found that "[work] overload due to e-teaching was a significant factor in staff dissatisfaction" (p.2). Secondly, there are wide variations in what is included in the category of elearning workload for lecturers. Some studies included generic technical support of students and other (generally) non-academic functions (e.g. Cavanaugh, 2005). Another variable to consider is whether course design per se should be included as part of the lecturer workload. Spector (2005) leaves it out of workload considerations, but Nichols(2008) notes that creating an online course (or one for hybrid learning) takes significantly more time than designing one for on-campus delivery. Thirdly, there are a wide range of other factors contributing to workload such as lecturer variables (e.g. high or low level of experience with elearning). Other variables include course type and design variables (e.g. blended learning or fully online, type and intensity of learning activities), and infrastructure variables (e.g. availability of instructional design and technical support). The pedagogy espoused by the lecturer (e.g. transmissive cf. constructivist) also influences workload. There is also the variable of class sizes - boutique post-graduate classes are very different from larger undergraduate classes. O'Hare (2011) reports of an Australian University course with a typical staff:student ratio of 1:75, being taught by part-time online tutors at 12 paid hours per week, i.e. approximately 9 and a half minutes per student per week.

Some of the available literature is, in some instances, 'singular case' experience of an individual lecturer – autobiographically-based on the experience of the paper's author teaching a single course (e.g. Cavanaugh, 2005). Other instances are case studies involving small numbers of staff (e.g. Donaghy and McGee, 2003). More recent studies (e.g. Conceição and Lehman, 2011, and Tynan et al., 2012) are now emerging which report on interviews with larger numbers of lecturers (38 and 88 respectively). These studies are beginning to provide some breadth to complement the depth of previous studies.

In general, the literature that indicates the online workload is less than teaching face-to-face (FTF) classes (e.g. DiBiase, 2000) is the exception. A number of writers conclude workload is about the same as teaching face-to-face classes (e.g. Thompson 2004, Anderson and Avery 2008). A recent study by Van de Vord and Pogue (2012) indicates slightly more time per student for FTF classes, but more time is spent online evaluating student work. Most other studies maintain that the workload is considerably more than teaching face-to-face classes (e.g. Cavanaugh 2003, Shaw and Young 2003). Visser (2000) and Tynan et al. (2012) concluded that more time is needed to teach online than in a purely face-to-face setting.

To sum up, because of the relative scarcity and variability of the literature, only tentative conclusions can be drawn. However, the current literature tends to support the hypothesis that elearning lecturer workload is at least the same as teaching face-to-face, but more likely to be greater than similar face-to-face teaching.

eLearning lecturer workload management strategies

Given that the addition of an elearning component to a lecturer's workload maintains or usually increases that workload, the interest of this research is in the strategies that lecturers who are experienced with elearning employ to manage that component of their workload.

Nichols (2008) addresses this topic in a section of his e-Primer series written as a handbook for lecturers new to elearning. Included in the handbook is a study by Ragan and Terheggan (2003), which outlined a more detailed set of strategies based on an e-teaching professional development course for lecturers at Penn State University. An example of a more recently published, comprehensive study examining workload is that of four Australian Universities contained in the Out of Hours project report (Tynan et al., 2012). Conceição and Lehman, (2011) provide, in their recent book, an example of a research-based approach to online workload management a using survey of 38 participants with 14 follow-up interviews. Some elearning workload management literature addresses this theme in an anecdotal way, usually based on the personal experience of the authors – the 'tips and tricks' approach (e.g. Paloff and Pratt, 2001, Boettcher and Conrad, 2010).

However, further research to explore elearning workload strategies is justified for several reasons. Firstly, research may uncover new workload management strategies as well as confirm the usefulness of existing strategies from the contemporary experience of practitioners. Secondly, publication of the research can help to disseminate these workload strategies to provide pragmatic assistance for new and experienced electurers.

Research questions, design and progress

The purpose of this research is to investigate the question of workload management for lecturers who are engaged in online teaching. Specifically the hypothesis is that lecturers who are experienced with online teaching will have developed a range of strategies for managing this component of their workload. The research question is: What are the effective work practices of experienced e-learning teachers which enable them to manage the workload of online programmes by working smarter not harder?

Case Study methodology

This research uses a case study methodology. Yin(2003) defines a case study as an empirical enquiry which researches a contemporary phenomenon within its real life context, particularly when the boundaries between phenomenon and context are not clearly evident. A limitation of the research is that selection of the lecturers was purposive and from a single institution, using the criteria that "cases are hand-picked for a specific reason" (Lewin, 2005:219). The case is of volunteer lecturers experienced with online learning from a New Zealand university, participating in a semi-structured interview. Workload strategies identified in the interviews are compared with the strategy framework outlined by Ragan and Terheggen(2003).

Job descriptions and workload allocation models

In terms of formal job descriptions, none of the lecturers interviewed so far have any clauses indicating that eteaching is part of the lecturers' workload. As all had been employed at the university five years or more (some over 20 years) this is not surprising. Most new academic job descriptions as advertised since 2011 do have a standard statement covering this component. Only one faculty (out of seven) has a workload allocation model which takes into account workload hours allocations for different elements of the job. This workload allocation model included a higher weighting to acknowledge that elearning involved an increased workload.

Workload comparisons

Interviews completed so far have confirmed the tentative conclusions of the current literature in terms of elearning lecturer workload. That is, the perception of all but one of the lecturers is that either equivalent time or more time is invested in elearning than learning delivered by face-to-face teaching. Some lecturers report the workload as being similar, but 'chunked' differently – online workload being experienced in smaller, more frequent time slots than face-to-face teaching commitments. One lecturer commented that it was easier to teach fully online than a mixture of online and face-to-face classes. Another lecturer commented that the major time investment was in setting up the course, but after that the time spent facilitating was reduced cf. face-to-face classes.

Workload management strategies

There is also some consistency with several of the workload management strategies outlined by Ragan and Terheggan (2003); such as establishing a predictable routine for course interaction, and using an LMS (Learning Management System) to focus communication and interaction. Interestingly, several lecturers had a policy of refusing to answer student email, all course-related communication and interaction had to be via the communication tools available within the LMS. This was identified as a conscious workload management strategy to circumvent email overload, a problem noted in some of the earlier workload studies. However, lecturers also identified specific extra work created by using the LMS, for example the time required to upload individual assignment feedback files for large classes.

Several lecturers had a strategy of deliberately not interacting with students in courses outside of normal working hours. While they might 'lurk' or view discussions or other online activity in evenings or weekends, they resisted posting in order to prevent any student expectation that they were the '24/7 lecturer'. Other lecturers specified response times as part of the course orientation – they would respond within a certain time frame to postings, but not during weekends, for example. Regular attention to what's happening on the online course is identified by several as a key workload management strategy – 'little and often' being recommended as better than less frequent, longer time allocations. Interestingly, Ragan and Terheggan (2003) imply the importance of time management strategies as part of their workload strategy framework but do not explicitly list any specific time management strategies per se.

Another key component to managing workload for several lecturers was advance preparation of online courses, learning activities and resources. While 'just in time' alterations were sometimes necessary, teaching workload was considered to be much more easily managed if the course was completely or substantially ready before the course was opened for student interaction. One lecturer identified the importance of trying to "see the course as the student sees it" so students weren't confused, anxious and unclear about what they were meant to be doing. He concluded that for him, this was "managing my workload by good course design".

Coaching and mentoring

The most important way that lecturers reported they had learnt these workload management strategies was from being mentored by a more experienced colleague and/or co-teaching an online course with a more experienced colleague. One lecturer gained insight into workload management from detailed recording of her online activity and reflecting on time spent on different tasks. Others reported working out strategies by trial and error for themselves. Attending professional development workshops and courses was mentioned by two as beneficial.

Innovative management strategies

Some practices outside of the scope of the strategies outlined Ragan and Terheggan (2003) have also emerged from the interviews. These include simple but effective 'do not disturb – I am teaching' signs on office doors while working online; time blocked out in online staff calendars for this purpose; and phones diverted to voicemail to enable complete focus on the e-teaching task. Some lecturers informed new online students of 'phone-in' times when they are available for phone help or advice, allocating a short, specified time during normal working hours. Lecturers also reported workload strategies which involved encouraging students to help students –for example having a discussion forum 'Questions for Anyone' where students answer each other's queries. Another strategy reported was the '3 b4 me' protocol – that lecturers would wait for at least three responses or concurrent queries before replying, to see if students could problem-solve the issue for themselves without lecturer intervention. One lecturer notified students of different lecturer response strategies specific to different discussion forums; responding regularly to most postings; providing a summative summary only; appointing a student moderator who facilitated and summarised postings. Another lecturer used podcast audio feedback for students as an efficient and personal way of providing feedback on assessments.

Summary and conclusions

The workload management strategies discussed during interviews so far represent tactics employed by experienced eteachers to manage their workload – but not always within the conventional working hours of the five-day week. Most lecturers acknowledged the overflow of work into 'out of hours' time was probably inevitable. However, they noted this typically involves other aspects of the teaching job as well as elearning (for example, marking assignments and exams). The pressure of elearning workload forcing lecturers into the role of the '24/7 professor' remains problematic, but not insoluble. Other strategies may emerge from further interviews, and more thematic analysis of the interview discussions is currently on-going. However, it must be remembered that at least part of the future and sustainability of elearning depends on lecturers managing their elearning workload effectively so that they don't 'burn out' from workload demands.

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An online community designed to support future makers in educational reform

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Australian education is undergoing national reform at many levels. The school sector, where pre-service teachers will be employed, are adjusting to the demands of the National Curriculum and improving teacher quality through the National Professional Standards for Teachers. In addition, the university sector, where pre-service teachers are prepared, is undergoing its own education reform through the introduction of a demand-driven system and ensuring quality for tertiary education interns through the Higher Education Standards Framework. In moving to prepare pre-service teachers for the school system; universities are grappling with the double-barreled approach to teacher quality; quality within the university course and quality within the student teachers being prepared. Through a collaborative partnership including university lecturers, Department of Education central administration staff, school principals, school coordinators, practicum supervisors, mentor teachers and pre-service teachers; the stakeholders have formed an online community of learners engaging in reflective practice who are committed to improving teacher quality. This online community not only links the key stakeholders within the project, it facilitates the nexus between theory and practice often missing in our pre-service teacher placements. This paper reports preliminary data about an initiative to ensure final year pre-service teachers are aspiring to meet the graduate professional standards through the use of an innovative online community.

Keywords: online learning, national teacher professional standards, pre-service teachers

Introduction

There is increasing focus on teacher quality and standards within Australian education practices, including the school and university sector. At the university level, the Tertiary Education Quality and Standards Agency (TEQSA) is Australia's quality agency for higher education. Its primary aim is to "ensure that interns receive a high quality education at any Australian higher education provider" (Commonwealth of Australia, 2011).

In terms of schools, the Australian Institute of Teaching and School Leadership (AITSL) is charged with providing national leadership on the promotion of excellence in the professional practice of teaching and school leadership. The National Professional Standards for Teachers explicitly state what teachers know and should be able to do at four career stages including: Graduate, Proficient, Highly Accomplished and Lead (Education Services Australia, 2011). The purpose of the standards are:

> To contribute to the professionalisation of teaching and raise the status of the profession. They could also be used as the basis for a professional accountability model, helping to ensure that teachers can demonstrate appropriate levels of professional knowledge, professional practice and professional engagement (MCEETYA, 2003, p. 11).

In order to ensure pre-service teachers are entering the workforce with the skills, knowledge and attributes of a Graduate Teacher, current teacher education programs offered by universities must explicitly connect with these standards.

Background

The National Professional Standards for Teachers describe what is required of teachers at four levels - Graduate, Proficient, Highly Accomplished and Lead - and support the collective responsibility of the profession to ensure that those who teach possess or will develop crucial knowledge and skills at differing stages of their career. The standards articulate what is required of teachers at each level and in doing so, aims to support improved access to quality teaching for all Australian students. The seven standards are grouped into three main domains including: Professional Knowledge, Professional Practice and Professional Engagement. Professional knowledge includes understanding how students learn, knowing the content and how to teach it. Professional Practice includes planning and implementing teaching, creating safe environments and assessing understanding and providing feedback on student learning. Professional Engagement includes engaging in professional learning throughout each level and engaging professionally with colleagues, parents and the wider education community (Australian Government, 2012).

To support education reform, the Federal government has invested significant funding into the National Partnership for Improving Teacher Quality. This program targets critical points in the teacher 'lifecycle' to attract, train, place, develop and retain quality teachers and leaders in our schools and classrooms (Australian Government, 2011).

In June 2011, the Department of Education in Western Australia called for tenders to address a National Partnership for Improving Teacher Quality: Training Schools Project.

The combined universities training schools project, more regularly known as WACUTS, includes three universities in Western Australia. A conceptual framework of the project is depicted in Figure 1. The project prides itself on a strong professional learning model where induction, formalized mentor training, CMS certification and rural field experience for interns and ongoing portal reflections are key to the quality of the project.

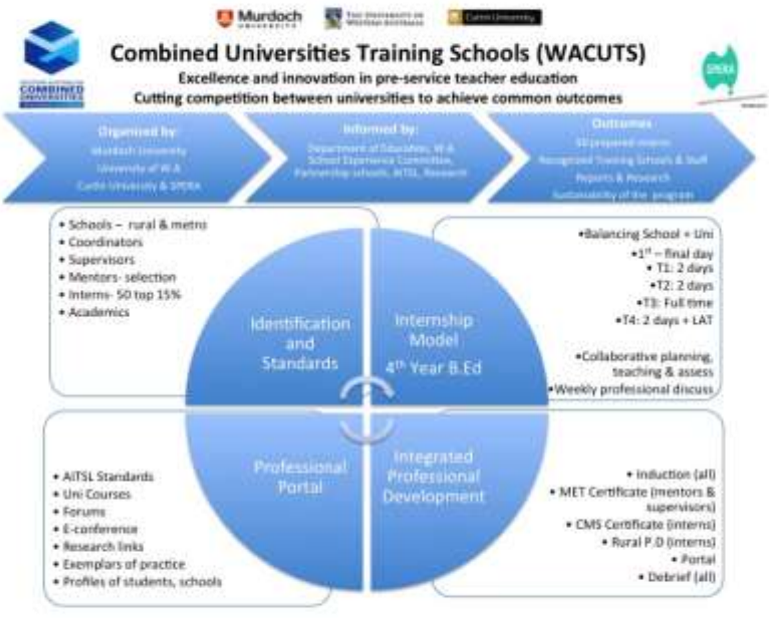

Figure 1: Conceptual Framework of WACUTS project.

Increasingly, the literature refers to the notion of a professional learning community within an e-learning environment, where teachers have convenient access to ongoing support, collaborative learning, and meaningful and stimulating discussion (Davies, Ramsay, Lindfield & Couperthwaite, 2005; Henderson, 2006; Herrington & Herrington, 2001; Rablin, 2007). A professional learning community, whether face-to-face or online, is an effective form of professional learning as the focus is on the teachers as members of a wider community of learners (Lloyd and Cochrane, 2005). The ethos of a professional learning community in the education arena is built around the continuous study of teaching and learning. Teachers who engage in these learning communities are working together to expand their teaching repertoire.

The professional portal, developed using Coursesites, is an imperative platform to enhance the online learning community that has evolved between all stakeholders within this project. This paper will report on the engagement occurring within the portal environment that is changing the discourse of pre-service teachers in a time of educational reform.

Research Context

The WACUTS project is based on an innovative internship program where 50 high achieving (top 15% of cohort) final year Bachelor of Education and Master of Teaching students were selected from within the teacher education programs at the three universities. The interns (n=50) were then placed in training schools, where 50 specifically selected mentor teachers were identified between the three universities and school leaders. Each training school appointed a school coordinator who facilitated the project within the school environment and was considered the conduit between the school and university staff.

The first year of the project started in January 2012. In this inaugural year there were 31 interns placed in metropolitan schools in the Perth area and 19 interns placed in regional schools outside of the Perth area. This project has three university academics from three different universities working closely with a project manager who is also a member of the Society for the Provision of Education in Rural Australia (SPERA). This link has ensured that the complexity of placing pre-service teachers in regional schools was considered in great detail. The importance of travel, accommodation and support for these interns was entirely different to the cohort of interns working in the metropolitan area.

Methodology

An open source Learning Management System (LMS) known as Coursesites, referred to as the portal within this project, was selected to host the online community to be engaged in the project. This system is powered by the latest technology from Blackboard 9.1 and was selected for the suite of collaborative tools available, to ensure synchronous and asynchronous communications were possible. All project participants were emailed an invitation to the portal and self-registration was required at that point.

Data were extracted from the course statistics within the portal to ascertain user statistics, number of discussion board posts and number of blog posts. Further qualitative analysis of this data will be presented in future research as the project progresses.

Results

At the time of this paper, some six months into the inaugural WACUTS project, there were 109 valid users within the portal. The total (n=112) included one test user established by the portal manager, one Blackboard administrator user and one valid user that had registered with two different email addresses, causing one of his logins to be considered invalid. Table 1 depicts the number of users enrolled in the portal and their role in the WACUTS project.

Table 1: Portal users by title and role.

Title	Brief Role Description	Users
Intern	Final year Bachelor of Ed. or Master of Teach student who is placed in one school for final year of studies.	50
Mentor	Classroom teacher who mentors and establishes a co-teaching relationship with intern.	27
School Co-coordinator	Facilitates and co-ordinates the project within the school.	15
Principal	School leader.	10
University Co-coordinator	University placement officer; school experience or practicum coordinator.	2
Project Team	Three academics from three universities; one project manager.	4
Department of Education representative	Training School Project Team employed within the Department of Education central office.	1
TOTAL		109

Reflective practice, blogging and professional standards

This section will provide a context to the reflective blogs and the number of blogs posted to each professional standard within Term 1 and 2, 2012.

Intern reflections are an integral part of the project. Reflections should demonstrate the interns' capacity to think critically about learning and teaching, together with discussion of the interns' growth as a teacher. Interns produce reflective prose, however, are encouraged to attach documents, images etc. as necessary for evidence of working toward the standards.

Each school term, interns are required to post at least one blog within the portal to address the seven National Professional Standards. Throughout the year of internship, this should culminate in a professional learning log or eportfolio of blogs that cover the seven standards. In this first instance of posting reflections, interns were scaffold through a number of direct questions that linked the standard to their university course requirements.

In Term 2, the interns were provided with less structure and asked to reflect on their Term 1 blog entry and provide a connection between the standard, their first blog, one university unit/course and specific classroom/school examples.

Over the two terms, inclusive of 21 teaching weeks, a total of 341 reflective blogs were posted to the portal. These blogs addressed the seven standards.

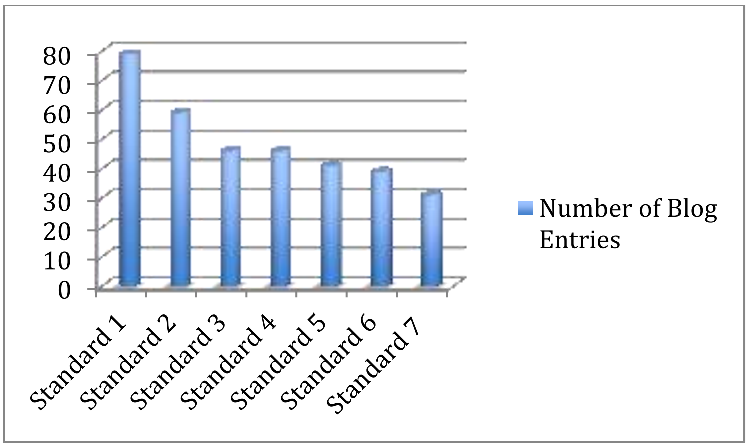

Figure 2: Number of reflective blogs for each Professional Standard in Term 1 & 2.

As reported in Figure 2, 79 blogs were posted to *Standard 1: Know interns and how they learn*; 59 blogs were posted to *Standard 2: Know the content and how to teach it*; 46 blogs posted to *Standard 3: Plan for and implement effective teaching and learning*; 46 blogs posted to *Standard 4: Create and maintain supportive and safe learning environments*; 41 blogs were posted to *Standard 5: Assess, provide feedback and report on student learning*; 39 blogs were posted to *Standard 6: Engage in professional learning* and 31 blogs were posted to *Standard 7: Engage professionally with colleagues, carers and the community.*

Strategies for online community building

This section will outline the five additional aspects of the portal that demonstrate the rich community that is being developed within the WACUTS portal. The portal is used to connect all participants in the project at all levels and is the main forum for dissemination of information; to ensure consistency in communication is received by all interns, mentors, school based co-ordinators, university co-ordinators and principals. More importantly, the portal has provided a platform for a community of practice around the combined universities training schools project.

1. The *Announcements* tool is highly utilised by the project team in order to provide important information regarding professional development sessions, university commitments, professional standard blog reminders and general communications.
2. Outside of the *Intern Reflection* blogs and the *Announcements* tool, the most utilised section of the portal are the *Coffee Lounges.* These informal discussion boards are split into the different user roles as mentioned in Table 1, however interns have a personal discussion thread, and all other users have a shared discussion thread. At the time of writing this paper, there were 114 posts in the Intern lounge and 23 posts in the 'other' users lounge.
3. The portal section, *In The News*, has developed a sense of wider community engagement through newspaper articles, school newsletters, community radio shows and digital videos that have showcased the interns, mentors and schools within the project. In the first six months, there were four artefacts loaded into the portal.
4. The course menu entitled *Partnership Schools*, provides the specific school logo and a web link to each school that is engaged within the WACUTS project. Users are able to connect quickly to other schools within the project and view the website of that school.
5. As timely topics for discussion arise, the section *Education Topics for Discussion,* is used to host youtube videos, journal articles, news links and websites. Of importance are the professional dialogue that arises from viewing such material. In order to encourage this dialogue to occur, a discussion board forum is attached to each topic of interest.

Discussion

The number of users enrolled in the portal closely reflected the number of people participating in the project. One challenge faced by the project team, was the issue of timely self-registration by participants. Due to the self-registration process the full number of enrolments was not achieved from the first email invitations, this meant further portal invitations including reminders were required throughout Term 1. In fact, there is evidence to show that some school-based staff had still not registered. This causes some concern in terms of ensuring regular updates of professional development and communications are being delivered to all school-based staff. Further, due to the total number of mentor teachers enrolled, it would appear they are the group least represented from their total numbers i.e 27/50.

The collections of intern blogs are paramount to documenting the success of interns moving toward the Graduate level of the professional standards. The blog tool within the portal appears to be the most appropriate tool to support the ongoing reflections of interns over one full year. Currently, university staff provide feedback to interns regarding the content of the blogs. This raises the notion of collegiate responses from others in the project and the possibility of mentor teachers or school based co-ordinators contributing to such valuable professional discourse. Consideration would need to be given to the impact on the demands already placed on teachers and workload issues associated. Currently, there are some cases of interns providing peer review of intern blogs and this could be further encouraged and developed in Term 3 and 4.

It is noticeable within the chart depicting number of blogs posted that a decline in posts has occurred since Standard 1. This could be due to many interns preparing and undertaking university exams during Term 2, which appears to have impacted on the number of interns posting their reflective blogs. Although there is a relative degree of flexibility in the due date of reflections, the due dates for Standards 5, 6 and 7 had not fallen at the time of writing this paper. These two reasons could provide a better understanding of the gradual decline in blog posts evident in the graphical representation.

The five initiatives within the portal to develop the online community have proven to be highly successful to this point. It is clear from the *Coffee Lounges* that interns use informal connections more than mentors. Anecdotally, a small number of mentor teachers within the program have been attempting to drive a more networked collegiate approach to mentoring, however have been less than successful to this point. In the future, the use of synchronous technologies, such as the virtual classroom, will aim to provide a better connection point for mentor teachers.

Conclusion

In a time of education reform where the National Professional Standards for Teachers (Australian Government, 2012) are driving the school experience and pre-service teacher university programs; this paper has delivered an innovative method of supporting pre-service teachers (known in this project as Interns) through an online community. The standards provide a statement of what constitutes teacher quality at all levels including graduates and as such can provide a keystone for the field experience model.

The very nature of the online community described in this paper, which resonates with Davies et.al. (2005), allows for collegiate networking and support across all key stakeholders including university lecturers, Department of Education central administration staff, school principals, school co-ordinators, practicum supervisors, mentor teachers and pre-service teachers.

Through the richness of the portal environment, a community of practice has evolved around the central notion of building a mentoring internship program. This online community not only links the key stakeholders within the project, it facilitates the nexus between theory and practice often missing in our pre-service teacher placements.

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Living the new normal: Reflections on the experiences of first-time distance learners

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Significant challenges face traditional distance education. The conventional 'pack and post' model of distance education is under serious threat along with the performance of distance education providers as governments and funding bodies increasingly scrutinize retention, progression and completion rates. The objective of the current study was to contribute to the enhancement of services and resources available for first-time distance learners in the future. The study was framed around Design-based Research involving a mixed method approach over three phases. The third phase was the major component of the study, which involved gathering the lived experiences of 20 first-time distance learners, in their own words, using weekly video diaries for data collection. The research proposed seven key takeaways, alongside seven guiding principles aimed at distance education providers wanting to enhance the success of distance learners in the future.

Keywords: Distance learners, retention, student success, digital learning, video diaries

Introduction

Historically, distance education is rooted in the goals of increasing educational access and promoting lifelong learning and development. Over the 20th Century, distance education has evolved to provide opportunities for study and life-long learning for mature and second chance learners, geographically isolated people and those from minority and lower socio-economic groups, along with students with disabilities (Daniel, 2011).

More recently, anecdotal evidence from distance providers in developed countries report a shifting profile from undergraduate to postgraduate study as the population ages and mid-career professionals strive to advance their careers. There is also evidence of increasing demand from younger students for the flexibility and convenience that distance education provides through the use of digital technologies (Krause et al., 2005). Since the advent of the World-Wide Web, a dazzling array of new possibilities has emerged and a new generation of digitally mediated distance education has fundamentally changed the tertiary education landscape (McKee, 2010). Arguably, new and emerging models of online, blended and distance education have become the 'new normal' in today's socially wired and globally connected world.

In contrast to the traditional first generation correspondence model of distance education (Taylor, 1995), or the 'lone wolf' approach to distance learning, Tennant, McMullen and Kaczynski (2009) report that online learning is the fastest growing sector of tertiary education. This growth has been driven in part by conventional institutions increasingly adopting new online and blended models of distance education as a 'sunrise industry' with many having established subdivisions to develop it (Simpson, 2000, p. 1). In particular, the enterprise-wide adoption of Learning Management Systems (LMS) in the last decade has helped many institutions to expand into the foray of distance education. As Sir John Daniel (2011) observes, the digital revolution has the potential to transform the 'iron triangle' of distance education 'to achieve wider access, higher quality and lower cost all at the same time'.

Currently, around 26% of students at the tertiary level In New Zealand study by distance education (Ministry of Education, 2010). In 2010, Ministry of Education statistics show that universities account for 25% of total Equivalent Full-time Students (EFTS) studying by distance with 16% of undergraduate degrees being undertaken by distance learners. Although Australia has been a pioneer in this field, over the last decade it is estimated that 15% of university students each year have studied by distance education (Nunan, 2005).

In comparison, in the United States the latest annual survey of online learning claims the number of students taking at least one online course has surpassed six million (Allen & Seaman, 2011). Based on these figures, Allen and Seaman (2011) estimate that 31% of higher education students in the United States now take at least one course online. This claim is further evidence of what is described as 'convergence'—that is, the gradual blurring of the boundaries of the distinction between 'campus-bound' and 'distance learning' paradigms (OECD, 1996).

In the United Kingdom a recent Online Learning Task Force (2011) encourages universities to seize the opportunities that new forms of online learning provide to enhance student choice and meet learners' expectations of greater flexibility and convenience. The Task Force concludes:

> Online learning – however blended with on-or off-campus interactions, whether delivered in the UK or overseas – provides real opportunity for UK institutions to develop responsive, engaging and interactive provision which, if offered at scale, can deliver quality and cost-effectiveness and meet student demands for flexible learning. (Online Learning Task Force, 2011, p.3).

Methodology

The objective of the current study was to contribute to the enhancement of services and resources available for first-time distance learners in the future. The research adopted a mixed methodology across three phases. Phase One involved a stocktake of current institutional services and supports at two large-scale distance education providers in Australasia. The primary data collection technique was document analysis. Informal meetings with staff involved in leading the initiatives at both institutions also helped to clarify questions related to specific services and resources. Initiatives were mapped against the conceptual framework developed by MacKay, Shillington, Paewai, Brown, Suddaby and White (2010) to support different interventions across the study lifecycle.

Phase Two involved the recruitment of first-time distance learners, followed by a baseline survey leading up to and during Semester 2, 2011. The survey comprised two sections: a reflective section followed by a demographic section. The reflective section was structured to gather student perceptions of reasons for undertaking distance study and to explore their perceived approach to study drawing on the concept of deep, strategic and surface study orchestrations taken from the Approaches and Study Skills Inventory for Students (ASSIST) used by Anderson et al. (2011). It was also designed around the Equivalency of Interaction Theory of student interaction with other students, staff and content (Anderson, 2003).

Phase Three had a strong phenomenological dimension where the experiences of first-time distance learners at one of the universities were recorded from their own point of view using video diaries for data collection. Approval to conduct the second phase of the project was granted by lead university's Human Ethics Committee. From a population of 750 potential participants enrolled for the first time at the beginning of Semester Two, 2011, 140 first-time distance learners volunteered to participate in Phase Three. Of these volunteers, 20 students were selected to participate in the video diary phase using Sony bloggie™ cameras. The sample was purposively selected to broadly represent the demographic and geographic diversity of first-time distance learners. The profile of diversity was informed by a demographic analysis of the University's distance students during the 2010 academic year. 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.

Video reflections were gathered using a 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' and 'insightfulness' of information. 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.

An exceptional amount of rich data was collected over the first half of the Semester. During semester-break, participants were given the opportunity to continue or conclude their involvement in the project as they had managed their way through the crucial first few weeks of study. Eight participants chose to conclude, while twelve chose to continue until the end of semester. Although continuation of the video diaries beyond the initial six weeks was not part of the original plan, the research team was mindful of any sense in which the students felt abandoned on conclusion of the study.

Consistent with the intention of drawing on the principles of a phenomenological approach, a grounded strategy was adopted to data analysis. The purpose was to ensure that the student voice was retained at the forefront of the analysis. That said, the researchers' implicit and explicit theories meant that student responses and subsequent data analysis were clearly influenced by pre-existing knowledge. To address this issue as much as possible, the Project Manager was responsible for most of the data analysis and the interpretation of findings was the subject of considerable discussion throughout the data analysis phase among the Project Team; as well as with an Advisory Group of subject matter experts.

The analytic approach was thematic analysis, which is a technique for identifying, analysing 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 followed a 'realist' approach in which the experiences, meanings and lived reality of participants were described as fully as possible to retain a sense of context. Within the limitations of grounded theory, an inductive approach ('bottom-up') was applied, which meant that the major themes arose from the data. Thematic analysis followed Braun and Clarke's (2003) six-step process.

Results

Grounded in the results of Phases One, Two and Three, seven key takeaways emerged from the study. These draw attention to some of the challenges ahead for distance education as it evolves to potentially become the 'new normal' mode of tertiary education delivery:

1. Learner stories add flesh to the 'soft factors' of what it means to be a distance learner. Reflections, recorded in student's own words, provide unique insight into the complexity of studying from a distance.
2. Adopting a conceptual framework that maps services and resources across different phases of the study lifecycle can help institutions to better design and coordinate supports which meet the diverse needs of distance learners.
3. Distance learning was perceived to enable tertiary study to fit around other life, work and family commitments. However, first-time distance students have relatively little conception of the actual demands of studying by distance.
4. Distance students who begin with study goals that are aligned with their wider aspirations and realistically balanced alongside life's other commitments also typically report active study orientations.
5. Although learner stories affirm the importance of the first few weeks of study, there are ebbs and flows in the life of a distance student over the semester; while a second 'at risk' period was identified in later weeks.
6. Digital literacy is variable among first-time distance learners; age and gender are not strong indicators of digital literacy. Irrespective of the level of digital literacy, insights gained from learner stories reveal that few students know how to be effective online learners.
7. Video diaries coupled with the researcher's role influenced student engagement by metaphorically providing a new cave, campfire, watering hole and mountain top for active learning and reflection (Thornberg, 1996). Learner stories highlighted the value of institutions supporting opportunities for first-time distance learners to engage in regular interaction and reflection over the initial stages of their study.

Discussion

Drawing on insights gained from first-time distance learners, alongside contemporary literature on retention, progression and completion, the guiding principles provide a basis for discussion among institutions wanting to deliver quality distance education to meet the needs of students in the future:

- Principle 1: Shared goals
  To what extent does the institution assist students to define their goals and understand whether university-level distance education is the most appropriate study option for them?
- Principle 2: Personal agency

To what extent does the institution develop the capacity (skills, understanding and opportunities) for distance learners to engage and purposively develop their own sense of belonging?

- Principle 3: Adaptive empathy
  To what extent does the institution promote a welcoming culture which seeks to understand the individual and diverse needs of distance students?
- Principle 4: Personalisation
  To what extent does learner profiling and institutional data monitoring allow for customized teaching and learning services to respond to individual needs?
- Principle 5: Transactional engagement
  To what extent do academic staff take responsibility for cultivating a sense of belonging through their curriculum design, learning activities and student interactions?
- Principle 6: Networked learning
  To what extent do online learning environments foster a sense of teacher and learner presence so distance learners feel they are part of a wider learning network?
- Principle 7: Spaces for knowledge generation
  To what extent does the institution intentionally design for reflection and knowledge generation within and across a range of distributed places and spaces?

Conclusion

In the rapidly changing landscape of higher education, the growth of new digital technologies has created significant opportunities for new institutions to enter the distance education community and is transforming the nature of distance education among existing providers. However, in this dynamic environment, it is important not to lose sight of whom the ‘new normal’ of online, blended and distance education serves. Many of the students in this research would not have been able to better themselves or develop capacity to enhance their workplace and potential to transform their local communities without the option of studying by distance. The new fusion of digital and distance continues to play a key role in providing life-long learning opportunities to a demographically, culturally and geographically diverse population at different stages of the learning pathway. In this regard, the learner stories reported in this study offer a glimpse of the benefits of supporting and enhancing different pathways to tertiary education in the future.

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Sustaining new approaches to learning and teaching with technology - more than just a Wicked Problem

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The basic premise of the 2012 Ascilite Conference theme is that; 'what happened in the past is no longer a reliable guide to the future'. However, if we do not learn from what happened in the past, it may well be a reliable guide to an unsustainable future. In the face of constant change, in order for higher education institutions to achieve the goal of creating sustainable approaches to new models and learning and teaching with technology a fundamental paradigm shift in management approaches is required. To address this, an interdisciplinary focus is introduced and two key concepts from environmental management: Wicked Problems and adaptive management are applied to the higher education environment. Using evidence-based practice these aspects have been researched in-depth in a large, mixed-mode university.

Keywords: learning environment, educational management, change management, wicked problems, adaptive management, sustainability

Introduction

> Information technology has brought about much of the economic growth of the past century, accelerating globalization and fostering democracy. Such broad impacts would be impossible if "information technology" were only a set of technologies. As our use of mobile devices, games, and social networks illustrates, information technology can create new experiences. But more important, information technology enables new models. It can disaggregate and decouple products and processes, allowing the creation of new value propositions, value chains, and enterprises. These new models can help higher education serve new groups of students, in greater numbers, and with better learning outcomes.
> As important as information technology might be, technology does not have impact in isolation—it operates as one element in a complex adaptive system... (Oblinger 2012)

When embracing technology and new models of learning and teaching in higher education there is a degree of hesitation noted in our sector. The themes of recent professional conferences in the area of educational technology give some idea where our preoccupations lie and where our recent research focus has been:

- Ascilite 2010 Conference – 'Curriculum, technology and transformation for an uncertain future.' (Available from HUhttp://www.ascilite.org.au/conferences/sydney10/UH);
- DE HUB/ODLAA Summit 2011 – 'Education 2011-2021. Global challenges and perspectives of blended and distance learning.' (HUhttp://www.dehub.edu.au/summit2011/about.htmlUH);
- Association for Learning Technology UK, 2011 Conference – 'Thriving in a colder and more challenging climate.' (Available from HUhttp://www.alt.ac.uk/altc/alt-c-2011UH);
- Association for Learning Technology UK, 2012 Conference – 'A confrontation with reality' (Available from (HUhttp://www.alt.ac.uk/altc2012UH);
- Tertiary Education Management Conference 2011 – 'Riding the Waves.'(Available from HUhttp://www.temc.org.au/temc-2011UH).

An example of the challenges we face in higher education is given by Diana Oblinger, President and CEO of EDUCAUSE who put forward some 'Questions for the future' in an article that is the result of global collaboration on the future of higher education (Oblinger 2010).

Oblinger (2010) notes that higher education is:

> A complex and adaptive system [and] … is influenced by trends in the larger society. Although Australia, the United States, the United Kingdom, and the Netherlands differ in many ways, similar forces are driving change in higher education in all four countries…

Higher education faces numerous challenges posed by the drivers of change, including worldwide demand for education, financial constraints, and a constantly changing knowledge base. Those of us involved with information technology in higher education thus need to ask ourselves several critical questions:

- How can we accommodate the increase in numbers of students without compromising quality?
- What can we do to lower the cost of learning resources?
- How flexible is our higher education system? Does it provide paths to degree completion that suit all students?
- If we were to transform the student experience, what would it look like? What would we do differently? How would those changes affect the individual? The workplace? Society?
- Can we create a better linkage between research and instruction, creating new opportunities for discovery and community?
- What can we do to speed the translation of research into solutions that benefit society?
- What type of administrative services and support will allow the institution, faculty, and students to optimize their time and talents?
- If the college/university metaphor today is a network rather than a campus, what does that mean for our work in information technology?' (Oblinger 2010, p.52)

Those of us who have been involved in higher education for any length of time will probably be thinking, 'familiar', 'not again', 'we went through that X years ago'…These challenges equate to Wicked Problems - the types of problems for which there could be important potential application for the findings of this research.

.Approach

An interdisciplinary focus is introduced by examining two key aspects of environmental management - Wicked Problems and Adaptive Management. Evidence-based practice has been applied by drawing on documented evidence, practical experience and research conducted within the context of the author's institution over a period of nine years. These research studies have applied a variety of environmental management concepts and theory to aspects of management of the learning environment, with a particular focus on the use of educational technology in the technology-enhanced learning environment (Buchan and Buchan 2003; Buchan 2008; Buchan 2010). The breadth and depth of insight from this evidence-based research gives rigour to the findings of this exploration.

Wicked problems

> Some problems are so complex that you have to be highly intelligent and well informed just to be undecided about them. (Laurence J. Peter quoted in Conklin 2005. P.1)

An exploration into environmental management gives us the wicked problem (Buchan 2012)**.** The perspective afforded by a study of the wicked problem contributes to our understanding of the variety of challenges in our broader environment, including an understanding of organisational management.

The term was first introduced into practice in 1969, in an address by Rittel and Webber to the Panel on Policy Sciences, American Association for the Advancement of Science, Boston. It is introduced into the literature in 1973 in Rittel and Webber's definitive article, *'Dilemmas in a general theory of planning'*. It is interesting to note that this article is published in the journal *Policy Sciences*, which is appropriate since policy and planning are fundamental to all organisational, educational and environmental fields of practice (Buchan 2012 in prep).

A search for references to wicked problems reveals thousands of references. References range from personal blog references, daily news items and company reports to scientific and academic research. In the contemporary literature the wicked problem is used widely in formal research as well as informal discussion. The concept of the wicked problem has been applied to Indigenous policy, juvenile justice (Murphy 2010), healthcare systems (Periyakoil 2007), public service policy, software solutions (deGrace & Stuhl, 1990), international enforcement of unregulated fisheries (Osterbohm et al 2010, Wang 2002) and business strategy (Camillus 2008). The use of the wicked problem is widespread in environmental management (Allan 2008). In this field it is more than simply a convenient term, since it is supported by research into management solutions (Allan 2007; Fazey and Schultz 2009; Stankey and Allan 2009).

'Wicked problem' is a term originally used in social planning to describe a problem that is difficult or impossible to solve because of incomplete, contradictory and changing requirements that are often difficult to recognise. Moreover, because of complex interdependencies, the effort to solve one aspect of a wicked problem may reveal or create other problems (Conklin 2005) .

At its simplest, a wicked problem can be described as having the following defining characteristics:

- You don't understand the problem until you have developed a solution.
- Stakeholders have radically different world views and different frames for understanding the problem.
- Constraints and resources for solving the problem change over time.
- Wicked problems have no stopping rule (the problem is never solved completely).
- Every wicked problem is essentially unique and novel.
- Solutions to wicked problems are not right or wrong.
- Every solution to a wicked problem is a 'one-shot' operation. (Rittel and Webber 1973; Conklin 2005)

'If a problem involves many stakeholders with conflicting priorities; if its roots are tangled; if it changes with every attempt to address it; if you've never faced it before; and if there's no way to evaluate whether a remedy will work, chances are good that it's wicked.' (Camillus 2008 online)

Given the basic characteristics of the Wicked Problem, it aptly identifies many of the managerial situations found in higher education. There are, however, relatively few substantial references to wicked problems in the field of education and this is a new and growing area of research (Bore and Wright 2009; Krause 2010; Trowler 2010).

Every Wicked Problem is essentially unique and novel.
Case study institution scenario – The following scenario was reported on in Buchan, Rafferty and Munday (2009); *'An investigation into the enhancement of blended learning environments – towards an effective pedagogy and practice'.* The study took place between 2005 and 2009 in the form of a Scholarship in Teaching project. The ambition was; '…to improve the educational experience of tertiary education students through engaging emerging technologies … The primary aims of the study were to develop an effective pedagogy for flexible and blended learning and to examine the values and limitations of blended learning opportunities offered through technology-enhanced learning experiences.' (Rafferty, Munday et al. 2011) . This was done through the use of heuristic inquiry process in an extensive case study. If the basic features of a wicked problem are applied to this scenario, what began with a simple ambition to teach better grew into what we can now recognise as a 'Wicked Problem'.

Stakeholders have radically different world views and different frames for understanding the problem.
Some of the practical outcomes of the research were summarised in this checklist. These organisational limitations and implications were identified in the case study within a particular institutional context and originally identified from the data as *issues*. The checklist frames the issues, the questions to be asked and it gives a hint of some of the solutions.

> A checklist of organisational limitations and implications for blended and flexible learning in practice:.

- For a university to be committed to blended and flexible learning it should have a stated definition of blended learning in its own context that is shared across the institution in order to guide the development of appropriate administrative and support processes
- Distance teaching and resource based blended learning approaches require significant time investment in order to fully engage students
- The academic who writes and plans the subject may not always be the person responsible for teaching the subject
- Academic fatigue can result in staff taking the path of non-excellence.
- Where there are staffing changes and academic buy-out for marking, adequate guidelines and detailed expectations should be provided for the markers
- Staffing allocations, and formulas for such, should account for varying class sizes, and [should] factor in the time taken to design and develop subjects for blended learning
- Timetable systems may not accommodate flexible use of learning spaces (classrooms)
- Student enrolment options should support blended learning
- The blended learning experience can be enhanced by active engagement in improving the learning environment of staff and students through scholarly research.

- Investment in educational designers and learning technologists can provide useful support for academics in designing effective blended learning experiences. (Rafferty, Munday et al. 2011)

You don't understand the problem until you have developed a solution.
The aim of experimenting with the use of digital media and technology to improve student outcomes was the starting point. The research problem being addressed was the perception that digital media could be used as part of a more effective way to teach students - not exactly a problem. However, the lived experience of the study uncovered a number of organisational limitations and implications which all contributed to the identification of a *complex problem*. This involved multiple stakeholders across the regional, mixed mode university and it became evident that there were different world views in this complex institution. There were institutional inconsistencies in the definition of flexible learning and in how the practice was actually supported on the ground. The interpretation of blended and flexible learning with which the researchers began in 2005, was a personal one and not necessarily shared by the university as a whole (Buchan, Rafferty et al. 2009).

Constraints and resources for solving the problem change over time.
Fast forward to 2012. Since 2005 when the blended learning study began there have been significant advances in providing support for the use of technology and exploring alternative models for learning and teaching with technology at CSU. This support ranges from hands-on practical centralised support to a long term strategic focus through the development of an institutional Educational Technology Framework (Uys, Keppell et al. 2010)

There have been some practical institutional advances such as a new electronic timetabling system (introduced in 2012) and advances in achieving consistency in workload policies to address the different modes of teaching. At a University level there have been structural organisational changes to support and foster learning and teaching. Some of these changes are represented in Figure 1. There has also been a significant investment in initiatives associated with the Flexible Learning Institute which are reported on in an inter-institutional DE HUB project (Buchan 2012).

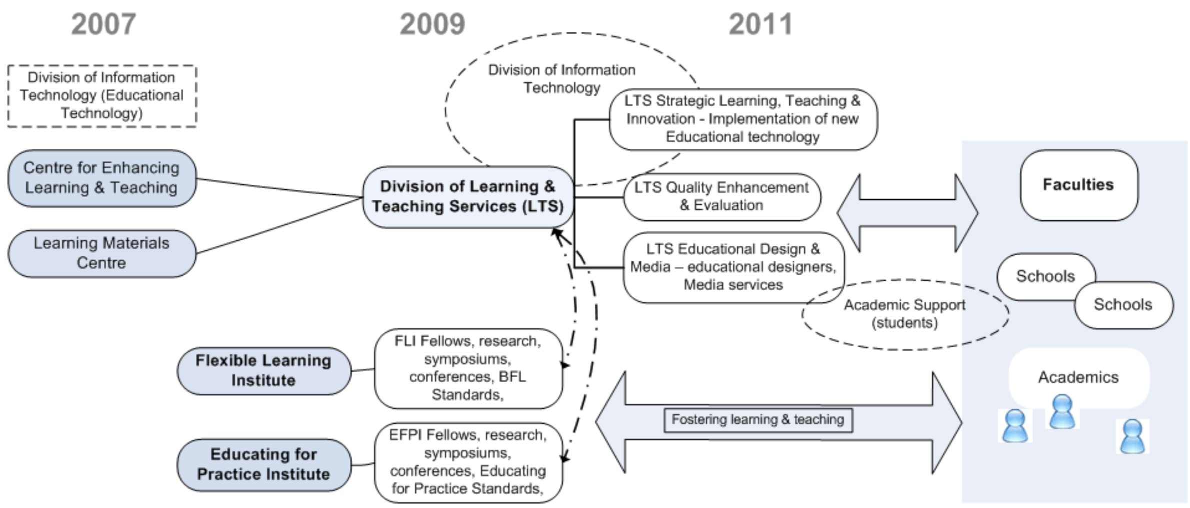

Figure 1: **The changing organisational structure of CSU: focusing on educational institutes, divisions, and units which support and foster learning and teaching (Buchan 2012)**

Wicked Problems have no stopping rule (the problem is never solved completely).
Educause Review's top Ten IT issues (Camp, DeBlois et al. 2007; Ingerman, Yang et al. 2010) are a good indication of current areas of concern in educational technology management. A Wicked Problem may never be solved completely, but only resolved again and again. This is not intended as flippant or critical, but realistically suggests that we need to consciously employ particular approaches to the management of truly wicked problems. When a wicked problem is identified there needs to be a tacit acceptance that there can be no single solution. One needs to be prepared to monitor, reassess and identify issues continually to address current progress.

Adaptive management

Adaptive management techniques are used extensively in natural resource management in an attempt to manage the uncertainty and complexity associated with natural resource management (Lee 1999; Allan and Curtis 2003; Allan 2004). The promise of adaptive management is that it has the potential to allow use of the management process as a way of understanding complex processes (Stankey and Allan 2009). The origin of adaptive management is in work done in the 1970's where scientists began looking for alternatives to existing environment assessment methods (Holling 1973).

Adaptive management combines management, research and monitoring and is a means of changing practices so that credible information is gained and management activities are modified by experience (Allan and Curtis 2003). Briefly, the adaptive management cycle begins with using indicators to benchmark and determine the current state of the environment. Planning is then done, the plans are implemented and the effects of the changes/new systems are monitored and reviewed. At each stage in the adaptive management cycle there is active reviewing of the current situation and learning from action that informs ongoing changes and improvements towards desired outcomes (Figure 2).

An important part of the process of policy and managerial decision making is adaptive management (Allan 2007). The essence of adaptive management is that it contributes to improved governance (policy and organisational processes). By using adaptive management the governance process itself is seen as 'experimental' and there is an in-principle agreement amongst contributing stakeholders to continually change things. While the term 'governance' may not sit comfortably with many academics, it is a part of our university management system and one with which we need to engage.

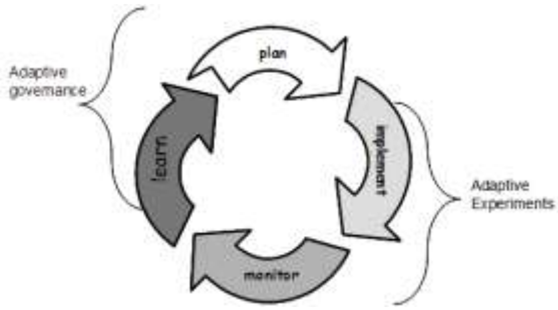

Figure 2: A simple conceptualisation of adaptive management (Allan 2007, p.2)

Adaptive management has promise in the educational management field because it ensures a focus on the *shared values* of the learning environment. It could potentially provide a way of developing dynamic policy and management decisions that can last beyond the lifecycle of a research or institutional project and could contribute to the ongoing management of the learning environment (Buchan, Rafferty et al. 2009). The promise of adaptive management also provides a way in which the evidence from academic research can inform management decisions to help a university truly become a learning organisation (Watkins and Marsicr 1993; Somekh and Thaler 1997; Dealtry 2008), thus making the most of its core business – learning.

Exploratory research into adaptive management

Since 2003 I have explored the application of adaptive management in educational management in a number of separate studies. These include exploring the use of adaptive management in: course (program) and subject management; environmental sustainability education programs; institutional project management and institutional change management for educational technology. A brief summary of the key aspects of the studies are provided here and readers are referred to the original research works for more detail.

Adaptive management was first introduced for use in educational management through a conceptual study; 'Lessons from nature: Developing an adaptive management model for sustaining quality learning environments' (Buchan and Buchan 2003). The original study drew heavily on environmental theory, metaphor and technical terminology. The outcome of that original study was the Adaptive Management Model which could be used as a framework for planning and analysis in educational environments. This original framework drew on principles of management for our natural environment to develop a values-based decision-making tool.

In 2004 the Adaptive Management Model was refined into the Adaptive Management Conceptual Framework and applied to the field of sustainability education in the paper: 'Successful Environmental Education: Adapting to the Educational Habitat'(Buchan 2004). A conclusion from that study was:

> 'Introducing adaptive management to the educational environment shifts the boundaries of the paradigm of educational management. It ensures that management of the learning environment is holistic; that the decisions made feed into actions and the effects of those actions are measured, with any necessary improvements made in the future. Most importantly, it ensures that the decision making processes controlling environmental sustainability education programs are grounded in appropriate values. Environmental sustainability education programs should be a fundamental part of our survival and it is only once something has an intrinsic value that its future is secure.' (Buchan 2004, p.54)

Adaptive management and blended learning

Between 2005 and 2008 adaptive management was incorporated into the longitudinal study; 'An investigation into the enhancement of blended learning environments – towards an effective pedagogy and practice' (Buchan, Rafferty et al. 2009; Rafferty, Munday et al. 2011). This research resulted in a refined Adaptive Management Framework (Figure 3) that is more suited to practical use in the educational environment paradigm than the more detailed original 2003 model and 2004 framework. The important focus of this Framework is the *learning* that takes place throughout all the stages. Moving through the cycle may take days, weeks, months or even years as appropriate. The timescale is essentially dictated by what and how one is measuring, what feedback one is gathering and the rapidity with which feedback is fed into each stage.

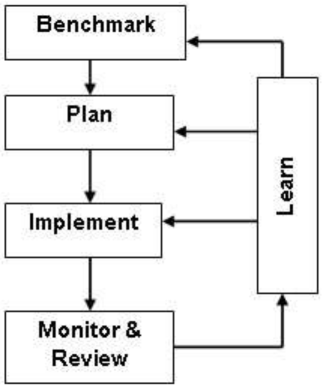

Figure 3: An Adaptive Management Framework (Buchan, Rafferty & Munday 2009, p.16)

> The Adaptive Management Framework was successfully introduced as a technique for managing the individual subjects over a number of teaching sessions (2005-2008). The researchers found the adaptive management steps; benchmark (learn), plan (learn), implement (learn), monitor and review (learn) (see Figure 2) to be a good way to focus on continuous improvement in the learning environment for the students subjects and the overall subject learning environment over time. The reflective learning process that is fundamental to successful adaptive management complemented the heuristic inquiry method used in the research. Learning from one's actions in adaptive management ideally feeds directly into policy changes that help to improve the learning environment. (Buchan, Rafferty et al. 2009)

Application of adaptive management to institutional project management 2007 to 2011

Adaptive management was explored for its possible contribution in institutional educational technology project management. This was done through one of the Online Learning Environment Programme Project teams of which I was the Project Lead. The study took place during 2007. A participatory action research model was trialled in the Project team. The key outcomes of the trial are summarised in this extract from my reflective journal.

> 'I had the feeling early on that using adaptive management in its purest sense in a project situation would not give a true reflection of adaptive management, because adaptive management is about

defining policy, taking a certain approach, and then reflecting and changing that approach according to the outcomes monitored. Projects are finite, and quite simply, the project cycle of a well run project contains the Plan-Implement-Monitor-Review cycle as part of its normal functioning…

This intuition was confirmed during the project, and I would say that the project cycle is probably closer to the action research cycle than adaptive management *per se.* This is because we were not trying anything new, and good project management requires that all team members are constantly learning from the situation as they go, and adapting accordingly…

[However] I believe that there is room for adaptive management in managing activities in the learning environment. Perhaps the critical difference between the very efficient project management approach to our operations and an adaptive management approach is perhaps that adaptive management has that longer term focus. adaptive management I would say supports the development of long term strategies, requires one to look at the big picture and not simply to focus on the current task, or at least to know where that task fits into the bigger scheme of things.' [2007 10 05 Buchan Reflection]

A more detailed understanding of the intricacies of institutional project management and the potential of projects as a means of implementing widespread (institutional) change and transformation has led to new understandings around project management for e-learning (Buchan 2010).

Using adaptive management in institutional-level change management for educational technology
Since 2010 the University's Interact2 Project has been exploring a new system to replace the LMS which underpins our existing online learning environment, *CSU Interact.* As Change Management Lead in the Interact2 Project Team, I have introduced the Adaptive Management Framework into the Interact2 Change Management Plan.

The Adaptive Management Framework is a guiding strategy for the processes and temporal aspects of the change management plan. The essence is benchmarking i.e. identifying *where we need to* be as a 'benchmark', and where the different parts of CSU (schools etc.) *actually are*. This provides a starting point for developing needs analysis tools and processes as part of the change management process. Benchmarking leads into Planning and then Implementation. Adopting an adaptive management approach ensures that we not only build continual monitoring and feedbacks into the implementation process, but importantly continue to learn along the way to inform improvements at each stage of the process. (Buchan 2012).

Further lessons from adaptive management

Stakeholders - the importance of stakeholders in the adaptive management feedback loops within the technology-enhanced learning environment was identified and some limitations in current models of using stakeholders were highlighted. A common link between environmental management and organisational management is that of shared resources and interests and thus a focus on the differing needs of stakeholders. The OLE Programme brought academics and professional (general) staff together in teams of multiple stakeholders. This foreshadowed changes to organisational structure and policy to support educational technology and we saw 'unprecedented inter-divisional and faculty cooperation' (Buchan 2010. P.71).

Organisational learning - single and double loop learning as principles of organisational learning were explored in relation to adaptive management. These principles are pre-cursors to complex systems thinking, and were explored for their potential in developing resilience at a whole-of institution level (Buchan 2012 in prep). Single loop learning within prescribed processes makes existing processes more efficient. Double loop learning means knowledge generated from single loop learning is internalised in the organisation (Argyris and Schon 1978). Double loop learning effectively supports the concepts of the learning feedback loops in the Adaptive Management Framework (Figure 3 above) where, at all stages of the adaptive management process, there is the opportunity for learning within the organisation.

Governance and policy - towards a dynamic approach – There were observed limitations in university policy development and governance in support of new models of learning and teaching. I was advised that an 'organic' approach to policy development was appropriate: 'Don't write policy in advance, once people begin using *Interact* the Learning and Teaching Committee and Senate can respond to required changes.' Taking the 'organic' approach, however, can leave the university in a precarious position where one may have been introducing new models of learning and teaching and new educational technology without the support of appropriate policy and guidelines (Buchan and Swann 2007; Buchan, Rafferty et al. 2009). Another observed limitation was that the changes in governance and policy can be independent of other initiatives. Policy changes thus end up being reactive and not proactive or anticipatory.

A final perceived limitation in policy development is inadequate feedback processes. In the absence of true lines of feedback such as those afforded by the adaptive management approach, on-ground experience and needs do not necessarily translate to changes to policy, governance and practice.

Conclusion

This paper only touches the surface of what is needed in order to effect a paradigm shift. That shift is to acknowledge a changing goal: that in our higher education environment there can be no single, stable state and change will be a constant.

I have taken some licence in drawing on the aspirational potential of adaptive management, as seen within the original context of environmental management in Allan and Stankey's 'Synthesis of lessons' (2009. p.346)

> Think then, what could be achieved in [educational management] by adaptive people, working together in trusting relationships, and within supportive organisations and institutions. When these types of processes become the norm and the standard – rather than the exception or the noteworthy – we will have made significant process *(sic)* to the goal of sustainable [environmental management of our technology-enhanced learning environment].

'We need courageous management if Adaptive Management is to work.' (Allan 2007). The reality of adaptive management in practice is that it does not always work (Smith 2009; Stankey and Allan 2009). However, one can sometimes learn as much from what did not work, as from what did. While there are limitations to applying adaptive management at an institutional level, some principles and concepts can contribute towards the development of strategies for managing a changing learning environment. The application of adaptive management in its broadest sense requires decision makers to: be prepared to come together for a common cause; be open to change and experimentation in governance and policy; plan with the intention to learn; learn from their actions; make use of multiple points of learning throughout the management process; use evidence-based practice to make their decisions and to be aware there can be no single optimum solution to a problem.

It will also be a courageous management which takes the essential step towards acknowledging that the many challenges we face in higher education are *simply* wicked problems. The wicked problem confronting us is that of creating sustainable approaches to new models of learning and teaching with technology *while managing for a changing environment*. Our management approaches need to reflect that there are no silver bullet solutions (for today's Wicked Problems the solution may need a scattergun or shotgun).

To return to the basic premise of the 2012 Ascilite Conference theme that; 'what happened in the past is no longer a reliable guide to the future'. If we do not learn from what happened in the past, it may well be a reliable guide to an unsustainable future. This is evidenced in this research which has proposed some ways forward as to how we can learn from the *past and the present* to inform a more sustainable future.

Moreover, real change will come through understanding the complex system which is the learning environment. This is the area being documented through the application of a social-ecological systems' approach to managing change through doctoral research into 'Developing resilience and managing change in technology-enhanced learning environments' (Buchan 2012).

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The Sapphire Vortex: blending virtual world machinima with real world commentary for effective learning of criminal law

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Traditional approaches to teaching criminal law in Australian law schools include lectures that focus on the transmission of abstracted and decontextualised knowledge, with content often prioritised at the expense of depth. This paper discusses *The Sapphire Vortex*, a blended learning environment that combines a suite of on-line modules using *Second Life* machinima to depict a narrative involving a series of criminal offences and the ensuing courtroom proceedings, expert commentary by practising lawyers and class discussions.

Keywords: blended learning, machinima, Second Life, criminal law, expert commentary

Teaching criminal law in Australian Law Schools

Writing in 1883, AV Dicey declared that nothing 'can be taught to students of greater value, either intellectually or for the purposes of legal practice, than the habit of looking upon the law as a series of rules' (Dicey, 1883). This attitude is manifest in the traditional approach to legal education. Like many disciplines, pedagogical practices in law tend to be dominated by the transmission of abstracted and decontextualised knowledge, with content often prioritised at the expense of depth. Several forces, both at an institutional and academic level, are at work in maintaining this as the status quo.

In 1992 the Consultative Committee of State and Territorial Admitting Authorities, headed by Justice Priestley of the Supreme Court of New South Wales, compiled a list of compulsory subject areas for academic legal study which individuals must complete in order to be admitted to legal practice. This list, which is known as 'the Priestley 11', comprises 'substantive law' areas such as criminal law. It does not directly affect law curricula. However, Australian law schools typically structure their degrees to accommodate the list so that their graduates may qualify for entry into legal practice. This is most easily discharged by means of the traditional model including content-focused lectures. A further impediment against change at an institutional level is the relatively low government funding for Australian law schools, which has been recognised as a significant impediment to innovation in the development of curricula and resources (Law Council of Australia, 2008). The lack of resources may make lectures a seemingly efficient means of educating the increasingly large classes in today's law schools.

There may be several impediments to changing the status quo operating at the level of individual academics. First and foremost may be that they know no better. It has been observed that: '[M]ost teachers uncritically replicate the learning experiences that they had when students, which usually means that the dominant mode of instruction is reading lecture notes to large classes in which students are largely passive' (Keyes & Johnstone, 2004, p. 539). In other words, 'if it was good enough for me, it is good enough for them'. In addition, for many law academics another barrier is lack of technical knowledge and literacy, and/or commitment to learn new technology. There may also be a perceived threat to academic freedom and autonomy and general 'academic inertia' (Middleton & Mather, 2008).

However, law schools like other areas in higher education, now operate in a time when there is a climate for change. Significant impetus for change has been provided by seminal reports criticising the traditional approach, both for its emphasis on the transmission of knowledge about legal rules and doctrine and the manner in which the law is taught (see, eg, Pearce, Campbell & Harding, 1987). The traditional approach also does not meet the expectations or needs of modern students. The current generation of learners are surrounded by ubiquitous information and merged technology, and deal with blurred boundaries between their work, study and social lives (Nelson, Kift & Harper, 2005). They generally want the flexibility of accessing their study materials in their own time and in their own way (McGarr, 2009), to allow them to juggle the demands of competing time commitments (Moreau & Leathwood, 2006).

The Sapphire Vortex: contextualising criminal law

At the Queensland University of Technology Faculty of Law criminal law is taught by way of two second year subjects, *Fundamentals of Criminal Law* (which covers criminal offences and issues such as jury selection and bail) and *Criminal*

Responsibility (which covers defences and issues such as parties to offences and attempts). Until 2012 the subjects were taught by traditional methods, involving a weekly two hour lecture and weekly one hour tutorials. These tutorials were dominated by advocacy exercises in which students presented submissions on a detailed scenario to the tutor sitting as judge. Accordingly, apart from the two students involved in any particular exercise, students in the two subjects occupied a mostly passive role in the teaching and learning approach. This was not well regarded by many students, who indicated by way of feedback that they preferred more opportunities to practise problem solving and applying the abstract and decontextualised principles they learnt in lectures.

From 2013 the two subjects will adopt a blended learning environment that will include an on-line computer program called *The Sapphire Vortex*. This program will be a suite of fourteen on-line modules, accessed via the university's Blackboard Learning Management System. All fourteen modules utilise *machinima* – computer graphics imagery created with the use the *Second Life* virtual environment rather than costly professional software or professional programming. The central element of the program, which is featured in the first module, is a 15 minute machinima video that depicts a succession of events that take place one night at a night club, the Sapphire Club. These events commence with a rape and progress to include a glassing, a homicide, a stabbing, and drug and property offences, in a connected narrative (see Figure 1). It also portrays facts that raise issues such as self defence, provocation, diminished responsibility and intoxication. In this way the narrative covers every topic covered by the two criminal law subjects.

Figure 1: scenes from the main video

This main video is complemented in the first module by machinima video depicting ensuing courtroom proceedings including an arraignment in which the charges against the three main protagonists are read in court and jury selection.

The remaining thirteen modules follow a similar format, incorporating prescribed readings, self-test multiple choice questions and machinima videos which depict barristers making submissions in court on various points of law relating to the various offences, defences and other aspects of law studied in the two units (see Figure 2). These videos will facilitate class discussion of the law, with students preparing the judge's rulings on the barristers' submissions.

Figure 2: courtroom scenes

Throughout the modules the machinima videos are accompanied by videos of a real life crown prosecutor and defence barrister who provide expert commentary on the events at the night club and the ensuing court proceedings, including trial techniques and tactics.

Machinima-facilitated narrative enhancing learning in context

Knowledge acquired in the absence of context – the frequent product of lectures as part of a traditional approach to legal education – typically remains 'inert knowledge' that is memorised by students for exams but quickly forgotten thereafter, rather than being retrieved and used across contexts (Hasselbring, 2001). By contrast, when a learning and teaching approach involves students in addressing multiple real world problems, the transfer of new knowledge and skills can be enhanced (Spiro, 1991). It has been recognised that representations of real world situations in digital media such as video can form the basis for focused discussion (Colasante, 2011). Video used as part of a learning environment that enables discussion promotes active learner engagement.

At the same time many disciplines recognise the value of storytelling in education (Clark & Rossiter, 2008). Stories can draw audiences into their plots and settings, creating perceptual, emotional, and motivational opportunities for learning (Rowe, McQuiggan & Lester, 2007). Storytelling can not only convey important information, it can provide 'contextual cues that facilitate recall of that information in situations in which it is likely to be applicable' (Ferguson, Bareiss, Birnbaum & Osgood, 1992, p. 99). A narrative may help learners to 'create meaning, reduce cognitive load involved in navigating through information, and support cognitive and imaginative engagement' (Paulus, Horvitz & Shi, 2006, p. 356). An appropriate story can help students to process new information by relating the material being studied to concepts and situations with which they are already familiar (Ferguson et al, 1992).

The use of narrative as a means of learning is not new in legal education. From Shakespeare's *A Merchant of Venice,* Dickens' *Bleak House* and Harper Lee's *To Kill a Mockingbird* to today's John Grisham books and the films based on them and the several *Law and Order* franchises, literature and film abound with examples of stories that can serve, and have served, as useful touchstones or exemplars for the examination of legal doctrine. None, however, can be said to be deliberately created for the purpose of facilitating the discussion of particular points of law.

The traditional approach to teaching and learning law frequently sees lectures supported by tutorials in which students are required to answer esoteric theory questions or provide advice to artificial John/Jane Doe problems (Webb, 1996). While the latter generally involve short fact scenarios custom created to allow discussion of the relevant legal principles, they are normally disconnected from each other and lacking in the detail.

Machinima like that used in *The Sapphire Vortex*, on the other hand, involves 'real world filmmaking techniques being applied within an interactive virtual space where characters and events can be either controlled by humans, scripts or artificial intelligence' (Academy of Machinima Arts and Sciences, 2005). Machinima involves the real-time rendering of an interactive environment in which the creator has a creative flexibility and total control over visual representations of characters, events and settings (AMAS, 2005). The *Second Life* virtual environment, with its ability to customise avatars, artefacts and environments, and to script the movement of avatars, facial expressions and objects, provides a rich canvas for customised storytelling and the simulation of realistic situations (Butler, 2012). These virtual characters and settings can be utilised to present tasks and critical information and thereby create an authentic learning environments online (Agostinho, 2006). The machinima in *The Sapphire Vortex* is used to create a dynamic, richly detailed narrative that provides a real world context and makes overt the connections between multiple topics spanning the two criminal law subjects, thereby creating an active, engaging and challenging learning environment.

Real world commentary lending an authoritative voice

The Sapphire Vortex utilises elements of a cognitive apprenticeship approach to learning – a translation of the situated learning framework of traditional apprenticeships with features including modelling, coaching, scaffolding and exploration – to teaching with practical classroom applications (see, eg, Brown, Collins & Duguid, 1989; Collins, 1991). Application of that approach to computer-based learning has had its critics, who have seen it as a further step removed from the traditional apprenticeship model or, as Hummel (1993, p. 15) once described it 'courseware becomes the learning environment and not the authentic situation'. Tripp (1993, p. 75) expressed a similar sentiment by observing that 'true expertise is learned by being exposed to experts'.

However, it is now widely accepted that computer programs can provide an effective alternative to the real-life setting without sacrificing the critical authentic context (Herrington & Oliver, 2000). Advances in technology and the ability of multimedia to effectively depict real world situations reinforce that view. Further, technology can provide the means of students being 'exposed to experts'. The inclusion of real world expert commentary on the machinima sequences by a practising Crown prosecutor and defence barrister serves a number of purposes as part of that approach. The expert commentary emphasises key theoretical principles in practice. In combination with machinima portraying the court proceedings, it also models analytical techniques. Finally, it provides an alternative method for engaging learners with the authenticity of the video, its relevance to real world practice and its relationship to their future professional identities (Perrone & Vickers, 2003).

Conclusion

It is a common experience in Australian law schools that criminal law is taught in an abstract, decontextualised fashion by way of passive transmissive lectures. However, as Lin, Hmelo, Kinzer and Secules (1999, p. 44) observed, 'technology, properly designed and used, enables us to realise reflective learning environments that were not previously possible'. *The Sapphire Vortex* represents an effective and engaging use of technology to provide students with an authentic context to their learning of criminal law. The use of *Second Life* machinima has enabled the creation of a dynamic and realistic narrative while the expert commentaries are a powerful additional strategy for promoting the convergence of theory and real world practice. It demonstrates not only leadership in adapting curriculum in a climate of change but also facilitates students' learning for their future careers.

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Implementing a learner response system in one university

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Although students expect to be engaged in lectures, it has been acknowledged that this can be challenging at universities across the world. When students lack engagement, attendance at lectures can be affected and students can become disengaged from the course. For these reasons and more it was decided by academics who lecture at one Australian university to implement a learner response system (LRS) for their large first year Education cohort. This paper investigates the literature and focuses on this implementation as well as initial data obtained by a group of first year students.

Keywords: learning response system (LRS), clickers, higher education, teacher education

Introduction

This paper describes the implementation process of a learner response system in a School of Education at one Australian University. There was a perceived need by some of the lecturers in the School to increase student engagement in lectures, particularly in the large first year lectures with several hundred students enrolled. The tertiary teaching environment requires us to be up-to-date with technology including what to use, how to use it, the rationale for using it and to be totally convinced of its merits. As lecturers, some technologies are helping us provide more flexibility in delivering course content (such as the availability of the Lectopia lecture recording system and the Blackboard learning management system) but these do not necessarily engage all students in a course. It can be a fine balance to maintain student engagement in a course when there is no longer a necessity for students to be physically present at a lecture. The possibilities for losing face-to-face contact with students, along with other debates around pedagogical practices such as including tutorial attendance in assessment, makes for a controversial space to discuss the relationship between new technologies and student engagement. With a diversity of tertiary students, many of whom are engaged in several hours paid work while being enrolled in university studies, and who are confident users of social media technologies, the challenges of maintaining engagement throughout the course of a lecture can quickly impact upon their level of success in the early part of the university studies.

There are many factors that determine whether lecturers will incorporate new technologies into the planning of their courses. Notwithstanding the time needed for professional development, there is an initial reluctance to trial new technologies with a new cohort of students, particularly in a first-year course. These courses often have large numbers of students who, at an early stage in their tertiary studies, can be reluctant to participate in class discussions. However, it is precisely because these large cohorts of students need to be able to quickly engage with both the course requirements as well as a new learning environment that there is an urgency to look for effective tools to enhance student participation. Another factor is the potential for new technologies to 'fall over' during lectures.

Literature Review

Clickers have been used in higher education for almost two decades and due to this there have been various types of research conducted on them. There is now a detailed body of literature that surrounds the implementation and use of clickers in various higher education contexts (For example: Barnett, 2006; Caldwell, 2007; Cheesman, Winograd, & Wehrman, 2010; Hall, Collier, Thomas, & Hilgers, 2005; Koenig, 2010; Milner-Bolotin, Antimirova, & Petrov, 2010; Strasser, 2010). They have particularly been used in science courses with large enrolments (Cheesman et al., 2010). In a study of first year physics students, the researchers defined clicker effectiveness as "student perception of how much clicker pedagogy helped them stay engaged in class, understand the material, get continuous formative feedback on their progress, clarify difficult concepts, and reflect on their own learning" (Milner-Bolotin et al., 2010, p. 16). Caldwell (2007) has suggested that using clickers offers a flexibility for learning as they can be used effectively in both lectures and tutorials and can be used with many different styles of questions. Trees and Jackson's research of 1500 undergraduates enrolled in seven large courses across three university departments have been reported and they suggest that there are a number of factors contributing to student's positive reception to using the clickers in class. These include the view that traditional lecture styles aren't the best, a desire to be engaged and involved in the class, valuing feedback as well as previous experiences with lecture courses (Trees & Jackson, 2007).

By using clickers in large groups it allows both the students and the lecturer to get feedback. Students can be given feedback on their responses and the knowledge they have gained on a particular topic. In an earlier study it was reported that one of the positives about students using the clickers is that they like receiving feedback on how well they actually understand the material they are learning. Students also reported enjoying the interactivity in class (Barnett, 2006). However, much of this literature focuses on the use of clickers in sciences where short-answer responses can help students and lecturers monitor progress. It also allows the lecturer to have feedback on how well the students understand the content they are teaching (Lantz, 2010).

One study presents positive results in using clickers in teaching, although having to make significant changes to actual teaching to see these results (Kolikant, Drane, & Calkins, 2010). This study used clickers in undergraduate math and science classrooms in the United States and results suggest that the use of clickers does not generally occur instantaneously in the classroom but is a gradual one where the instructors firstly needed to overcome various challenges. However, the study suggests that the use of clickers "may act as a powerful catalyst to transform them, moving them from teacher-centered conceptions and approaches to teaching to student-centered conceptions and approaches" (Kolikant et al., 2010, p. 134).

Another quantitative study focusing on an undergraduate operations management course investigated how the use of clickers affected learning outcomes (Yourstone, Kraye, & Albaum, 2008). The results suggest that the use of clickers "can have an impact on student learning as measured by test scores" (Yourstone et al., 2008, p. 85). The authors of this paper go on to comment that it may not actually be the clicker technology that is responsible for the improved learning outcomes but the actual immediate feedback provided to the students through the use of the clickers.

Implementation and Methodology

After reviewing the available learner response systems it was decided that the School of Education would purchase the Promethean brand. So, in May, 2011, the School of Education purchased 64 ActivExpressions, the hand held learner response system and 300 licenses of ActivEngage. This is the online system where the students use their own laptops to complete responses in a lecture. Students are required to 'register' their device on the system at the beginning of each class or semester. As this can be time consuming, due to the students not having it set up or the correct wireless etc, it was decided that they would only be registered once per semester. This required all students who wished to use ActivEngage on their laptops to register at the one time or they would miss out. For the lecturer they could use a software program called ActivOffice to create the questions either prior to class or on the spot in the lecture. This program works in PowerPoint which is familiar to all lecturers. It also works in an interactive whiteboard software program called ActivInspire, which many lecturers are not familiar with.

ActivEngage was used as soon as it was purchased for 3 lectures in May 2011. The cohort were first year education students enrolled in a first year compulsory ICT course called Learning Tools for the 21st Century. The setup was almost one lecture in time and involved quite a few support people. Numerous problems were encountered at this lecture. These included students

- not have Eduroam wireless network preinstalled on their laptop computer,
- not downloading the installation file prior to class, and;
- not entering the registration details correctly while in class.

Students were given the one opportunity to register in this class for the rest of the lectures during the semester so it was important that problems were solved if possible.

In Semester 2, ActivEngage was initially used in a lecture for a first year sociology in Education course called Introduction to Education. However, due to difficulties in the lecture it was decided that the trial would continue with one tutorial group. As the group was approximately 20 students in size the ActivExpression devices were used most weeks for the rest of the semester. Results of this implementation were positive with tutorial attendance being high, and with the students "more confident and thoughtful in relation to providing responses to questions during class discussions" (Campbell & Monk, 2012, p. 5).

Semester 1, 2012, began full of promise and ActivEngage was introduced to both first year cohorts in the one lecture. This was planned for well and students were not allowed into the room unless they had Eduroam working on their computer (although they were sent to the library nearby to get it working so that they could come back). Some students had problems with the registration code, and although it took quite a bit of time it was much easier than previously. ActivEngage was then used for the next 11 weeks in the first year ICT course and it was used a total of four times in the first year sociology course.

The students in the first semester, first year ICT course had the opportunity to use ActivEngage each week in the lecture until the end of the semester. For those students who were unable to register their laptops it was discovered through trial and error that the ActivExpression devices would work in conjunction with ActivEngage. This meant that students could pick up a 'clicker' at the beginning of each lecture and both systems would appear to give one integrated approach to the user. The system was set up to allow the students to respond anonymously.

At the end of the semester the students in the course were asked to complete a survey about their experiences using the learner response system. They were asked how many lectures they attended as well as how many times they used the clickers. Students were then given a range of statements to state whether they strongly disagree, disagree, agree or strongly agree. From the 219 students enrolled in the course there were 111 students who participated in the survey. Students were also asked a range of open ended questions in order to ask them to explain their reasoning for the various answers. In this course there were three different ways in which the clickers were used. These were for research, in other words, the lecturer was trying to find out particular things, for formative questioning and for open ended opinion questions that the lecturer wanted the student's opinion about. Results show that students were positive about using the learner responses.

Students who attended the lectures were generally positive about the use of the LRS in the lectures. Students commented that the voting in class "reinforced information", "allowed for shared ideas and responses" and that "more feedback and clarification was possible". Open ended questions were often used in the lectures with students required to type in a text answer. This allowed for a variety of student responses, with one student commenting it enabled students to see "other views than my own". These responses suggest it can be a powerful teaching tool in the classroom, and not just in lecture theatres. Another student commented "found it amusing and fun to participate in a way that was new and different to ways of learning that I have previously experienced".

Further Directions

In Semester 2 this study will continue with an implementation in the first year sociology course. It will be used in nearly all lectures with a variety of guest lectures. This provides potential new research areas as most guest lecturers will not have experienced using a learner response system in their teaching and potentially an investigation will provide insight into changing pedagogy. Semester 2 students will also have an advantage with using this technology as there is now an App available for iPhones and Android devices. The App is being trial by Faculty IT and will be available for students to download in Semester 2. It is hoped that between using the laptops, apps or the ActivExpressions all students will have a device to use.

Conclusions

This paper describes an implementation process of a learner response type system at one university. It is hoped that by sharing this journey other universities may be able to avoid some of the problems that occurred during this period.

It does appear that the students engaged in the class with greater depth when they were able to use the clickers. Massingham and Herrington (2006) report in their study on student attitudes, participation, performance and attendance in tutorials and lectures that engaging students with greater depth is an important factor in lecture attendance. Thus, student engagement is an important aspect in lectures and by using clickers this may contribute in a positive way to the class.

This study concurs with previous research that students are more engaged in lectures when they are able to use a learner response system in class (Strasser, 2010). Using clickers in class also appears to allow the students to get continuous formative feedback on their progress (Milner-Bolotin et al., 2010) which students in this cohort also commented on.

Although there were some initial problems setting the learner response system up, from student responses it appears to have been well worth the effort. The lecturers involved in this study look forward to using it again in Semester 2, 2012, and in the same courses next year with a new cohort of students.

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Leadership in Online Learning: Developing the Next Generation of Leaders

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Dr. Bruce N. Chaloux was named Executive Director and Chief Executive Officer at The Sloan Consortium in March, 2012. Prior to assuming his new position, he served as the director of Student Access Programs and Services at the Southern Regional Education Board (SREB) in Atlanta, Georgia. In this role, he developed a number of programs designed to help students start or continue their education, in particular SREB's Electronic Campus, providing access to over 30,000 online courses and 1500 degree programs. Prior to assuming his duties at the SREB in 1998, Dr. Chaloux served in the Graduate School at Virginia Tech for thirteen years, including four years as associate dean for Extended Campus Programs at the institution's main campus in Blacksburg and earlier as the head of Tech's Northern Virginia Graduate Campus in suburban Washington, D.C. He previously held positions on the staff of the State Council of Higher Education for Virginia and as an academic affairs administrator and faculty member (business administration) at Castleton State College (Vermont). He was named a Sloan C Fellow in 2010.

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Professor Mark Brown has specific responsibility for policy, strategy and leadership of teaching and learning development at Massey University. Over the last five years Professor Brown has played a key leadership role in the implementation of several major university-wide digital learning and teaching initiatives, including the enterprise level deployment of Moodle (aka Stream) and the original development of the open source Mahara eportfolio system. Mark has also been centrally involved in designing several online professional development modules in learning design and leadership training for senior university managers as part of a larger international project. He serves on a number of international journal editorial boards, has published extensively in the areas of online, blended and distance learning and is on the executive committees of the Australasian Society for Computers in Learning in Tertiary Education (ASCiLiTE) and the Distance Education Association of New Zealand (DEANZ). He is also a recipient of a National Award for Sustained Excellence in Tertiary Teaching.

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Dr. Lawrence C. Ragan directs the design and development of a wide range of faculty development services and systems for Penn State's Academic Outreach. Academic Outreach serves learners via online (the World Campus), Continuing Education, and the video learning network. Dr. Ragan designs and delivers professional development programs, establishes a faculty development learning community, and conducts research including the articulation of strategies to help faculty manage the online workload (SMOW) and the definition of competencies for online teaching success (COTS). He has served in leadership roles as co-director of the EDUCAUSE Learning Technology Leadership program (2005–06), and is currently co-director of the Penn State/Sloan-C Institute for Emerging Leadership in Online Learning. He was named a Sloan-C Fellow in 2011.

Intended audience and degree of expertise/past experience required

This program is designed to explore and examine the challenges facing the next generation of leaders in online learning. Ideal participants would be individuals poised within their institution or organization to assume increased leadership responsibilities OR individuals responsible for identifying and preparing the next generation of elearning leaders. Individuals should have a "working" understanding of the issues facing the growth and development of elearning activities at the institutional, state, national and global level.

Statement of objectives for the workshop

Participants in this workshop will:

1) explore and examine a range of forces impacting the development of elearning activities in higher education institutions and organizations;
2) be introduced to the dimensions of leadership development necessary for success in the complex and dynamic context of elearning in higher education
3) compare and contrast leadership challenges in different countries, educational settings and political environments; and
4) become familiar with the structure, goals, outcomes and benefits of the IELOL and how it may serve the professional development needs of merging leaders in elearning from around the world.

Detailed description

The Sloan Consortium and the Penn State World Campus are proposing a pre-conference workshop focused on emerging leaders in e-learning programs. Specifically this workshop will address the rapidly changing landscape of higher education which provides the context of elearning as a new and viable alternative learning system. This workshop will feature senior leaders in the field, using a tested model of working with professionals on leadership issues areas related to unit operations, institutional policy, and personal leadership style.

The growth of online learning has created significant opportunities for higher education institutions globally, bringing many new institutions into the distance education community and transforming the role of distance education in other institutions. We are now well into the second decade of elearning and a new challenge of leadership is emerging. Many of the pioneering elearning leaders in our institutions are nearing retirement or moving on to broader leadership roles. Thus to ensure effective succession planning, we need to develop the next generation of leaders, preparing them as change agents and managers in the field. Many in this next generation of leaders will emerge from careers in elearning and with a growing number of institutions placing great strategic emphasis on elearning, a situation dramatically different from the earlier periods of initial growth and acceptance of elearning.

"The Emerging Leader in Online Learning: Context and Challenges" is an outgrowth of the highly successful Institute for Emerging Leadership in Online Learning (IELOL) program, a collaboration between the Sloan Consortium and the Penn State World Campus in the United States. Since 2009, the Institute, using a blended format that combines both online and in-person programming, has brought together an international community of more than 100 educators designated by their institution as emerging leaders. Working with a faculty of senior leaders from the Sloan Consortium community, the Institute has focused on creating change leaders for the future. This effort built on the success of the Administrative Leadership Institute, a workshop held for several years by the two organizations as part of the annual Sloan Consortium Worldwide Conference (ALN).
The proposed workshop is modelled after the Institute and is designed to give participants a 'slice' of the full program. The workshop will use the Sloan Consortium's five "pillars of quality" to illustrate the different operational and policy dimensions involved in building a leadership culture in a university-based e-learning operation. These quality pillars embody the ideals of online education in a quick, holistic view of continuous quality improvement and provide a helpful framework for the challenges of leadership.

The pillars include:

1) **Access**--All learners who wish to learn online have the opportunity and can achieve success.
2) **Learning Effectiveness**--The provider demonstrates that online learning outcomes meet or exceed institutional, industry, and/or community standards.
3) **Student Satisfaction**--Students are successful in learning online and are typically pleased with their experiences.
4) **Faculty Satisfaction**-- Faculty achieve success with teaching online, citing appreciation and happiness.
5) **Scale (Cost Effectiveness and Commitment)**--Institutions continuously improve services while reducing cost to achieve capacity enrolment.

Around this framework, three strategic leadership areas will be addressed:

- **Operational Leadership** –This section of the workshop with identify leadership issues, challenges and strategies in each of the five quality pillars.
- **Policy Leadership** – This section of the workshop will focus on leadership strategies needed to address both institutional and external policy issues related to creating a transformative innovation in the mainstream of a higher education institution. In many institutions, elearning began as an innovation that operated outside the institutional mainstream. Today, elearning is becoming recognized as a transformative innovation that will help institutions adapt to changing societal and individual learner needs. Increasingly, emerging leaders need to work within the mainstream to achieve sustainable success.
- **Personal Leadership Style** – This section of the workshop will explore several dimensions of personal leadership style needed to create change in this kind of institutional culture. Many leadership development programs grow out of corporate management experience. However, higher education is a unique social institution, regardless of how it is funded. Leading change in this unique environment requires personal and professional skills that are better suited to a large and often decentralized community.

Participants will engage in a variety of activities during this interactive one-day workshop and will establish a community where efforts with fellow participants and workshop facilitators will continue beyond the workshop.

Evolution of a higher ed curriculum based ecosystem

Christopher James Cheers

In a Higher Education context learning is an individual experience within a learning community. Such a community no longer needs to be bound by temporal or spatial limitations. Drawing on concepts found in Complexity Science, Ecological Psychology and Distributed Cognition this paper argues that educational design needs to focus on supporting the dynamics and flow of interaction, the exchange of ideas and negotiation of meaning within a curriculum based ecosystem.

Keywords: Complexity Science, Ecological Psychology, Curriculum Based Ecosystem

The dynamics of our lives have changed. Our senses and cognitive processes have been extended and supported beyond our physical selves. We live in a world that has been described as a 'digital ecosystem' where the physical and the virtual are fully intertwined and functioning through well-designed, well-integrated social and technical architecture working together in a wireless mesh that is persistent, pervasive, and mobile (Suter et al 2005). This digital ecosystem is an open, flexible, demand driven, self-organising, collaborative environment. It can, and has, enhanced our abilities to connect with other people, share ideas, work collaboratively and form communities.

Our students are becoming very comfortable with this digital world, at home with its tools and processes. Today's learners increasingly have access to, and use a broad range of social networking tools and technologies that provide a constantly evolving multiplicity of interactive resources for information and communication. As such learners expect to see this diversity reflected in their educational experiences. If our educational practices are to remain relevant our higher education institutions must also embrace this evolving digital age. Unfortunately traditional transmission models of education (reinforced by widespread use of instructivist teaching approaches and top-down management structures) seem to still dominate our educational institutions. (Garrison et al 2003, Laurillard 2006).

> Technological innovation in higher education has been largely restricted to administration and research. The significant technological innovations in teaching and learning have been confined to addressing issues of access and convenience. However, addressing the relevance and quality of the learning experience demands that higher education take a fresh look at how it approaches teaching and learning and utilizes technology. (Garrison & Vaughan, 2008)

Virtual learning environments and social networking solutions have the capacity to cater for a diverse range of learner initiatives and learner interactions. The learner can be provided with opportunities to interact with the tutor, other learners, course content (readings and other resources), and external experts. Learners therefore, have access to a rich socio-cultural context. Unfortunately, the adoption of these technologies seems to have been more about the preservation of the status quo than any paradigm shift. Higher Education practices need to reflect the dynamics of the digital ecosystem our world has become. This requires a major change in current practices if we as educators are to provide our students with educational experiences which will enable them to develop the attitudes, skills and knowledge needed to meet the challenges they will face as professionals in this constantly evolving digital world.

It has been argued that we do not learn a set of rules or abstract theories that we then apply in our interaction with the world. We in fact internalize a common set of practices, roles and ways of thinking that are provided by the current predominant paradigm (Imershein 1977). Knowledge is structured within a paradigm, supporting a particular worldview that defines an understanding of what can be achieved; the paradigm itself guides activities along particular directions. So implementing alternative educational approaches without changing the fundamental underlying paradigm tends to have little or no effect on actual practice. An alternative paradigm needs to be used if real change is to occur, and exemplars based on this paradigm need to be developed to provide concrete models to support change in practices (Kuhn 1970, Imershein 1976).

Our current curricula are not designed to mirror the complex dynamic world we live in and expect our students to be able to function in and succeed in as professionals. Curricula as we find them across our institutes of Higher Education have their roots in Europe in the 1500's. The term 'curriculum' was first used, in an educational sense of a course of study at a university, by Petrus Ramus, Regius Professor of Logic, in the late 16th century. Ramus' ordering and classification of courses and knowledge is fundamentally reductionist (Doll 2012). Reductionism is the belief that the whole can be understood if you understand its parts; that by dividing something under examination into as many parts as possible is the best way to understand that thing. It is the belief that by reducing everything to its simplest parts universal laws can be discovered and/or applied. It has been the foundation of scientific method since the time of Descartes and Newton (Mitchell 2009, Smitherman 2005).

This has led to the prevailing view in education that curriculum design should be based on the categorization and organisation of content to be delivered and learned. However it has been realized that while reductionism has its place as a scientific method it does not provide the means to explain much of our world.

> Many phenomena have stymied the reductionist program: the seemingly irreducible unpredictability of weather and climate; the intricacies of and adaptive nature of living organisms and the diseases that threaten them; the economic, political and cultural behavior of societies; the growth and effects of modern technology and communications networks; and the nature of intelligence and the prospect of creating it in computers. (Mitchell 2009)

Complexity science

A complexity paradigm provides us with the alternative view of the world we need for real change to occur; one that sees it as complex and unpredictable, one where relationships are non-linear and dynamic. It is made up of complex adaptive systems where intelligent agents anticipate the behavior of others and the external environment, and modify their behavior accordingly. Complexity science is not one theory but a combination of theories and concepts informing a wide range of disciplines including physics, biology, chemistry, mathematics, economics, sociology and a growing number of others.

Common properties of complex systems are:
1. Complex collective behavior: They consist of large networks of individual components (eg. ants, neurons, stock-buyers, website creators) each typically following relatively simple rules. It is the collective actions of vast numbers of components that give rise to the complex, hard-to-predict, and changing patterns of behavior.
2. Signaling and information processing: All these systems produce and use information and signals from both their internal and external environments.
3. Adaptation: All these systems adapt – that is, change their behavior to improve their chances of survival or success – through learning or evolutionary processes.

(Mitchell, 2009)

Concepts drawn from Complexity Science relevant to education include:
- The whole is greater than the sum of its parts: a complex system cannot be understood by dividing it into parts.
- Emergence: the process by which new patterns, features, qualities or products result from the non-linear interactions of agents within the system. Emergence is driven by the self-organizing nature of a system far-from–equilibrium.
- Self-organization: the tendency of many systems to generate new structures and patterns over time on the basis of its own internal dynamics – order emerges from patterns of relationships among individual agents.
- Non-linearity: actions can have more than one outcome and can generate non-proportional outcomes.
- Far-from-equilibrium: systems in far-from-equilibrium states evolve and adapt to changing conditions and spontaneously self-organize with structures of increasing complexity.
- Co-evolution: the process of mutual transformation that takes place for both the agent and the environment in which it exists.

When curriculum design is viewed from a complexity science perspective the focus shifts from curriculum content to the underlying processes of the complex adaptive system that is a discipline, a profession. We discover a world where the whole is greater than the sum of its parts. A perspective of curriculum stemming from the complex non-linear dynamics of such a world can spark new notions of epistemology and pedagogy. Through the use of concepts associated with complexity theories, new visions for curriculum can emerge (Smitherman 2005).

Curriculum based ecosystems & ecological psychology

Complexity Science provides us with the language and concepts to describe the nature and dynamics of our world as a digital ecosystem. To build further on this we need to be able to describe how human beings as independent agents within such a system find meaning, know and learn. Developments in ecological psychology provide us with the means to do this.

> … many contemporary thinkers from a variety of domains describe knowing not simply as a psychological construct existing in the head but as an interaction (or what Dewey, 1938, referred to as a *transaction*) of individuals and physical and social situations. (Barab & Plucker, 2002)

This ecological view of psychology takes as fundamental the interaction of agent and environment. Rather than explain things as all inside the head of the learner, explanations emerge from learner-environment interactions that are whole-body embedded in the lived-in world experiences. Interaction is dynamic and continuous, not static or linear (Young, 2004). Ecological psychology is based on the premise that perception and knowing is a property of an ecosystem, not an individual, and is co-determined through the individual–environment interaction. All environments have certain affordances that allow an individual to perform an action or actions and achieve a goal.

> Gibson (1979/1986) introduced the relational terms affordance and effectivity. An affordance being a specific combination of properties of an environment, taken with reference to an individual, that can be acted upon—opportunities for action (Gibson, 1977). Reciprocally, an effectivity is a specific combination of properties assembled by an individual, taken with reference to the environment, that allow for the dynamic actualization of a possibility for action. (Barab & Plucker (2002)

An ecosystem can be seen as an affordance network, that is a collection of facts, concepts, tools, methods, practices, and even people, taken with respect to an individual, that are distributed across time and space and are viewed as necessary for the satisfaction of a particular set of actions or goals (Barab & Roth 2006). An affordance is a possibility for action by an individual and an effectivity is the dynamic actualization of that affordance. An effectivity set constitutes those behaviors that an individual can produce so as to realize the potential of an affordance network.

Many educational practices implicitly assume that conceptual knowledge can be abstracted from the situations in which it is learned and used, this assumption inevitably limits the effectiveness of such practices. Knowledge is situated, being in part a product of the activity, context, and culture in which it is developed and used (Brown et al, 1989). Knowing and meaning, and therefore learning, is part of the dynamic interplay of individual and environment. When designing curricula we need to recognize this and design to support the dynamics and requirements of the ecosystem of the chosen profession or discipline. Learners need to be provided with opportunities to develop the effectivities needed to function effectively and succeed in the affordance network or ecosystem of their chosen field.

How do we identify the 'effectivities' that need to be integrated into the design?

The concept of distributed cognition provides us with a basis for identifying these effectivities. We need to understand the emerging dynamic of interaction within the complex networked world of a digital ecosystem. The theory of distributed cognition has an important role to play in understanding interactions between people, technologies and environments, as it's focus is on whole environments, what we really do in them and how we coordinate our activity in them.

Distributed cognition looks for cognitive processes, wherever they may occur, on the basis of the functional relationships of elements that participate together in a process. While traditional views look for cognitive events in the manipulation of symbols inside individual minds, distributed cognition looks for a broader class of cognitive events. For example, an examination of memory processes in an airline cockpit shows that memory involves a rich interaction between internal process, the manipulation of objects, and the traffic in representations among the pilots.

At least 3 kinds of distribution of cognitive process have been identified:
- cognitive processes may be distributed across the members of a social group
- cognitive processes may involve coordination between internal and external (material or environmental) structure
- processes may be distributed through time in such a way that the products of earlier events can transform the nature of later events

Hollan et al (2000)

Culture, social organization, the structure added by the context of an activity, and the tools used to complete that activity, are all forms of cognitive architecture.

> … in the distributed cognition perspective, culture shapes the cognitive processes of systems that transcend the boundaries of individuals [Hutchins 1995a]. At the heart of this linkage of cognition with culture lies the notion that the environment people are embedded in is, among other things, a reservoir of resources for learning, problem solving, and reasoning. Culture is a process that accumulates partial solutions to frequently encountered problems. Without this residue of previous activity, we would all have to find solutions from scratch. We could not build on the success of others. Accordingly, culture provides us with intellectual tools that enable us to accomplish things that we could not do without them. (Hollan et al 2000)

Knowing and meaning, cognitive activity, is constructed from both internal and external resources, the meanings of actions are grounded in the context of activity. It is not enough to know how the mind processes information, it is essential to also know how that information is arranged in the material and social world. We interact with, and within, the structure in environments, ecosystems. To design effective curricula we must know what that structure is and how it can be organized, the processes individuals and groups engage in and the resources and tools they use to render their actions and experiences meaningful. We need to have an understanding of information flow, cognitive properties embedded in systems, social organizations, and cultural processes.

An ecological view of the world requires a shift of focus in education to learner's interactions rather than the dissemination of information. We need to design experiences that are a true reflection of professional practice in the real world and provide an environment/ecosystem that supports, and in fact enhances, the evolution and emergence of professionally relevant attitudes, skills and knowledge in those engaged in and traveling through a curriculum based ecosystem. We have to support the dynamics and flow of interactions, the exchange of ideas and negotiation of shared meaning, and the engagement with others in a community of inquiry, within and around a professionally relevant educational experience (Cheers et al, 2011).

The author is currently conducting research into the design of a curriculum based ecosystem for Higher Education.

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Extrinsic and intrinsic barriers in the use of ICT in teaching: A comparative case study in Singapore

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This study examined the use of ICT for teaching undertaken by two primary school teachers at pre-examination period and at post-examination period. Their perceptions of using ICT for teaching and learning and their ICT experiences were also analysed. The results showed that both teachers improved in ICT integration from Adoption stage to Adaptation stage after examination (when the curriculum is more flexible and teachers had more time for lessons), with increased scope and sophistication in ICT use in classrooms. These observations confirmed that extrinsic barriers - time and curriculum constraints - are negatively impacting ICT integration of teachers.

Keywords: ICT integration, time constraint, curriculum constraint, case study, Singapore schools

Introduction

The benefits of integrating Information Communication Technology (ICT) in enhancing classroom learning and teaching have been well documented in education research (Sutherland, 2004; Korte & Hüsing 2006; Grabe & Grabe, 2007). Educational researchers and practitioners are making every effort to pursue "ubiquitous computing" (Weiser, 1991) in which technologies are woven into diverse dimensions of pedagogical practices in formal educational contexts. Singapore is no exception in this regard. To make "ubiquitous computing" a reality, the Ministry of Education in Singapore has launched a series of ICT Masterplans (MOE, 2008) and the Programme for Rebuilding and Improving Existing Schools (PRIME) (MOE, 2008) to promote the meaningful use of ICT In schools.

With the cognition that ICT integration will not naturally happen by solely providing technological "assets" (Horrigan, 2007) in classrooms, teacher development activities are designed and implemented to augment favorable "actions" and "attitudes" toward technology in the agents of change of classroom practice. In the National Institute of Education (NIE) of Singapore, the teacher training institute for all public school teachers, courses concerning ICT use for educational purposes have long been incorporated into its teacher training programs. Given the extensive support for teachers, one might assume that ICT use in classrooms should improve and inspire the transformation of traditional pedagogical practices. According to Cuban (2001) and the Office for Standards in Education (2004), the adoption and integration of technology into classroom learning and teaching is behind expectations. In practice, ICTs are either scarcely used or only used to supplement traditional and frontal teaching (Redecker, 2009).

This reality makes investigating the factors that compromise ICT integration in school settings imperative. There have been scholarly efforts made for this end. Informed by previous research, the present study explores the issues that undermine teachers' ICT use in authentic, regular classrooms in Singapore via a comparative case study approach. The findings in this micro-analysis can help school authorities and policy makers to plan interventions to encourage ICT use and the progression of "ubiquitous computing" in Singapore schools.

Research Goal & Framework

In existing literature, there has been discussion concerning the barriers that teachers face in using ICTs from a general perspective. Peggy Ertmer (1999) classified those exposed into two categories: 1) Extrinsic barriers, first order barriers that result from inadequate and/or inappropriate configuration of ICT infrastructures, including access, time, support, resources and training; 2) Intrinsic barriers, second order barriers that related to teachers' personal experience and awareness, including attitudes, beliefs, practices and resistance.

Previous studies have extensively investigated teachers' beliefs and attitudes toward ICT adoption and the results indicate that most teachers were positive about ICT integration as it makes learning more effective and teaching and learning resources easier to reach (Gulbahar & Guven, 2008; Prestridge, 2012). Thus, the unsatisfying implementation of ICT-supported learning and teaching could probably be ascribed to the lack of Technological Pedagogical Content Knowledge (ICT-TPCK) (Angeli & Valanides, 2009) to design and deliver effective pedagogies in technology enhanced learning environments and to the shortage of time and support for ICT use. In the Singapore context, the former is confirmed. Chen, Lim & Tan (2010) disclosed the existence of discrepancy between every ICT skills and those essential for teaching in pre-service teachers born after 1980, which limited their ICT adoption in teaching.

The time constraint for ICT use, to some extent, has been neglected in the Singapore context. Research into teachers' ICT use in other countries has identified the lack of time as a common barrier that most, if not all teachers face (Cuban, Kirkpatrick & Peck, 2001). Teachers, apart from finishing allocated teaching load, also help out in arranging and organizing both curriculum-related and unrelated activities and other administrative work. To many teachers, adopting ICT is additional work that is only looked at when there is extra time. Curriculum constraint, which is closely related to the time issue, has been confirmed as another barrier. Research done in North Carolina shows that teachers "having insufficient freedom to make decisions about content and pedagogy" (Kauffman, 2005) discourages teachers from exploring and experimenting with innovative teaching leveraged on ICTs. Illuminated, we would like to investigate whether the same barriers (time and curriculum constraints) exist in Singapore.

To achieve this, we observed and documented the ways two teachers used ICTs for teaching and learning during regular lessons (before the Primary School Leaving Examination, PSLE) and in post-exam lessons (lessons after PSLE). These two teaching periods were chosen as, in Singapore, after PSLE students still have to attend school but there is no longer a prescribed curriculum to follow, which gives teachers more freedom to plan and practice intended activities. Teachers also have more time due to reduced administrative work and school activities after PSLE. A comparative case study has been conducted to examine whether there was a discrepancy in ICT use between these two periods.

To describe the level of ICT integration of the teachers observed, we have translated the developmental trajectory of ICT use proposed by Dwyer, Rinstaff and Sandholtz (1991) into our context. According to this framework, teachers generally go through five stages in the process of incorporating ICTs into their classrooms indicated by their ICT-related teaching performance: 1) Entry stage, where the physical environment of learning starts to change with the introduction of ICT devices yet the learning activities and supporting tools used remain relatively traditional (e.g. pen, paper and books); 2) Adoption stage, where ICT devices are used but for traditional learning activities (i.e. using new tools for old practices); 3) Adaptation stage, where various ICTs are used with increasing depth and breadth, and integrated into specific learning scenarios; 4) Appropriation stage, where ICTs are routinely used and transforming pedagogical practices in a broader context (e.g. more extensive and frequent application of technology-enhanced collaborative learning) ; 5) Invention stage, where both the physical environment and teachers' mindsets about learning have been transformed and teachers are actively exploring and experimenting with new tools and activities to enhance learning effectiveness. In analysis, the level of ICT use of the teachers involved at both the pre and post examination period was examined and compared. It should be noted that in our study, the determination of ICT integration level was phenomena-based, i.e. based on the users' existing practice. The progression of ICT integration was thus defined as the improvement in the scope and frequency of ICT adoption which might and might not indicate the increase in users' competence in "ICT for teaching".

Participants & Data Collection

Two teachers, Tom and Paul, participated in this study. Both teachers were from a group of pre-service teachers who had responded to a call for volunteers for a research project in NIE to study the ICT habits and practices of pre-service teachers. Before graduation, this group of teachers was asked whether they would like to participate in the present study and these two teachers indicated their interest. Approvals were then sought from their respective schools for data collection.

Data was collected via lesson observations and interviews. Observation sessions were arranged once a month for a semester (from July to November). In practice, the researcher shadowed the two teachers throughout the whole school days. Observation notes, videos and photos were recorded and documented for analysis. The interview sessions took place right after the observation sessions. In the interview, teachers were asked about their perceptions and reflections on these ICT use experiences. All the interview sessions were audio-recorded and transcribed.

Data Analysis & Discussion

Adoption level at pre-examination period

Both Paul and Tom were found at the Adoption level of ICT integration before the examination. In Paul's lessons, most activities were supported by traditional tools and resources such as whiteboard and paper-based textbooks, workbooks and exercise books. ICT platforms were present but used infrequently. Basic applications such as PowerPoint presentations and visualizers were adopted most, but for very traditional practices. He used a visualizer for flashing worksheets, examination practice papers, passages and pictures for oral description. Sometimes, he used PowerPoint presentations to teach students the meanings of some new words. Only in one instance, he was observed using the online resources—the online timer to train his students to complete their work within time. Though a student portal – the LEAD Portal (an e-learning portal by Marshal Cavendish) was readily available in school, Paul did not use it often. He only turned to it when he lacked time to go through the answers of the examination papers with the students before PSLE. On these occasions, he merely used the portal to post answers and explanations for the students to look through on their own.

Compared to Paul, Tom adopted more ICTs in his teaching, yet his usage was still within the Adoption level. Whiteboard and paper-based textbooks, workbooks and exercise books were still the main vehicle for most learning activities. Sometimes Tom used digital textbooks (on his laptop) instead of the physical ones. The visualizer was the most common tool for presenting and demonstrating learning materials. Sometimes, he also used MS Word to take notes. Instead of writing the words out on the whiteboard, he typed the words out on a blank Word document (while the document was projected on the board) for the students to copy. He felt it was neater that way, and was easier for the students to read the typed words, as compared to the written words. To encourage student participation, he created a simple scoring programme using Flash to use in class and it worked very well with the students. Like Paul, Tom was also observed using an online timer. He used it during oral practice to remind students of the time passage in oral practice.

Adoption-Adaptation level at post-examination period

After the PSLE, ICTs were more significantly used in both teachers' lessons and these applications were of enhanced scope and effectiveness. Paul used significantly more ICT in his lessons and these applications were with enhanced scope and effectiveness. PowerPoint presentation was still mostly commonly used but Paul experimented with more functions. He played a charades-inspired game with the students on this platform. He also incorporated an activity about a girl caring for her mother in his PowerPoint slides to encourage students' reflections in class. Apart from basic applications, inspired by Amazing Race, Paul created a game specific for Primary 6 students via combing various ICT tools. In this activity, students had to apply skills such as typing in Chinese, searching web engines using Chinese and using online translator (Google Translate). During this process, he voluntarily reflected on the limitations of Google Translate and taught his students how to tell reliable online resources from unreliable ones.

Like Paul, Tom also brought the students to the computer labs more often after the PSLE. The post-examination activities for his Primary 6 students were also more creative and incorporated better use of ICTs. He created a game to test students' general knowledge and ability to read in Chinese using multiple ICT tools. In the learning activity, selected students were put in groups and the groups had to play against each other, while the rest of the students watched. There were various categories of questions to choose from and the students were also given options like polling the (student) audience, doubling their points for a question or throwing the question to another group.

From these observations, we found both Paul and Tom had enhanced agency in exploiting the affordances of ICTs within reach and improved awareness and techniques to address the changing requirements and side-effects brought about by the introduction of ICTs. From the evidence, we can see both teachers' progress from Adoption to Adaptation with regard to ICT use for teaching.

Time and curriculum constraints for limited ICT use

Apart from performance analysis, the investigation of teachers' perceptions of their ICT use experience offered further validation for pinning down time and curriculum issues as negative forces hindering ICT integration in classrooms. During the interview sessions, the two teachers were asked about their thoughts and reflections on ICTs. Paul directly cited the lack of time as the main reason he did not add much ICTs to his regular lessons. Activities like planning and preparing ICT-related lessons, bringing the students to the (computer) lab, setting up the systems was all quite time-consuming. There was also time needed for troubleshooting technological issues.

In addition, Paul felt the existing curriculum had somehow restrained his teaching. As a beginning teacher, he had "a certain curriculum to follow already, so it was not so easy to think out-of-the-box to and plan certain ICT instructional or even ICT-based activity for them (the students)" as "a lot of things are already in place". The academic activities for the year were already mapped out for teachers. There were workbook activities and other academic related activities like spelling tests (dictated by the heads of department) that the teachers had to complete, so little time was left for other activities. He also "didn't want to try anything new or incorporate certain things that they (the students) might not be used to".

Paul also mentioned that "ultimately, we are still preparing them (the students) for that (PSLE)", so a lot of drilling was necessary. That was the very reason why even if he had used ICTs, he used them for drills. The students were not going to be tested on their skills in ICT, so that was "not crucial". Moreover, the tests were to be done using pen and paper, not on the computer. That students learning using various ICT platforms would not help much or even make them slow and uncomfortable in doing pen and paper-based tests. Besides, he believed that incorporating ICT was only used to enhance students' interest and skills like the games he played with the students. Paul was "quite sure that whatever they learnt in terms of content today, they will not remember on Monday", though he believed that they would retain the skills they had learnt "because it's more kind of kinesthetic kind of work".

Like Paul, Tom perceived the press for time in using ICTs in his lessons. He complained that school computers worked too slowly and mentioned that compatibility and security issues when he used his personal laptop in school and solving these technical problems took up a lot of class time.

Tom also mentioned the same problem with existing curriculum that he was fully-occupied with planned learning content and activities so that he was so tired and "not energetic enough to do extra stuff". He also said that the focus for his teaching was on preparing students for PSLE.

Other barriers that limited ICT use

Apart from time and curriculum constraints, other issues also became evident from Tom's feedback. That teachers had not fully comprehended the needs and methods to integrate ICTs to transform traditional teaching was one of them. According to Tom, ICT tools were not so necessary for teaching a language. In his opinion, he could conduct his lesson by just talking and using the whiteboard (chalk-and-talk), even if the visualizer was not working, or if he had forgotten to bring the textbook to class. He deemed traditional classroom tools more than sufficient to provide for his teaching needs. To him, ICT tools were fancy add-ons, to "attract" the students by showing them video clips or animation clips. He felt that the "area and the opportunity to use ICT to enhance teaching is limited". According to him, "language is all about the interaction" and multimedia simulation was the same as him talking and gesturing ("The sound, I can talk, I have the sound. The video I, my gesture, it's still the same"). To him, using ICT was merely a different mode of presenting the lesson, but ultimately, the lesson content was still the same, so it did not make much difference.

Another source of problem lay with the lack of ICT infrastructure for linking formal and informal learning contexts. Tom found giving his students learning materials and assignments from the LEAD portal was "effective", but he did not continue to do so after trying a couple of times as students complained about the problems with their Internet connections at home which prohibited them from finishing the learning activity. As such, Tom only used the portal for supplementary purposes like uploading answer sheets, posting examples and spelling lists.

Conclusion

This paper reports a comparative case study of teachers' ICT use for teaching before and after the examination period. After analysing two teachers' ICT experiences and perceptions towards ICT for teaching and learning, extrinsic barriers - time and curriculum constraints - has been confirmed as discouraging ICT adoption in classroom settings. After the examinations, both the teachers used ICTs more extensively and effectively due to increased freedom for embracing more diverse and sophisticated ICT-supported pedagogical practices. Though curriculum being responsible for reduced ICT integration in classrooms is suggested, we do not argue for the eradication of existing curriculum but for the modification as curriculum can give teachers a clear sense of what to teach and foster teachers' on-the job training (Valencia, et al., 2006).

From these findings, it is recognised that policy makers and school authorities should make further efforts to better accommodate the "support" teachers and students need in leveraging on ICT supported learning environments if "ubiquitous computing" is to be attained. Apart from providing technology-centred support (e.g., ICT devices and software), people-centred support (e.g., initiatives that encourage ICT-related innovation in pedagogy and curriculum) are also needed to facilitate and stimulate teachers to explore and experiment in this area.

The study also revealed teacher beliefs and attitudes as well as ICT infrastructure as limiting factors. As these factors typically change over time, they could be further studied by comparing the findings from beginning and more experienced teachers.

It should be pointed out that this is an ethnographic study and is qualitative in nature. Data used was collected over several events with humans being "the research instrument" and "generalizability is interpreted as generalizability to identifiable, specific settings and subjects rather than universally" (Cohen, Manion and Morrison, 2000). Any application of findings and conclusions achieved in this study should be done with caution. Another limitation of this paper has been its sole focus on those extrinsic factors within the school context. As indicated in the interview data, these two teachers, if representative of other teachers, have not grasped the whys and hows in integrating ICTs and that there exists a lack of coherent infrastructure linking formal and informal learning contexts which also contributed to the encumbered ICT use. More extensive investigation is needed to offer a comprehensive capture of the factors impacting ICT integration.

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Embedding eportfolios in teacher education: Lessons from a multi-year implementation

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ePortfolios are being used in teacher education across Australia as a technology and as a process. They allow pre -and in-service teachers to showcase teaching practice against teaching standards and reflect on their practice throughout and after study. The University of Tasmania is implementing an eportfolio as an integral part of its Master of Teaching and Bachelor of Education programs to help with this process. This paper uses document analysis to describe the support strategies used in the previous two years of implementation of eportfolios at the university and outlines future plans for progressive implementation (including plans to change eportfolio technology and support implications). Some of the strategies used to implement eportfolios include: the use of a community of practice, the use of templates and scaffolds, support from L&T and IT infrastructure, embedding assessments in units; and modelling/building exemplars of effective portfolio practice.

Keywords: eportfolio, higher education, teacher education, e-learning, teaching standards

Introduction

The use of teaching portfolios has been around for many years. Bunker (2005) suggests that teaching portfolios can be used for demonstrating learning; career enhancement; professional development; as part of academic audits and review. According to Butler (2006) there are three main purposes of eportfolios in education: as a showcase of achievement; as a tool for assessment and/or certification; and as a record of learning over time. Teaching registration boards across Australia have focused attention on developing professional teaching standards to be used for certification, promotion and professional development. It is suggested that teaching portfolios can be an effective way to demonstrate professional standards and are now becoming a common strategy for assessing these standards (Zeichner & Wray, 2001; Smith & Tillema, 2003; Strudler & Wetzel, 2005).

Although there is potential for eportfolios in developing teaching portfolios there are issues that need to be considered before they can become a sustainable part of the curriculum. Wright, Stallworth and Ray (2002) studied the perceptions of students in an implementation of eportfolios in a four-year teacher education course. They identified a number of concerns including increased time commitment, lack of clarity regarding purpose and audience, and problems with the technology. The use of an eportfolio is not the same as creating a paper-based teaching portfolio. There is a need for students to develop eportfolio skills via training (Heath, 2005) and to develop technical knowledge (Abrami & Barrett, 2005). These aspects need comprehensive support and developing these skills takes time.

Context

In 2007 the *University of Tasmania* decided to make the use of eportfolios one of its strategic goals. In 2008/2009 the *Projects and Evaluation Unit* implemented a trial of eportfolio software with a number of staff and students. One of the cohorts that trialled and evaluated the eportfolio software was the Faculty of Education. In 2010 the University started a wide-ranging “progressive implementation of eportfolios” making eportfolios available across the university “to all UTAS staff and also available for student use within course[s] and units” (Allan, 2010, p. 3).

The initial evaluation of eportfolios by the Faculty Education included units within the course *Bachelor of Teaching*. This course had previously used a portfolio (a printed hardcopy version) which was used for the purpose of a “showcase portfolio” (Stefani, Mason & Pegler, 2007) and an “exit portfolio” (Constantino & De Lorenzo, 2006). The portfolio contained evidence of teaching performance standards, as detailed by the Tasmanian Registration Board (TRB), and was compiled by students to demonstrate mastery of these areas. The students worked on the eportfolio throughout the two-year course and then provided evidence of their performance against the TRB standards in the final unit (Poot, Oerlemans, Kertesz, Hawkins & Eversole, 2009, pp. 2-3).

After the trial, the Faculty of Education decided to introduce the eportfolio across two of their major programs: the *Master of Teaching* and the *Bachelor of Education* courses. The faculty was interested in developing the eportfolio process throughout its various offerings. Its intention was to get students to create a "developmental" (or working) portfolio throughout the course and to use the evidence and reflection from this portfolio as a final "evidential" (or exit) portfolio in a hope to demonstrate evidence against the TRB standards.

The eportfolio was planned to be used as both a formative and summative part of the *Master of Teaching*. It would have a summative assessment component in the final unit of the course: Preparing for the Profession. "At this time, the portfolio will be presented to a panel of assessors, and this process will result in summative feedback to the student and a final grade for the portfolio" (Fraser, 2009, p. 4). It would also have formative aspects throughout individual units and professional experience during the course.

Year 1 (2010): Get something up and running (but make sure it is supported)

In the first year the goal was to get something up and running and ensure there was enough support for students and staff. We knew, from experience, that if this was going to get off the ground then support would need to be abundant and available wherever needed.

The eportfolio plan for the Faculty of Education was that all students in the *Bachelor of Education* and the *Masters of Teaching* courses starting in 2010 would work on an eportfolio throughout their course. All these students would have access to an eportfolio system (PebblePad), mentors, and technical and educative support for this process. Students would complete an exit portfolio at the end of the course. The eportfolio was to have a number of purposes, including: to show the students' individual growth throughout the course; as a way for students to document their knowledge of teaching and their ability to teach; and for students to show their best work in relation to the teaching standards.

One of the advantages we had in the implementation was that we were able to get a degree of top-down support for the eportfolio project. There was endorsement from the University Learning and Teaching Committee including a highest level (H1) reporting requirement within the University strategic plan. This provided us with reasonable funding in our first year for Learning and Teaching and IT support and also expenditure for the software. We also had endorsement from the Faculty of Education Associate Dean of Learning and Teaching.

The major initiatives within the scope of the first year evolved around getting the support processes in place and in particular liberating academics from the technical aspects of eportfolios. It also included the provision of advice regarding learning and teaching aspects. We provided the following:

- **A comprehensive training and support package**. This included two sessions for teaching staff (*eportfolios for learning and teaching* and *how to create your own eportfolio*). The provision of at-elbow support for all units involved in teaching or assessment using the eportfolio tool (there weren't many in the first year). The development of support resources for tasks. IT Help Desk support for all staff and students using eportfolios.
- **The development of a small number of activities to promote the use of an eportfolio as a progressive task**. Learning & teaching staff supported a small number of units in developing tasks incorporating the eportfolio. One example involved students developing a professional experience blog to document experiences when on placement in school. This was intended to be a hurdle task (i.e. needing to be completed as part of Faculty requirements) but, as it ended up not being a requirement, students did not complete it.
- **The development of an Online Community of Practice (CoP)** using the current Learning Management System. An online site was created and supported by an experienced teacher and technical personnel (it was essential to have both). The community of practice provided a variety of key resources regarding the use of eportfolios, an FAQ section to support both technical and educative aspects of developing eportfolios, and web conferencing for student training and support. All students in the Faculty of Education had access to the CoP. It was not meant to be unit specific but a place where all students could ask questions about the eportfolio process.

Year 2 (2011): Embed into key units and model effective practice

The major lesson learnt from the first year was that if the eportfolio task was optional and not embedded within a unit then it is highly unlikely that students would participate – no matter what the long term value of the task was. We also realised that it was essential to give students (and lecturers) examples/exemplars of what was expected and also scaffolds and templates to support the process. Helping students to understand the purpose of an eportfolio and what was required to develop one was a key issue of year one.

The major focus for year two was embedding eportfolios into core units and grass roots initiatives. We continued to provide the support and training that we offered in the previous year (although much of the funding disappeared due to the changes in University priorities). We also continued to provide the Community of Practice for all staff and students. The major initiatives included:

- **Embedding eportfolio tasks within key units**. We decided to embed learning, teaching and assessment tasks within key professional experience units in both the *Masters of Teaching* and *Bachelor of Education* courses. We focused our attention on specific units that were consistent in both courses and that had a professional experience focus. Two of the units that we helped develop were the *Foundations of Teaching* and the *Preparing for the Profession* units (the first and last in the degree).
- **The development of a template for the final professional portfolio**. We developed a scaffold/template that was available to students from the beginning of their course and was used in the *Preparing for the Profession* unit. The template provided the students with an understanding of the TRB standards and the types of evidence and information that would be needed to support their case that they had achieved the standard. Students were able to copy the template, modify it with their own experiences and then submit this as part of the requirements of the final unit.
- **Inclusion of examples / exemplars of eportfolio practice**. In 2011 we had our first students complete their eportfolio. We collected a number of examples of student generated eportfolios with permission to use these as a part of the Community of Practice.
- **Documenting case studies of eportfolio tasks**. In 2011 we also collected a number of case studies designed by lecturers using the eportfolio. These case studies can be used in training and at-elbow support to help lecturers understand the kinds of tasks that can be developed within an eportfolio.

Year 3 (2012): Changing systems - transition

The third year saw the arrival of a significant new challenge: a decision by the University to move to a new eportfolio product. This new product would be integrated within a completely new Learning Management System (LMS) that the University would be progressively implementing in the second semester, 2012 and throughout 2013. The key objectives for this third year became:

- **Consolidating positive attitudes** towards the use of eportfolios within the Faculty.
- **The development of a migration plan** that moved students from one system to the other with the least amount of disruption or extra work for Faculty staff and students. The development of a plan to roll out the new eportfolio tool in semesters 1 and 2, 2013.
- The **introduction of the new eportfolio tool** to Faculty eLearning support staff and key academic staff.

The integrated nature of the new eportfolio tool offered a distinct advantage over the previous software. Staff and students will no longer need to access a separate system and learn to use a product with a different interface and support systems. When fully rolled out by the end of 2013, the new tool will have a familiar interface; a single login shared with the LMS; integrated help and IT support as well as the capacity to draw on assessment and content tools in the new LMS. The integration, however, also meant a re-evaluation of our approach to eportfolios and a rethinking of our eportfolio process. Previously the eportfolio was individually owned and only accessible by the student until work was purposely shared or submitted for assessment. It operated as a personal learning environment which could be continued after completion of the degree. The move to an integrated institutional system raises questions about how we promote the use and value of an eportfolio and also what training is conducted. This rethinking is ongoing and will continue to be a major consideration for our future development and use of eportfolios within the Faculty of Education.

The lessons learnt from the first two years are expected to provide a solid foundation as the project transitions to a broader audience. By the end of 2013 the new eportfolio tool will be available to all students and staff within the Faculty of Education and throughout the University. The combination of a structured workshop series, the delivery of at-elbow and technical support, scaffolding of eportfolio activities, the provision of templates and learner support materials and the development of Communities of Practice will continue to play an important part in the future success of this project.

Conclusion

If eportfolios are going to be used to showcase and reflect on teaching practice then appropriate measures need to be in place to support both the teacher educator and the teaching students. All users need to feel comfortable in the environment from a technical and from a learning and teaching perspective.

This study found that a combination of top down support from Learning and Teaching, IT and Faculty leaders and support through grass roots initiatives in eportfolio development is significant in the adoption of an eportfolio. This support will affect how the eportfolio is utilized and whether it is sustained throughout a program of study. The grass roots initiatives in particular need to be nurtured, supported and celebrated in order to develop positive attitudes and perceived value for teacher educators.

The eportfolio implementation in the Faculty of Education at the University of Tasmania is still early in its development. It will need further support to add value within its programs. It will be interesting to see how changes in the eportfolio system (PebblePad to Desire2Learn eportfolio) will affect the uptake and use of eportfolios in 2013. There are some positive indications that the new system will support greater integration between eportfolio use and learning tasks. Maintaining the positive attitude of staff and students within the faculty during migration will be a key consideration for this change to be effective.

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Exploring Mobile Augmented Reality

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Intended audience and degree of expertise/past experience required

- Educators wanting to explore or engage with mlearning and augmented reality
- Educators interested in ideas for enabling student-generated content and contexts beyond the classroom
- Ability to install and use smartphone/iPad applications.

Statement of objectives for the workshop

- Participants will gain an understanding of the educational possibilities of mobile augmented reality
- Participants will experience a variety of mobile augmented reality applications on their own devices
- Participants will create points of interest for a mobile augmented reality browser
- Participants will discuss examples of student-generated mobile augmented reality

Detailed description

Full programme outline available on Google Docs at:
https://docs.google.com/document/d/1oYHP5g9OlS8nCZUUpkEkaAFSAZP7RQJgWBvkxfbwcMw/edit

The session will include:

- An overview and demonstration of mobile augmented reality
- Examples of the educational use of mobile augmented reality
- A hands-on tutorial on how to create enhanced points of interest and an augmented reality layer for a mobile AR browser (e.g. Wikitude, Layar, and Junaio)

Organisation of the session

AR demo

Poll - what mobile device do participants own? http://www.polleverwhere.com
Establish use of back-channel via Twitter Hashtag for session. **#ascilite12AR**

AR Overview:
YouTube Playlist: http://www.youtube.com/playlist?list=PL91E9CED8BCC4CF76

AR Demonstrations:

- QR Codes
- High tech AR example
- AR mobile browsers (Wikitude, Layar, Junaio) – participants download Wikitude to their own device.
- AR mobile Apps (Nokia Point and Find, Google Goggles, SkyMap, Word Lens, urbanspoon, AR.Freeflight, etc…) – participants download 1-2 example AR apps to their own device.
- ARDrone - Quadracopter & Christchurch Quake
- CityViewAR
- Google Glasses
- Google Sketchup and AR Media
- 15 AR Apps for iPhone:

Presentations of student mobile AR projects
Links to educational research on mobile AR.
Other useful augmented reality resources
A how-to create POIs and a Wikitude layer
Participants create their own POI and Wikitude layer and upload and share them via Twitter
Overview of Junaio & Stiktu

Heutagogy and mobile social media: post Web 2.0 pedagogy

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O'Reilly coined the term Web 2.0 seven years ago (O'Reilly, 2005), yet in the past seven years we have seen limited evidence of wide-spread impact of Web 2.0 on traditional higher education pedagogy. Seven years on, the social media landscape has changed and today's school-leaving students are entering higher education within an increasingly post Web 2.0 society that is predominantly characterised by engagement with mobile social media. We argue that there is a need for higher education to engage with new pedagogies that are appropriate for an emerging post Web 2.0 society. We present a sustainable framework for preparing lecturers to engage with the challenge of post Web 2.0 pedagogies by experiencing the potential of mobile social media within authentic communities of practice.

Keywords: heutagogy, mlearning, Web 2.0, communities of practice, professional development.

Introduction

The advent of the world wide Web brought about an information revolution (Web 1.0) with the likes of Netscape and Yahoo, while Web 2.0 is characterized by social collaboration and user-customization with the likes of LinkedIn and Facebook. However, Jackson (2012) argues that there will never be a Web 3.0 because the next paradigm shift of the Internet is mobile rather than desktop browser-based. International Telecommunication Union (ITU) November 2011 statistics (International Telecommunication Union, 2011; mobiThinking.com, 2012) show that mobile broadband Internet connections out-number fixed broadband Internet connections by two to one, and 87% of the worlds population have a mobile phone, whereas less than 16% of the worlds population have access to a desktop or laptop computer. ITU statistics also show that in many developing nations, the majority of mobile Web users are mobile-only, with the highest including Egypt at 70 percent and India at 59 percent of Web use via mobile only. Just as the post-modern society emerged out of modernism, we are experiencing a transformation of Web 2.0 into post Web 2.0 mobile social media. This brings the potential to appropriate new pedagogies that harness the potential of mobile social media to create powerful situated, authentic, and informal learning experiences and bridge these into formal learning (Vavoula, 2007).

> As our use of mobile devices, games, and social networks illustrates, information technology can create new experiences. But more important, information technology enables new models. It can disaggregate and decouple products and processes, allowing the creation of new value propositions, value chains, and enterprises. These new models can help higher education serve new groups of students, in greater numbers, and with better learning outcomes. (Oblinger, 2012, p. 11)

However, the challenge is that a shift to the use of mobile Web within education as described by Oblinger (2012) will require two ontological shifts (Cochrane, 2010b, 2012): 1. Re-categorising mobile social media from the domain of informal social interactivity to collaborative tools that enable new pedagogical designs (Kukulska-Hulme, 2010; Laurillard, 2007, 2012), and 2. Re-categorising teaching and learning from teacher-directed pedagogy to enabling student-determined (or negotiated) learning, which has been termed heutagogy

(Blaschke, 2012; Hase & Kenyon, 2000; Luckin et al., 2010). In particular, mobile social media enables student-generated content and student-generated contexts utilizing the affordances of mobile devices, for example using the camera and GPS built into smartphones to display and interact with augmented reality layers created by students (Cochrane & Rhodes, 2011). We use Chi and Hausmann's (2003) definition of ontological shifts:

> An ontological shift is merely the re-assignment or re-categorizing of an instance from one ontological category to another… shifting ontologically may be difficult (if not directly told to do so) for three basic reasons. The first is a lack of the alternative category. The second is the lack of awareness of the need to shift. Finally, the third is that it is resource-intensive. (Chi & Hausmann, 2003, p. 432)

This paper presents a sustainable framework to address the three reasons (according to Chi & Hausmann) that make our two identified ontological shifts difficult: The framework (LTDF) provides alternative categories of pedagogy (from teacher-directed pedagogy to student-directed heutagogy), provides lecturers with an authentic experience of mobile Web 2.0, and provides sustained support for these by embedding these shifts within the activity of supportive communities of practice (COP).

Methodology

The Learning and Teaching Development Fellows (LTDF) builds upon the model of using COP for professional development developed by the researcher as an outcome of a participatory action research methodology (Swantz, 2008), between 2006 and 2010 and summarized in several papers (Cochrane, 2010a; Cochrane, Black, Lee, Narayan, & Verswijvelen, 2012; Cochrane & Narayan, 2011). We have found that one key to pedagogical innovation enabled by technology is developing lecturer competency with the technology (Cochrane, 2010b), creating an awareness of the need for an ontological shift in teaching and learning. Providing a series of short-term professional development workshops is unlikely to provide the support required for these shifts. This then is the goal of establishing and nurturing lecturer COPs, as although this is a resource intense approach, that involves long-term commitments, the results are rewarding. This COP framework was initially developed by the researcher at Unitec, New Zealand's largest Polytechnic, but was then applied to the researcher's new institution, AUT University, New Zealand's newest and fastest growing University. Four examples are provided in this paper. While each COP was unique, a common methodology refined throughout more than 35 mlearning projects was utilized for establishing and nurturing these COPs.

Communities of practice

Our conception of COPs is based upon that developed by Wenger, which began as a social learning theory (Lave & Wenger, 1991; Wenger, 1998), and has been developed as a framework for collaboration enabled by social technologies (Wenger, White, & Smith, 2009; Wenger, White, Smith, & Rowe, 2005). In our LTDF examples, Google Docs was used to collaboratively create and shape the four LTDF proposals around the formation of lecturer COP. These proposals focused upon identifying and supporting teaching fellows with the capability and passion to engage with the two identified ontological shifts. Each teaching fellow then partnered with the researcher to create the core of a COP within their department of lecturers interested in investigating the potential pedagogical impact of mobile social media within their teaching and learning contexts. The LTDF grants were managed by the institution's central support unit CfLAT (the Centre for Learning And Teaching) and provided funds for time-release for the accepted teaching fellows, as well as funds supporting the dissemination of practice-based research. The Teaching fellows then invited 4 to 6 of their peers to form a COP, that would meet regularly (usually weekly), and establish the use of several core mobile social media tools: mobile blogging, Twitter, Google Plus Hangouts, and a range of mobile social media applications.

Each LTDF proposal was also supported by an associated LATENT (Learning And Teaching ENabled by Technology) grant that provided funds for equipment purchases such as iPhones and iPads for use by the lecturers who joined each COP. Each participant was provided with either an iPhone, an iPad, or both for personal and professional use throughout the COP. Those lecturers who committed to participation within the COP for a full academic year were allowed to keep their devices. The mobile devices were not institutionally managed, but were expected to be used as personally-owned devices by the lecturers, thus providing a model for student-owned devices or BYOD (Bring Your Own Device). The LTDF projects therefore provided iPhones for the lecturers participating in the mobile social media COPs that are used to develop their own eportfolios and research relative to integrating the use of mobile Web 2.0 tools in teaching and learning with their students beginning in semester 2 2012. Research-informed experience will enable the course lecturers to not only experience the use of mobile Web 2.0 enhanced teaching and learning, but become confident enough to model the use of these tools within their own courses. Potential outcomes of each project for the participants include:

- Active participation in an authentic COP.
- Research and development of a professional eportfolio.
- Publication and sharing of a peer reviewed research output based upon their experience and the impact on their students.
- Development of new assessment and learning activities enabling student-generated content and student-generated contexts via student-owned mobile devices and Web 2.0 tools.

Four Case Studies: Learning and Teaching Development Fellows 2012

The four LTDF COPs focused upon using mobile social media as a focus for lecturer development, student-generated content, and student-generated learning contexts, or Pedagogy 2.0 (McLoughlin & Lee, 2010) within the contexts of: Journalism, Graphics Design, Product Design, and Public Relations. These are summarized in Table 1, and further described in the following sections.

Table 1: Four LTDF COPs

LTDF Contexts	LATENT Project	Project Blog	COP Participants
Journalism	Reinventing Journalism education via Mobile Social Media	http://ejeteam.wordpress.com	3 lecturers + 1 technology steward
Graphics Design	Heutagogy and Mobile Media Production	http://mopcop.wordpress.com	6 lecturers + 1 technology steward
Product Design	Augmenting the Design Thinking Studio	http://autproductdesign.wordpress.com and http://autdesignjournal.posterous.com/	6 lecturers + 1 technology steward
Public Relations	Communities of Practice in Public Relations	http://icollab12.wordpress.com	3 lecturers + 1 technology steward

Journalism

The Journalism COP was a collaboration with CfLAT to establish a COP based within the Department of Communication Studies at AUT that will establish a group of Lecturer peers and generate collaborative networks both nationally and internationally. This was initially based upon the lecturer's international contacts in the Journalism industry. The COP participants were identified as lecturers who are interested in investigating innovation in teaching and learning using social and mobile technologies within a participatory action research framework. The project built upon the establishment of an initial lecturer COP in collaboration with CfLAT during 2011 (Cochrane, Sissons, & Mulrennan, 2012). Outcomes of this COP are evidenced in the development of several student projects that integrate the use of mobile social media using student-owned devices (smartphones) in Journalism at AUT. The project is supported by an associated LATENT grant project that enables participating lecturers to utilize mobile Web 2.0 tools (for example the iPhone or iPad) in preparation for projects with their students.

The formation of a lecturer COP focused upon mobile social media (in particular Twitter, SMS Polls, and student-generated eportfolios) within Journalism aiming to have the following outcomes:

- Innovation in teaching and learning enabled by technology, in particular a focus upon student-owned devices to enable social constructivist learning environments that engage and empower students, modeling the authentic (Herrington, Herrington, Mantei, Olney, & Ferry, 2009) use of new technologies within Journalism.
- Establishment and development of a Journalism and cross-disciplinary lecturer COP exploring the potential of mobile and social technologies in teaching and learning.
- The COP also explores the affordances of mobile Web 2.0 technologies to enable cost-effective international teams, and remote expert participation, bridging the classroom environment across the

boundaries of time and geography.

- The Journalism lecturer COP builds upon mobile Web 2.0 projects established in 2011 (Cochrane, Sissons, et al., 2012).
- Outcomes of the project will be presented at appropriate peer-reviewed conferences for critical feedback, such as Ascilite2012, MLearn2012, ALT-C2012.

Storifying Journalism
Mobile social media (particularly Twitter and Facebook) have had a huge impact on traditional Journalism (Hirst, 2011; Rusbridger, 2011), but while there has been a big impact on the content of Journalism education, there has been little impact on the pedagogical practices of Journalism education. The default approach to teaching the impact of social media on Journalism has been by written case studies and student-learning assessed by essay writing critiquing these case studies. The LTDF Journalism COP led to reinventing this case study approach to modeling the use of mobile social media in class, and to get students to collate, curate, and critique actual source content around a mobile social media incident in Journalism. Students chose a breaking incident of mobile social media and used Storify.com either on their iPads or laptops to collate and comment upon Twitter, Facebook, YouTube, Instagram, Flickr and other mobile social media, creating an annotated rich-media story of the event or incident. The assignment question became: "How if at all have social media altered the way journalists and public relations practitioners interact? Use real examples from at least three social media platforms as well as academic sources to back up your arguments" (Assessment schedule 2012). This was then either published to their own blog, or their own Storify.com site for their lecturer to mark. Students interacted directly with rich mobile social media, developing creative rich-media stories that required metacognitive critiques. There was a considerably higher level of critique and creativity evidenced in the Storify.com project in comparison to that evidenced in previous essay versions of the assessment. Students used Storify to express and create very personalized critiques of the impact of social media on Journalism. Two contrasting examples are provided: 1. A student used Storify to create a very engaging rich media story that included many elements of humour (http://storify.com/carowells/assessment-1-test), 2. Another student took a more traditional approach to using Storify to enhance an essay, by providing rich media links to the events behind the story, and example contrasting views by experts as video talks (http://storify.com/shawnmoodie/how-if-at-all-have-social-media-altered-the-way-a).

> The best essays made the most of the platform and the freedom to include multimedia examples. These students also altered their style and the way they wrote into the examples to make their essays fit the medium. Further, by using a mixture of books, journal articles and discussions on social media, these students were able to explore the question far more deeply than most of those who stuck to the more traditional format. Initial feedback from students suggests they enjoyed the opportunity to explore social media in a way other that for social purposes. Most also realize the need to be confident using social media for their future role as professional communicators.
> In conclusion we believe the use of Storify in this essay was a success. The question was particularly suited to the use of social media tools. (Lecturer blog post, 2012)

This represented a significant pedagogical shift from the previous traditional written essay approach.

Graphics Design

The graphics design lecturer collaborated with CfLAT to establish a COP of Lecturer peers from the department, as well as establishing collaboration both nationally and internationally (for example: Unitec New Zealand, Salford University UK, and the University of Strasbourg) with other lecturers who are interested in investigating innovation in teaching and learning using social and mobile technologies within an action research framework. The COP links with networks already established as part of the Mobile Innovation Network Aotearoa (MINA, http://mina.pro/) brokering expertise beyond the physical boundaries of the COP. Outcomes of this COP are evidenced in several student projects that cross international boundaries including student mobile video projects presented at international mobile film festivals (for example http://www.mobilefilmfestival.com). The COP builds upon relationships established nationally and internationally in 2011 via the ELVSS11 (http://www.youtube.com/playlist?list=PLB2FFDB84091FD488&feature=mh_lolz) and iCollab11 (http://icollab11.wikispaces.com) projects (Cochrane et al., 2011). The project was supported by an associated LATENT grant project that enabled participating lecturers to utilize mobile Web 2.0 tools (for example the iPhone) in preparation for projects with their students.

The formation of a lecturer COP focused upon mobile media, in particular mobile film making with the following goals:

- Enabling innovation in teaching and learning enabled by technology, in particular a focus upon student-owned devices to enable social constructivist learning environments that link informal and formal learning both locally, nationally and internationally via a virtual international COP.
- Exploring the development of collaborative student-generated mobisodes as digital stories in an international team-based context.
- The COP also explores the affordances of mobile Web 20 technologies to enable cost effective international teams, bridging the boundaries of time and geography.
- The lecturer COP builds upon mobile Web 2.0 projects established in 2011 with Unitec and Salford University, and the MINA project (http://vimeo.com/groups/mobileprojects).

Graphics Design: mobcop12
A lecturer COP was established to explore the potential of mobile social media in graphics design education. The COP was titled mocop12 – mobile COP 2012. Six lecturers were supplied with an iPhone 4S and committed to meeting together weekly to investigate mobile social media. The COP established the use of mobile social media tools for communication and collaboration, including: Twitter, Wordpress, and Google Plus. Those COP members with previous mobile social media experience (including the LTDF fellow and the researcher as a technology steward) created an initial programme of mobile social media tools to investigate:

- Social media overview
- An introduction to Twitter
- An introduction to Blogging
- An introduction to Google Plus Hangouts
- What is RSS – how to manage social media
- Social video via YouTube and Vimeo
- Mobile livestreaming via Bambuser
- Mobile eportfolios via Behance
- Collating and curating mobile social media via Storify.com

Participants wrote an initial mobile social media proposal for implementation with their students in semester two 2012 at the beginning of the COP. This was then rewritten at the end of the first semester after their mobcop12 experience. These project outlines were uploaded and shared as Google Docs and provided a reified reflection activity evidencing significant development of the lecturers' understandings of the affordances of mobile social media for education and pedagogical change. The projects included:

- Creating a short interactive Web documentary using iPhone 4S's to interview members of an orchestra
- Exploring letterpress type development using the iPhone 4S camera and creating an app that can turn captured imagery into vector type
- Exploring mobile film making
- Developing stop frame animation on the iPhone, with project progress reported via student blogs

Product Design

The overall aim of the Product Design Learning and Teaching Fellowship was the formation of a lecturer COP focused upon enabling Design Thinking through the use of social, mobile, Web 2.0 and digital media technologies. The COP provides the lecturers with an authentic experience of the development of a learning community enabled by technology. This will then be implemented and modelled by the lecturers within the course itself.

Specific outcomes include innovation in learning and teaching through:

- The development and exploration of an mlearning infrastructure in the department using contemporary technologies (mobile and Web enabled tools) for lecturers;
- The exploration and use of student-owned mobile and digital media devices to enhance the studio environment that link informal and formal learning beyond the physical studio space. This includes the ability to better capture observations, and reflections in the research and design process, and to better collaborate with other team members in Design Thinking projects;
- The further exploration and application of an online Design Thinking resource in mobile learning

environments, specifically the use of it on mobile, technologies such as laptops, tablets (iPad), and smart phones;

- The exploration and use of student-generated, Web 2.0 enabled e-portfolios in learning environments. This will include the use of Linked In as the 'hub' to integrate a variety of portfolio elements including CV's, project documents (PDF files), photographs (Flickr, Picassa), video (YouTube), and blogs; and
- The exploration of the potential for a 'smart', Web enabled, mobile assessment tool, to be used in the assessment and feedback of Design Thinking project (this is a scoping exercise in the context of the overall project).

The COP spans 2012, and provides time release and support for one lecturer as the coordinator and research partner with CfLAT. In addition LTDF funds were used for reporting the outcomes of the underlying project such as the presentation of papers in the proceedings of a number of international conferences. A COP was established involving the entire Product Design department (including lecturers from the undergraduate, postgraduate Product design programmes, and the Bachelor of Business, Design major, with a total of eight participating lecturers) to investigate and explore innovation in learning and teaching using social, mobile and digital media technologies. The overall goal of the COP was to explore and evaluate the use of contemporary technologies, for example the mobile phone, tablet, Web 2.0 portfolio tools, to 'augment' and enhance constructivist Design Thinking studio environments (both physical and virtual), and to support the learning and teaching process. The technologies will be used in: the delivery and support of teaching, in the process of eportfolio creation, and assessment of Design Thinking projects by students. An informal survey of Product Design students at the end of 2011 indicated the ubiquity of smart phone ownership amongst the students, and this enabled the implementation of innovation in teaching and learning utilising student-owned devices.

Product Design: Busstop moblogging
This student project involved research, analysis and the design of one or more 'product' interventions that clearly improve and enhance the experience of bus patrons (users) in Auckland. The project was undertaken in conjunction with Auckland Transport, a division of the Auckland Council. Students utilized their own smartphones to aid observation and role playing research to identify poor experience ‘touchpoints’ in the Auckland bus journeys. Key to the implementation of mobile social media in the project was the formation of a collaborative blogging platform using Posterous.com and the use of student-owned smartphones to augment the formal studio aspects of the Design Thinking process. Posterous was selected as a good mobile blogging platform because of its clear and simple interface, ease of use, the ability to upload images and text from email, and because it had a good mobile app for smartphones and tablets. In addition to using blogging, students were also asked to undertake some of their research using social media platforms such as Facebook and Twitter surveys to enlist feedback on peoples bus journey experiences, and on the ideas and concepts the students generated through the Design Thinking process.

This project represented a significant conceptual shift on the appropriateness of mobile social media for education by the lecturers. Previously the lecturers had limited their online interaction with students to official institutionally hosted and managed systems such as Blackboard (for course documentation) and Mahara for student eportfolios. Neither of these systems were particularly mobile accessible, and neither were they open to much student customization.

Public Relations

The goal of this LTDF project was to build capacity for innovation in teaching and learning within the Public Relations Department via the establishment and nurturing of a COP of lecturers in partnership with CfLAT. The departmental Teaching and Learning Fellow championed the establishment of this COP and modelled examples of innovative social constructivist practice enabled by technology, leading to transformed teaching practice. An outcome of is COP the further development of two existing global collaborative projects, leading to several student-centered projects within Public Relations courses at AUT, supported by a LATENT grant. This COP builds upon two international collaborative mobile and Web 2.0 projects during 2012: GlobCom (Gordon & Picherit-Duther, 2009), and iCollab12 (Buchem, Cochrane, Gordon, Keegan, & Camacho, 2012). These projects provide authentic collaborative projects for the Public Relations lecturers and students to engage with peers in building international communities, enabled by mobile social media tools. Three key mobile social media tools utilized included: Twitter, Google Plus Hangouts, and Polleverywhere.com. In addition, for one of the projects students experimented with virtual platforms such as Wiggio, Google Docs and Beehive to facilitate team collaboration and share material.

Public relations: Icollab12, students as global mobile social media reporters
The core of the icollab12 project was a COP of lecturers across four countries established in 2011 by the iCollab11 project exploring student-generated digital identity and social media reporting across New Zealand, UK, Spain, and Germany (http://icollab12.wordpress.com/about/). As part of the iCollab12 international project, students in each participating country were required to move beyond the 'classroom' and use their skills in digital communications and social media content production to become transmedia reporters or citizen journalists. The students worked in groups to develop a series of reports for (and in collaboration with) an international audience. The main focus of the project was to produce rich media reports on Social Media in a) their local community, and b) their chosen industry (for example: Web, computing, creative, gigs). Their reports were then presented to students in Germany, Spain and New Zealand – in turn, their fellow iCollab12 students overseas produced parallel content. At the end of the project, students in each country were asked to vote for the best "Social Media" report, and the winners received an iTunes voucher. The following link is to an example YouTube playlist of the final student presentations for iCollab12 project: http://www.youtube.com/playlist?list=PL4C72B10F1B2AC723. For several of the student groups the icollab12 project was a non-assessed project that added an authentic collaborative experience to their course, but did not contribute to their summative assessment. The level of student engagement in this non-assessed project was beyond the expectations of the lecturers. For example, the New Zealand lecturer reflected upon the iCollab12 project:

> The New Zealand AUT University postgraduate students worked enthusiastically on this collaborative project with the students at Salford University in the UK as well as two other groups (Germany and Spain), guided by the researcher as the technology steward. The students presented their projects in class while streaming a live feed via Qik and also posted them on the project collaborative blog to get feedback from these students, and the public at large... This project was not graded but the students were extremely motivated to create what has become a student-led project. (AUT Lecturer, 2012)

Embedding the use of mobile social media within authentic team-based projects led to significantly increased student engagement and creativity.

Discussion

Each of the lecturer COPs utilized a common methodology, as outlined in Table 2. This framework recognizes the uniqueness and creativity of each COP allowing for tailoring the use of mobile social media to each context.

Table 2: Example Product Design COP framework.

mLearning COP Stages	Timeframe	Outcome
Establish weekly COP with lecturers and technology steward. Establish support requirements. Completion of an initial survey that explores participants prior pedagogical beliefs and practice. Establish lecturer eportfolios. Establish a collaborative research agenda and research questions, and establish ethics consent proceedures.	Semester 1	Staff reflect upon their prior pedagogical beliefs and practice. Staff share their current course outlines and assessment strategies for collaborative editing via Google Docs. Staff develop competency with mlearning. Staff explore mlearning pedagogies. Staff develop pedagogical mlearning activities based on social constructivist pedagogies
Mlearning projects with staff and students. Implementation of the mlearning activities within each course and assessment.	Semester 2	Students establish mlearning eportfolios. Increased student engagement. Flexible delivery. Facilitating social constructivist pedagogies and bridging learning contexts.
Lecturers publish and present case studies based on project implementation, these then inform the design of the following iteration of the project.	End of Semester 2 and beginning of following Semester	Collaborative research writing based on prior and redeveloped course outlines and outcomes via Google Docs.

The reified activity of the COPs established around the LTDF's have been used to broker the impact on student learning by showcasing student projects coming out of these COPs. These have provided tangible examples of post Web 2.0 pedagogy in action. Thus far the examples have come from the practice of the LTDF's, as they establish COPs of their colleagues, and have begun the process of drawing them in from the periphery of post Web 2.0 practice into full participation within these COPs. Typically this involves a process of initial personal appropriation of the affordances of mobile social media for increasing lecturer productivity. This is then followed by an investigation of the pedagogical potential of these tools, and finally by an investigation of how these tools enable new pedagogies and the design of learning activities and assessments that focus upon student-generated content and student-generated contexts.

The LTDF lecturer COPs intersect with a variety of other COPs, including:

- Each student course cohort
- The four lecturer COPs a part of a wider LTDF COP made up of the four Teaching Fellows and the technology steward
- Individual course projects

This framework addresses the three issues confronting ontological shifts (Chi & Hausmann, 2003): The first is a lack of the alternative category, addressed by reframing pedagogy from teacher-directed to enabling student-generated content and student-generated contexts (heutagogy). The second is the lack of awareness of the need to shift, addressed by building a COP that provides authentic experiences while building a culture of trust. Finally, the third is that it is resource-intensive, addressed by providing sustained pedagogical and technical support throughout the projects. Addressing these three issues provides the foundation for significant pedagogical change based upon sustained engagement, enabling an ontological shift from teacher-directed pedagogy to student-directed heutagogy, as illustrated in figure 1.

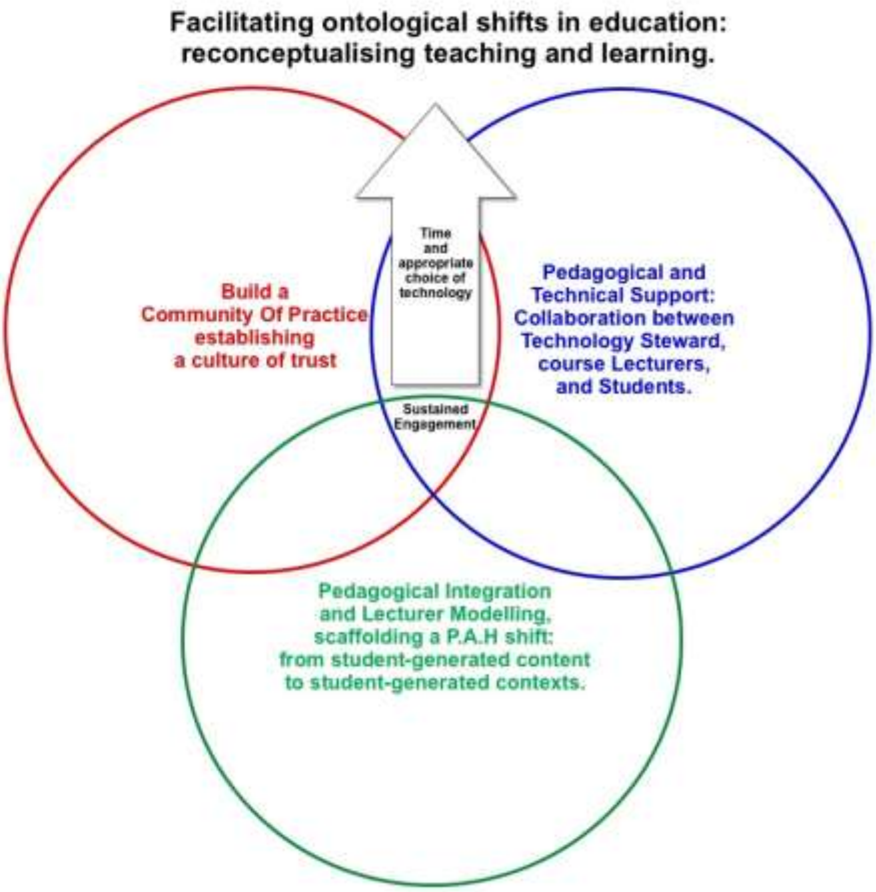

Figure 1: Nurturing ontological shifts leading to heutagogy.

In Figure 1 we use Luckin et al.'s (2010) concept of the Pedagogy-Andragogy-Heutagogy (P.A.H) continuum as a measure of pedagogical change as the projects evidence shifts along this continuum from teacher-directed (pedagogy) to student-directed (heutagogy). The examples, one from each LTDF COP, illustrate the use of mobile social media in education to enable shifts from teacher-directed pedagogy to student-generated content and student-generated contexts within the four LTDF course contexts. In each of these projects the LTDF fellows engaged in modeling the use of mobile social media tools alongside their students and colleagues.

Next steps

The next step in developing this framework will be evaluating it's impact within the four contexts outlined during 2012 and beyond, and continuing to bring other lecturers from the periphery of these COPs into full participation within new COPs in other departments. We have begun to do this by celebrating and showcasing the innovative and creative work that students have created as outcomes of these four COPs. This has taken the form of symposiums and published research outputs by the participating lecturers based upon reflective teaching practice informed by the framework (Cochrane, Antonczak, & Wagner, 2012; Cochrane, et al., 2011; Cochrane, Sissons, et al., 2012; Withell, Cochrane, Reay, Gaziulusoy, & Inder, 2012). An analysis and review of the impact of the LTDF model at the end of 2012 will be used to compare the institutional impact of this model in comparison to the previous model of just-in-time lecturer support combined with the delivery of a series of professional development workshops for lecturers. Initial results indicate that the LTDF model is providing significantly more support for innovation and pedagogical change than the previous institutional support model, and thus institutional funding for the LTDF model is likely to continue.

Conclusion

We have a presented a framework for preparing lecturers to engage with the challenge of post Web 2.0 pedagogies by experiencing the potential of mobile social media within authentic communities of practice. These COPs use mobile social media as catalysts for redesigning learning activities and assessments around student-generated content and student-generated contexts. We have also provided examples of resultant projects that utilize these new pedagogical approaches focusing upon learning for the future of post Web 2.0 or mobile social media. The institutional sustainability of this LTDF framework will be evaluated at the end of 2012.

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Post Web 2.0 Pedagogy: Mobile social media

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Outline of focus area and summary of ideas to be explored

Mobile Internet connectivity has outgrown desktop and laptop Internet connectivity (MobileFuture, 2010). Mobile social media has become the successor to web 2.0 (Brown-Martin, 2010; Cheney, 2010; Jackson, 2012; Ryan, 2011). We will discuss examples of how higher education can harness the potential of mobile social media (McLoughlin & Lee, 2010), with reference to four projects that represent significant pedagogical change within eight different course contexts (including four courses in Spain, Germany, France, and UK):

- The use of mobile social media in Journalism (Cochrane, Sissons, & Mulrennan, 2012)
- The ELVSS12 project that established international student teams for co-production of mobile movies (http://elvss2012.wordpress.com)
- The use of mobile social media for enhancing a physical studio-based Product Design course (http://autdesignjournal.posterous.com/)
- The iCollab12 international project that featured student teams in four countries (NZ, UK, Spain, Germany) becoming social media reporters (Buchem, Cochrane, Gordon, Keegan, & Camacho, 2012; Cochrane, et al., 2011)

The symposium presenters will discuss issues relating to ethics, privacy, student engagement and the new pedagogical strategies they used to facilitate and design student-directed learning experiences or heutagogy (Blaschke, 2012; Hase & Kenyon, 2000; Luckin, et al., 2010) within their courses. A key strategy has been embedding these projects within the establishment of communities of practice (Lave & Wenger, 1991; Wenger, 1998; Wenger, McDermott, & Snyder, 2002; Wenger, White, Smith, & Rowe, 2005), both local and international. Student-generated projects have provided reified artifacts from these communities of practice. Key tools such as Google Plus Hangouts will be used during the Symposium to demonstrate how mobile social media was integrated into these projects. Examples of student projects created as a result of these projects will also be demonstrated and critiqued. Discussion with the audience will include an invitation for participation in future national and international mobile social media projects, with a particular focus upon enabling authentic collaborative experiences for students.

Range of views that panel members will represent

The panel members represent four mobile social media projects that have leveraged student-generated mobile media and student-negotiated teams. Two of these projects are locally based within the institution, while the other two are part of international collaborations with five countries including: NZ, UK, France, Germany, Spain. Thus views include facilitating collaboration across cultural, language, geographical and timezone differences.

Intended audience

The general audience for the symposium will be academics interested in exploring: new pedagogies, social and mobile media, and student-generated content and contexts for learning.

Outline of the symposium format, including strategies that will be used to engage the audience

A live Google Plus Hangout will connect the NZ panel with International members of the projects in the UK, Berlin, and Spain. The Hangout will be broadcast live with the URL publicized for anyone to view, and the Hangout will also be archived on YouTube for later asynchronous viewing and commenting. A Twitter hashtag will be used for collating feedback and live interaction, and a Twitter stream will be displayed throughout the symposium. Participants will also have access to a Wikispaces wiki discussion for collating ideas and a page will be created providing links to all the examples presented. Examples of student-generated projects resulting from the investigation of new pedagogies for mobile social media use in higher education will be demoed and critiqued. Participants will be encouraged to use a range of mobile social media throughout the symposium (for example: Twitter, Instagram, Flickr, YouTube, Facebook), and these social media artifacts will then be collated/curated by the panel at the end of the symposium via Storify.com, reifying the activity of the symposium and providing an authentic mobile social media record of the symposium.

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Eportfolios in the Sciences: The Role of Reflection as students build professional skills and career readiness

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This poster presents a series of UNSW LTU seed funding grants that explored a program-wide approach to using ePortfolios as a reflective learning process together with the need for life-long and life-wide learning alongside career goal setting. ePortfolios were selected as the learning technology for these studies as they provide a cohesive and reflective space to enable a student to reflect upon and understand different ways of operating and possible new directions for their learning. In higher education more recently, there has been a growing imperative to have a portable record of work undertaken across a number of areas of endeavor in a student's academic life for assurance of learning. A Mahara ePortfolio serves several important functions with this in mind; it allows for integration of reflective elements, in the Journal, with career-oriented elements, including the articulation of academic and personal skills, plans and the Resume; it records past and current practice for reflecting upon practice to effect change, and acts as a change agent by enabling long-term on-going evaluation of student performance and associated learning outcomes.

Keywords: ePortfolios; Mahara; reflection; reflective practice; medical science; advanced science; higher education; careers.

Newman & Wehlage (1993) identified five key standards or benchmarks that support the development of deeper learning when designing curriculum for student learning:

- Higher order thinking;
- Depth of knowledge;
- Connectedness to the real world;
- Encouragement of substantive conversation between students and between students and_their teachers, and;
- Social support for student achievement.

This approach to implementation in Medical Science and Advanced Science core courses includes these key standards of Newman & Wehlage alongside self-awareness and career development learning (Stanbury, 2005) to make explicit to students the relevance of the ePortfolio for their current studies and future careers. The connectedness to the real world includes authentic learning and assessment in the course and after graduation when the ePortfolio can play a role that supports the ‘practice’ of skills (Brown, 2003) in the workplace.

Building Professional Skills and Career Readiness in the Sciences

These pilot projects in their individual courses in Medical Science and Advanced Science use an ePortfolio to develop self-awareness in relation to course content through reflection and career goal setting. Beyond a single course, the project seeks to build professional skills and career readiness in the sciences on a wider program level. This we believe will provide a platform for holistic development and assessment of a range of graduate capabilities both academically and socially, while helping to support and develop student’s self and career awareness, readiness and graduate employability. This pilot involves approximately 510 students across selected Science, Advanced Science and Medical Science courses.

Life long and life wide learning

ePortfolios enable both a self-directed and an individualized approach to learning that can promote life-long capabilities and can enhance students’ professional preparedness in science by approaching the learning experiences through an orientation of process rather than product. As these students engage in reflection upon the relationships between their educational experiences, in each of the courses, they are developing both personal and professional future career aspirations, aptitudes, and opportunities. As students develop the appropriate skills to self regulate their learning and become responsible for their learning, they can engage both individually and collaboratively in the ePortfolio. This highlights and makes clear the interrelatedness of learning processes, knowledge and skills that the students gain across a degree program.

The fundamental outcomes of using ePortfolios can be summarised as follows. Students are encouraged to collect, select, reflect and connect. *When developing personal ePortfolios* students are supported to develop skills that enable them to:

- self regulate learning and become responsible for their learning beyond the walls of the classroom; and,
- engage both individually and collaboratively using ePortfolio.

In this setting, students learn to critically review the work of others and gain an insight into the varying qualities and standards of work in the course. This also helps students to identify quality in their own work and that of their colleagues as they develop an understanding for the standard required.

Career development learning and ePortfolios in the Sciences

Career development learning (CDL) is a process that “empowers individuals to identify, develop and articulate the skills, qualifications, experiences, attributes and knowledge that will enable them to make an effective transition into their chosen futures, and manage their careers as lifelong learners, with a realistic and positive attitude” (Stanbury, 2005). It is both a transdisciplinary process and a subject discipline with its own history, evidence base, theoretical frameworks and methodologies.

The goal of career development learning is to help students to acquire knowledge, concepts, skills and attitudes which will equip them to manage their careers, their life-long progression in learning and work (Watts 2006). Reinforcing the intention of this outcome, the Bradley review for the Australian Government listed an expectation that higher education should “produce graduates with the knowledge, skills and understandings for full participation in society and the economy.”

Although there are different theories and developmental approaches to careers education, the most widely used framework by career centres around the world is the DOTS model. The basic assumption underpinning this model is that effective career learning is composed of a dynamic relationship between Self, Opportunities, Decisions and Transitions (DOTS) (Watts, 2006). These four elements involve:

- self-awareness - the ability to identify and articulate motivations, skills, and personality as they affect career plans;
- opportunity awareness - knowledge of opportunities and the ability to research these;
- decision making - being able to weigh up personal factors to make a sound plan, and;
- transition learning - understanding of how to seek and secure employment opportunities.

Discussion and Conclusion

This poster presents how this project has arisen through the combined interests of educators and career advisors. Together we have identified opportunities to address the UNSW Graduate Capabilities through the introduction of ePortfolios. This study is appropriately staged such that graduates should develop career pathway awareness, begin to reflect on the transferable and technical skills acquired throughout their undergraduate studies and address any weakness that might hinder their ability to achieve their career target. Together, these elements can help fortify student career awareness by encouraging students to consider their work interest areas, career paths and decisions, employment opportunities and attitude for career success. Students also learn to consider what recruiters are seeking and strategically devise a plan to achieve their career goals.

It is not enough, in times of evidence-based education practices, for students to simply claim, at the end of their programs of study, that they have achieved capabilities of Scholarship, Leadership, Professionalism and Global Citizenry. They are now required to substantiate such claims with clear records of achievement. EPortfolios offer students the perfect opportunity to both record and enhance their professional skills and tailor them to the workforce in which they will practice. Further it will enable the University to warrant the claims of its Graduate Capabilities through the students' own acknowledgements of achievement. It further seeks to explore the often-tenuous relationship in higher education between the 'hard' and 'soft skills' where careers and employment, learning and teaching unit, teaching academics and science researchers have developed a project with the principal aim:
That by providing a portfolio platform and digital repository for holistic development and assessment of a range of graduate capabilities both academically and socially student's career awareness, readiness and graduate employability can be enhanced and improved.

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If we build it, will they come?
Developing an online assessment resource for educators at UNSW

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Through the Assessment AS Learning Toolkit, on the new Teaching Gateway at University of New South Wales (UNSW) educators and academics have the opportunity to find ideas, guidelines, and practical strategies on the holistic processes of designing online assessment as learning. This toolkit has been devised to collect and share resources and includes practical strategies for selecting technologies that suit the learning objectives and outcomes of courses and programs to support more effective and efficient assessment. The premise throughout this Toolkit is that assessment should focus primarily on learning and the achievement of intended learning outcomes. This poster seeks to showcase the range of online assessment practices being used at UNSW to enhance student learning.

Keywords: Technologies for assessment; professional development; blended learning; online assessment.

Building a Toolkit

In this poster we describe our experiences of developing this online resource for teaching staff as UNSW developed new strategies for assessment AS learning (See Figure 1). The online resources developed have been designed to provide support in selecting assessment with practical strategies on the holistic processes of designing online assessment while also providing discipline specific resources that focus on faculty experience. The Toolkit has included the building of professional development resources for staff and to enable them to share their own practice though short videos and video case studies and scenario video clips in situ.

Figure 1: UNSW Assessment AS Learning Toolkit

Why develop an online assessment resource for educators at UNSW?

It was found that many academics at UNSW were keen to develop more innovative and student focused assessment however, they were often in need of assistance to undertake such changes. At the same time there were others who were willing to share with their colleagues during seminars and workshops how they were integrating technology and introducing varied assessment techniques into their assessment practices. A common request was "Will you be recording this? Can I get a copy?" Concurrently with this, as well the creation of a new Teaching Gateway, the Vice Chancellor instigated a University wide review of assessment seeking to make assessment more efficient and effective. It was decided that the best way to harness the resources that were available within our own academic staff to support such changes to practice would be to develop a toolkit (modeled on Macquarie University's toolkit) of resources fully available online to those teaching both within and beyond the University.

Selecting Technologies for Assessment

This poster focuses on the technologies for assessment resource to support technology in assessment processes.

To support educators, the toolkit offers strategies and benefits of utilising technology (See Figure 2) for assessment to help learners engage more productively and flexibly in their course learning and assessment, and can help staff manage assessment more efficiently and effectively. The Toolkit resource seeks to promote how learning can be more flexible when students can choose when and where they access content and engage in learning and assessment online. This flexibility helps students to regulate their own learning and play a role in the process. Using tools such as discussion forums and wikis, educators can record student group processes and support students more flexibly as they progress through assessment tasks. This support and ownership can aid in developing a more student-centred approach to learning and assessment and provide students with a space to learn, reflect and develop connections between knowledge ideas.

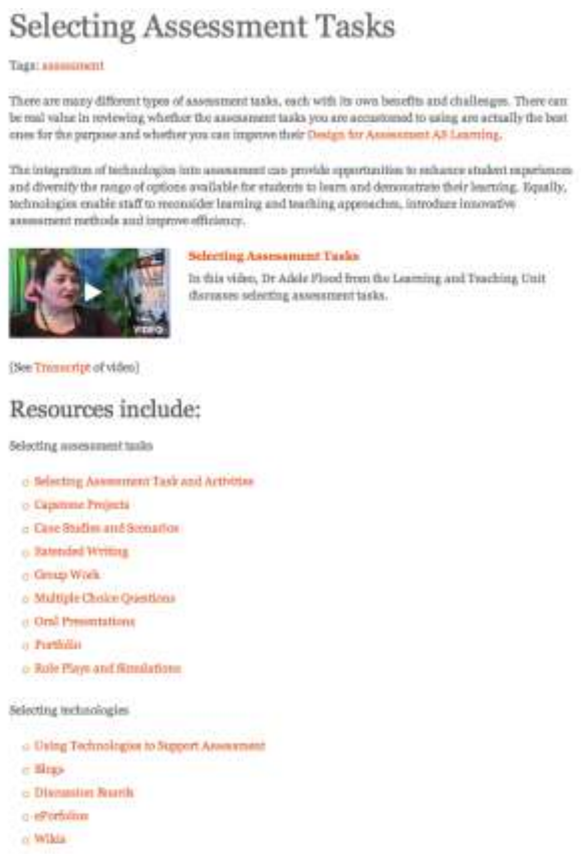

Figure 2: Selecting Assessment tasks

In many cases, technology-improved efficiencies in managing assessment also benefit students educationally. For example, providing online multiple-choice quizzes with automated marking and feedback may ultimately reduce staff marking loads, as well as giving students immediate feedback on their learning performance. Other strategies from the Toolkit suggest how blending technologies with face-to-face teaching, learning and assessment can:

- enable online submission of assignments.
- enhance students' assessment-as-learning experiences.
- give students more ways to learn and to demonstrate their learning.
- enable staff to reconsider learning and teaching approaches.
- introduce innovative assessment methods
- help staff give timely and more comprehensive feedback, and
- improve teachers' efficiency in managing large volumes of marking and administration.
- support a students' learning process, through automated assignment receipts, and marking and feedback records.
- support students as they develop graduate capability skills such as communicaton, global citizenship and professional skills (eportfolio).

Have they come?

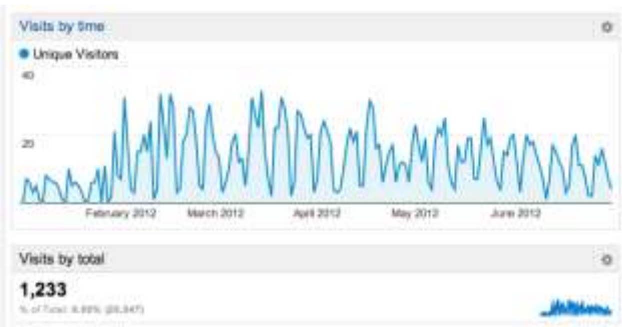

Figure 3: Jan-July 2012 Analytics from Google Analytics

The overall satisfaction of the analytics (see Figure 3) on the Toolkit pages have suggested that 1233 unique visitors in Sydney using the identifier ‘assess’ have accessed the Online assessment Toolkit in the last 6 months. This suggests that we have more work to do in delivering the content to faculty, however, as the Internet enables the views from outside users and externals is currently on the rise we assume that content as a professional development resource is valid and required in the field.

Will they keep coming?

The Assessment Toolkit will continue to be analysed, built upon and presented to faculty. It will also continue to be developed to present how emerging technologies can enable assessment and learning to develop digitally literate 21st century citizens. It will also continue to provide a world-class set of resources available to anyone wishing to enhance their own assessment practice within a global audience.

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Researching around the world: Developing an International Reference Group for ePortfolios in Higher Education

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This poster presents the newly developed International Reference Group (IRG) for eportfolios in Higher Education as part of the work by The Association for Authentic, Experiential and Evidence-Based Learning (AAEEBL) 2012 Research Committee. The purpose of the poster is to highlight this initiative, to share the AAEEBL mission, and to recruit interested individuals to join the IRG. AAEEBL is the international professional association for the eportfolio community with the mission to develop learners and to transform institutions with eportfolios. AAEEBL seeks to accomplish this by serving the global eportfolio community as a non-profit, service organization that offers membership benefits to institutional members and opportunities to corporates to share practices, research and industry developments supporting eportfolio implementation.

Keywords: eportfolio; International Research Group; research; higher education; AAEEBL

ePortfolios as a catalyst for connections

ePortfolio community leaders recognized in 2008 that eportfolios, as a technology, and as a body of theory and of practice, had emerged as a promising influence and direction for education. As such, the eportfolio movement needed its own professional association to catalyze the implementation of eportfolios in education. AAEEBL deeply believes in the value of eportfolios for assessment as learning, life-long and life wide career success and professional readiness. Members of the global eportfolio community formed AAEEBL in 2009 to serve educators and learners in order to address the growing need to underscore advances in knowledge about eportfolio use and to recognize the emergence of eportfolios as a field of specialized research and practice. AAEEBL promotes authentic, experiential and evidence-based learning for an international community of eportfolio users, researchers and educators.

As the recent research of Oliver (2008, 2010) and Oliver and Whelan (2011) suggests, the relevance to higher education student learning in providing evidence for graduate employability is becoming increasingly warranted. As Oliver et al. (2009) indicated, eportfolios are “an interface for collecting and sharing evidence of learning and professional development” and demonstrate “recognition that learning happens both within and beyond the formal classroom” (p.1). This growing importance of demonstrating graduate capabilities and competencies necessitates a revision of traditional assessment practice. 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. While the potential of eportfolios has been recognized for over a decade, eportfolios as a catalyst for research connections still needs further development.

Penny-Light, Chen and Ittelson (2012) delineate an eportfolio implementation framework that they describe as “an iterative process” (1). It is significant that a number of the eight critical issues they identify in this process include attention to a variety of research-related activities: 1.) Defining learning outcomes; 2.) Understanding your learners; 3.) Identifying stakeholders; 4.) Designing learning activities; 5.) Using rubrics to evaluate eportfolios; 6.) Anticipating external uses of evidence; 7.) Including multiple forms of evidence; and 8.) Evaluating the impact of eportfolios.

This poster presents AAEEBL's mission to develop learners and transform institutions with electronic portfolios alongside its desire to establish an International Reference Group (IRG) of researchers. AAEEBL is a service organization that offers conferences, resources, community connections, a newsletter, and consulting to institutional members and corporate affiliates.

If we build it – will you come?

With affiliations and collaborations among a wide array of worldwide eportfolio initiatives, projects and organizations, AAEEBL helps delineate the new field of eportfolio scholarship and research. Its offices are located in North Kingstown, Rhode Island, USA. A Board of Directors oversees AAEEBL's activities and serves as a governing board. Members of this board include prominent leaders in the field of eportfolio implementation, publication and research. The development of an International Research and Reference Group aims to provide integrated knowledge and strategic advice on future research investments, including in the areas of education and higher education, professional development and collaborative activities.

Future directions - Developing an International Research Group

The mission of the IRG is to establish collegial connections and to disseminate educational research while developing international collaborations on research projects. The IRG aims to have impact by encouraging effective and innovative models of partnership through joint research, conferences, and publications, which will be shared locally, nationally and internationally.

ePortfolio conceptions vary from country to country. Likewise, sources for support to implement eportfolios vary from country to country with full governmental funding available in some instances and the barest of institutional funding provided elsewhere. Therefore evidence gathered from eportfolio research and assessment data is often uneven and lacks meaningful synthesis upon which to "close the loop" as Clemson University's Gail Ring (2012) suggests in order to "share assessment data in ways that significantly improve learning outcomes."

In the USA, eportfolios are employed in several ways, the most prevalent being for: career/showcase; assessment; learning; and advisement according to a report compiled by the Connect to Learning Project (C2L Leadership Team, 2012). Other widespread emerging uses for eportfolios in the US include professional accreditation and institutional credentialing. The focus is therefore primarily on learning and assessments with a developing focus on employability.

In the UK, eportfolios are seen as "recording achievement," demonstrating learning, workforce development, with an incipient focus on learning.

In Europe, eportfolios have little traction except as the Bologna process tries to align certification across the members of the EU: What does a college degree mean in France as compared to the Netherlands?

In Australia, eportfolios are seen as both reflective and life long learning spaces. They are used in courses and programs to enable students to reflect on their learning, performance and /or achievement in both formative and summative assessment, while encouraging independent learning. They also serve for students to present evidence of achieving program outcomes through artifacts that demonstrate transferable skills in capstone courses and programs that require professional accreditation.

To connect these international foci, The AAEEBL-facilitated IRG will encourage innovative approaches to eportfolio assessment and evaluation in training, education, professional development and research-focused activities. The IRG aims to develop a coalition of international, regional and national eportfolio bodies whose members contribute in sharing eportfolio research findings and thus widening the field of eportfolio implementation and investigation. The IRG will keep abreast of changes and innovations in eportfolio research and share these updates. Sites for sharing include international, national and regional conferences and webinars, the new publication, *International Journal of ePortfolio*, a variety of social media, and the creation of a collaborative online repository for research findings and discussion. AAEEBL's bi-monthly newsletter, *The AAEEBL Learner*, will dedicate space for highlighting resources and for sharing write-ups about research initiatives and upcoming events that seek to explore how international eportfolio research can be shared more widely in the community.

How to get involved: Expressions of Interest for the IRG are to be addressed to the authors. For information about joining AAEEBL, contact Judy Williamson Batson (judybatson@me.com).

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Links

AAEEBL – www.aaeebl.org
AAEEBL Research Committee – www.aaeebl.org/research_2012

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The 7 Cs of learning design

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Gráinne Conole is Professor of learning innovation at Leicester University. Her research interests include the use, integration and evaluation of technologies and their impact on organisational change. Two of her interests are learning design and Open Educational Resources. She serves on and chairs a number of national and international advisory boards, steering groups, committees and international conference programmes. She has published and presented nearly 1000 conference proceedings, workshops and articles and keeps a blog www.e4innovation.com. She has a PhD in X-Ray Crystallography. She is author of a new Springer entitled: 'Designing for learning in an open world'.

Intended audience and degree of expertise/past experience required

The workshop will be of interest to academics and support staff with an interest in exploring how to use technologies more effectively in learning.

Statement of objectives for the workshop

By the end of this module, participants will be able to:

- conceptualise the learning design process from different perspectives
- apply a range of learning design resources, tools and methods to a learning intervention
- critique a range of pedagogical approaches and the role played by different technologies in supporting these
- review and debate the theoretical underpinnings of learning design
- develop an innovative storyboard, learning activities and a structure for implementation.

Detailed description

The participants will engage with a range of learning design conceptual tools and a social networking site for sharing and discussing learning and teaching ideas. They will work in groups and will periodically share back their discussions with the rest of the participants. Artefacts produced will be captured and made available online. Activities will include the following:

- How to ruin a course
- Course map view
- Activity profile
- Course dimensions view
- Task swimlane view
- Learning outcomes map
- Affordances of technologies
- Mapping pedagogies to technologies
- Harnessing social media for dissemination and communication
- Exploring pedagogical patterns to promote collaborative learning

The activities are part of the 7Cs of learning design framework that we have developed which consists of seven components:

- Conceptualise – which initiates the design process and consists of imagine, design and prepare.
- Capture – which covers the ways in which search engines, OER repositories and social bookmarking can be used to find and collate relevant resources and activities.
- Create – which covers both the creation of content and activities.
- Communicate – which covers how to moderate asynchronous and synchronous forums
- Collaborate – which considers how tools like wikis, voicethread, pirate pad can be used to foster collaboration and how to work in virtual teams.
- Consider – which covers the ways in which tools such as blogs, e-portfolios and Multiple Choice Questions

(MCQs) can be used to promote reflection and different forms of assessment.

See http://e4innovation.com/?p=576 for more detail. This work is described in more detail in a forthcoming book (Conole, 2012).

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Conole, 2012, Designing for learning in an open world, New York: Springer

Moodle Workshop activities support peer review in Year 1 Science: present and future

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Compulsory Science Faculty (SCIF) courses in various programs of study serve to provide students with a sense of belonging within their own cohort and with their professional future, as well as developing a range of skills relevant to that future. These aims are supported through completion of assessment tasks, which in turn are supported through the use of the Moodle learning management system. Specifically, the Workshop tool facilitates the practice of peer review, one of the processes in the course not only relevant to professional practice in the sciences but supporting active learning among students through noticing aspects of a range of tasks in which they can improve. This paper describes the use of the Workshop tool in its original form as well as modifications developed at the University of New South Wales (UNSW) to support the use of peer review and assessment processes associated with a range of assessment tasks.

Keywords: Moodle, peer review, active learning, workshop, marking

Peer review in education and the profession

The importance of peer review in professional life is beyond question. It pervades all areas of endeavour, within, as most relevant to the current study, the sciences, including research (presentation, publication, grant proposals), and teaching (peer observation). Its many and profound benefits in education in, for example, the biosciences, have been highlighted (Orsmond 2004). The use of peer review and assessment in an increasing range of settings is rapidly gaining acceptance at UNSW (http://teaching.unsw.edu.au/peer-assessment). Further, the use of technology to support learning and teaching, including peer review and assessment, in Engineering at UNSW has been described (Russell and Posada 2011). This paper describes use of the Workshop (peer review) activity in Moodle, as it exists or with modifications, to support and enhance learning activities and assessment tasks in selected Year 1 Science courses.

The context – Year 1 Science courses

The Faculty of Science at The University of New South Wales offers a range of courses with a SCIF (Science Faculty) prefix. In Year 1, these courses are designed to support transition to university study by providing a sense of belonging but also cognitive challenge and development or enhancement of skills relevant to the professional scientist. Specifically, these courses, literally and/or thematically "professional perspective and practice" courses, are designed to:

- engender a sense of belonging or acculturation, among students, to strengthen identity within the cohort, but also with scientists and the professional community to which students aspire;
- develop or enhance soft skills, graduate attributes or capabilities (professional practice), and;
- develop perspectives on science, including the history and philosophy of science, the discipline or area of interest, the community serving an area or discipline, and professional life within that community (professional perspective).

These courses comprise two major components. The first is a either a lecture series covering history and philosophy of science, or a discipline module variously incorporating research activities processes or lectures contextualised within specific scientific areas or disciplines (e.g. chemistry, medical sciences and so forth, from which students choose one). While the SCIF courses differ in the first component, the common second component comprises tutorials focusing primarily but not exclusively on the first two aspects of design above.

Given its pervasiveness in professional life in the sciences and academia and its increasingly recognized role as an active learning process, peer review represents a critical activity appropriate to the themes of professional perspective and professional practice in SCIF courses. All these SCIF courses employ Moodle as the learning management system/environment, currently in pilot mode at UNSW. The following sections describe assessment tasks typically used in the courses, the integration of peer review with those tasks and how the use of Moodle and specifically the Workshop activity, in its present form, or with our recent modifications, facilitates the peer review process.

Essays

Students complete two essays; in both cases, three peers review those essays. The first is a short (600 word) biography, based on an interview of a classmate. This task is designed to promote belonging (within the cohort), to build on classroom activities around written communication, to assess student ability in written communication and provides the first opportunity for peer review. The feedback from this essay is provided back to the author while, in parallel, the essay is marked by the tutor/teacher. The emphasis on peer review with this essay is then around the *process* of peer review rather than utilizing peer review for the *product*. This aligns with providing students with early engagement with the peer review process and classroom activities and discussion around peer review in the sciences. It is also seen as formative for the peer review process itself, as it relates to further use of peer review in the course.

The second essay is a longer (1800-2000 word) personal prospective biography. Students are asked to consider where they will be, professionally, in 15-20 years' time, acting as though they, as a current student in the SCIF course, are interviewing themselves in the future. Thus, this task aligns with the first essay, from present to future. More generically, the tasks align with a course emphasis on written communication and, as the genre is the same, feedback on the first essay scaffolds the second. The peer review process for this essay emulates more fully the research publication process; students submit a draft version of their essay, like an original manuscript, which is then reviewed by three peers. The reviews are made available to the author of each essay, allowing them to review and revise their essay as the feel appropriate, prior to final submission for marking. Thus, this task makes use of peer review not only once again as a *process*, but to facilitate enhancement of the *product*.

Both of these learning and assessment processes are supported using the standard workshop activity under, at the time of writing, Moodle 2.2.1. Three students are assigned, randomly, to review (or assess) the essay of each classmate. Prior to that review, each student is required to review three essays drawn from previous students, using the same criteria as used to review the current essay; these exemplars are of varying quality and have been assigned comments and marks against each of the marking criteria. The use of Moodle automates the assignment of reviewers as well as supporting the scaffolding of the peer review process, as students are able to compare their review of each exemplar with that of the teacher, as expert, for each criterion, and overall, both qualitatively and quantitatively. This enhances the student-centeredness of the activity while greatly enhancing efficiency for the teacher. In the case of the second essay, the formative feedback from the first essay and the opportunity to review the second essay prior to marking results in a better final essay (as observed by tutors), enhancing quality of the final essay and thus efficiency in marking (fewer corrections to be made). This aligns with the observation, in a study of educational practices in the sciences, that "*no learning gain was connected to the writing* [of a scientific report]*, whereas the computer-supported peer assessment appeared to be entirely responsible for the measured "average" learning gain…*" (Bos 2009).

A limitation of the current workshop activity is the lack of functionality around rating of peer reviewers prior to engaging in the peer review of essays. There is a simple rating process that can be applied post-review, though this is invisible to the students. We wanted to provide students with an indication of how they compared to the expert review (and indeed with each other) through assignment of a score for the capacity to review, and to use that score, optionally, as a weighting against the mark for their own essay and/or that of their peers. We have developed and are currently trialing a modification to the Workshop activity that reflects or indeed emulates the rating of expertise of reviewers associated with a range of professional or educational sites and applications such as, respectively, ScholarOne Manuscripts (http://scholarone.com/products/manuscript/) or Calibrated Peer Review (CPR; http://cpr.molsci.ucla.edu/Home.aspx).

Group assignment

Aligned with another theme of the course, group or teamwork, students undertake a group assignment after completion of experiential learning activities that deal with group dynamics and roles. This involves a group of 3-4 students preparing for and conducting an interview with a professional scientist, typically a member of the academic staff. Students are provided with a starting set of questions, though they are able to shape the interview both before and during its conduct. The interview is conducted using video such that the students produce a video or multimedia product featuring video that tells, in 5-10 minutes, the story of the subject's career in science. This task serves a range of educational purposes, aligned with the aims of the course. The interview provides insight into a professional future (aligning in turn with the prospective biography essay task), provides a task in which members of a group can assume specific roles (aligned with classroom instruction and activities around groups or teams), adds a technological and cognitive challenge, at least for some, in the production and editing of video as a new media project (thereby aligning with inquiry or problem-based learning and the need to learn new techniques, as in scientific research) and provides a readily accessible format (and an alternative to the written form) for other students to gain insights into professional futures, as they undertake peer review.

In the past, students have had to assess this assignment 'offline'. The video or a link to it, or to a multimedia product, such as a web site, has been uploaded into Moodle. One or more groups of students have been assigned randomly and manually to assess the product from each student group. Students have been required to assess the product individually but then to collaborate in providing an overall group review of each product, against the requirements of the assignment (*process and product*) as well as other broad criteria relating to the product. Students also have to provide an individual account of their experience of, role in and contribution to the group assignment (a focus on *process*).

The current Moodle workshop activity is designed for the assessment by one or more individuals of assignments produced by individual students. To utilise the existing workshop activity for review of the group assignment, each student in a given group would have to upload the same assignment (which would seem somewhat pointless even if using a link to a file rather than each student uploading the full video). Similarly, the reviewers from the one or more assigned reviewing groups would have to be manually allocated which, in a large class, would take a significant amount of time. We have now modified the workshop activity to include a "Team mode" so that each group can upload just one copy of their assignment and one or more groups can be assigned to review the assignment, though review still involves individuals within each of the assigned groups. While this has the benefit of providing multiple reviews to a group, even if only one review group is assigned, we still wish to develop the tool for full group-to-group review.

Seminar/debate

Oral communication, as a technical seminar presentation and/or debate, is embedded as an assessment task in all Level 1 SCIF courses. As with other elements of the course, this task aligns with professional practice, and follows classroom activities around instruction in and discussion of effective technical oral communication (and, particularly in the case of debates, may draw on activities and discussion of ethics and codes of practice).

We focus on the seminar task here. Students must deliver a short (typically 5-minute) seminar on any topic of their choosing, the only proviso that it must relate to science. Free choice is given so as to allow for the best possible delivery by each student; the primary focus is on communication rather than technical content, and performance may be constrained if choice is restricted or the topic assigned. Three peers and the teacher assess each seminar. The assignment of peer reviewers is a highly involved process, as the seminars are delivered within tutorial groups, over multiple weeks. Further, specific allocation is required as, first, it is not desirable to have students reviewing just prior to their own delivery, so they have the opportunity to relax and prepare mentally before their seminar and, second, students are required to reflect on their seminar immediately after their performance, impossible if they are assigned to review.

Unlike the other assessment tasks where random allocation is perfectly acceptable, this obviously makes random allocation impossible. While the initial assignment of reviewers within a given tutorial group and week of presentation is randomized, the final allocation is refined according to the needs just described.

Assessment employs an instrument (mark sheet) that allows for rating of different aspects of the seminar across three broad categories, the speaker, visual aids, and structure and content. There is space for provision of comments and an overall mark and grade. Students become familiar with the instrument when the teacher delivers a ‘how to give a seminar’ seminar. In the past, the course coordinator has gathered the mark sheets after the seminars, collating and photocopying them as records of assessment and, finally, returning them to the students; for a large class, this is a very time-consuming and tedious process.

We have modified the Moodle workshop activity to allow for upload of a comma-delimited (.csv) file produced from a spreadsheet of assigned reviewers. This means that the specific reviewers assigned to each seminar (or any task, for that matter) no longer have to be allocated manually within Moodle; after the initial necessary allocation of reviewers in a spreadsheet (an unavoidable task), the upload to Moodle is automated, saving a great deal of time.

The student, as presenter, submits to the workshop activity their visual aids (typically a Powerpoint file), a script, or simply a ‘dummy file’ as their assignment. The accumulative grading mode is used as that provides the representation closest to the use of the mark sheet. The reviewers, both teachers and students, are then able to transcribe their reviews to the workshop activity, entering as words the rating chosen for each criterion with any specific comments and a numerical rating out of 10. This process concludes with upload of any final or overall comments, an indicative grade and a mark out of 20. This mode is a little clumsy; for the most part the Rubric mode would align best with the format of the mark sheet, but there is no provision for inclusion of comments. Thus, the workshop activity requires further modification to permit selection or inclusion of multiple modes of assessment (rubric and/or accumulative grading and/or comments). This is under discussion. Regardless, the upload of feedback to Moodle by all participants shares the workload and aligns better with the practice and benefits of peer review. It also improves the quality of feedback as presenters are provided with mature typescript rather than handwriting that may be note form and thus difficult to read and/or interpret.

Conclusion

Through the use of the Workshop activity, as-is or with our modifications, we have been able to facilitate online peer review, providing students in Year 1 Science courses with opportunities, through various assessment tasks and different models of peer review, to engage in peer review not only for its own sake (as a professional practice), but as a mechanism to enhance learning through active or reflective practice. Collectively, these activities align with all three themes of ascilite 2012: peer review promotes learning for the future, both generically, in promoting self-efficacy, and professionally, in early engagement in the practice; further, integration of peer review in high-end programs in the sciences is particularly important as these programs are considered incubators of scientific leaders in the future, and; as we embrace increasingly the use of technology in teaching and learning, including the imminent enterprise implementation of Moodle at UNSW, the ongoing development and refinement of educational technologies to support pedagogies demonstrates leadership in a climate of change.

The innovations in Moodle represent collaboration between academic staff in Science and Engineering and the Faculty of Engineering Learning and Teaching Team who, through the nature of open source software, were able to modify and add to the Moodle Workshop activity to suit the needs of UNSW users. The following key modifications facilitated the assessment activities described above:

- Team Mode, allowing teams/groups to submit assignments for review by members of other teams/groups within the course (there are plans for further modification, allowing team to team review);
- CSV Allocation Upload, allowing instructors to create a spreadsheet of students and staff to be assigned as reviewers within activities, and;
- Reviewer Calibration, allowing instructors to rate the expertise of students in marking by having them mark samples assignments, which the instructor has already determined how the samples should be marked.

While not available in current versions of Moodle, these modifications have been submitted to Moodle HQ for incorporation into Moodle Core code, making the modifications available globally to all users of Moodle.

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Exploring the relationship between afforded learning tasks and learning benefits in 3D virtual learning environments

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In this paper, we build on our previously proposed model of learning in three-dimensional virtual learning environments (3D VLEs) (Dalgarno & Lee, 2010) by exploring the relationship between learning tasks that are afforded by such environments and learning benefits that arise from their use. We draw on data from a questionnaire in which 53 of the 117 higher education respondents described how they used 3D VLEs with their students and indicated the degree to which they believed each of the five potential learning benefits occurred. The results provide strong support for the idea that each of the benefits occurred, but suggest the links between learning tasks and learning benefits are, at this stage, unclear. We postulate some of the possible reasons for these findings and make recommendations for further research, discussing some of the challenges involved in designing studies that seek to relate afforded learning tasks to learning benefits through measurement of actual learning outcomes.

Keywords: 3D virtual learning environments (3D VLEs), virtual worlds, affordances, learning tasks, learning design, learning benefits, educator perceptions

Introduction

In an article published in the *British Journal of Educational Technology* (BJET) (Dalgarno & Lee, 2010), we systematically reviewed published research on three-dimensional virtual learning environments (3D VLEs) from the past 20 years and carried out a theoretical analysis based on that body of research, with the goal of identifying a set of unique characteristics of 3D VLEs as well as a series of learning benefits arising from tasks afforded by such environments. The results of that analysis led us to propose a model of learning in 3D VLEs (see Figure 1). The model includes 10 distinguishing characteristics of 3D VLEs, the first six of which relate to aspects of the representational fidelity of 3D VLEs, and the remaining four of which relate to the aspects of the learner–computer interactivity these environments are able to facilitate. We argue that the 10 environmental characteristics give rise to three characteristics associated with the experience of using or ‘being in’ the virtual environment (construction of identity, sense of presence and co-presence), and that the environmental and experiential characteristics, either together or individually, then afford various types of learning task, which in turn lead to a set of five potential learning benefits that are believed to accrue from the performance of those tasks. We conclude the BJET article by pointing to the dearth of empirical insight available about the precise nature of the relationships between each of the environmental and experiential characteristics of 3D VLEs, the types of learning task they afford, and their potential learning benefits. The focus of this paper is on the relationship between the afforded learning tasks and learning benefits, from the perspective of higher educators who have used 3D VLEs in their teaching.

Background and related work

Over the years, attempts have been made by a number of authors to classify or taxonomise applications and learning activities/designs in the area of 3D VLEs, and there has been substantial recent interest in such efforts, spurred by the advent and growth of the current generation of massively multiuser 3D virtual worlds such as *Second Life*. For example, Ryan (2008a, 2008b) outlines 16 pedagogical approaches or ‘ways’ of using *Second Life* and other virtual worlds as educational tools, supported by a range of different datasets including but not limited to survey responses, formal interview transcripts and notes from meetings and informal conversations, as well as her own personal observations, reflections and ethnographic journal entries. Some of the ‘ways’ Ryan suggests of using the technology are ‘to add a visual element’, ‘to house an interactive library or collection of learning objects’, ‘as a connection device (i.e. for communication)’, ‘as a role-playing device’, ‘as a simulation device’, ‘to facilitate games for learning’, ‘to conduct virtual tourism and field trips’, ‘for machinima creation’ and ‘for building “for the sake of learning how to build”’. A similar list is presented by Kay and FitzGerald

(2008), although the method and approach they followed to arrive at the list is largely unclear. Their list comprises categories of educational activity in *Second Life* including but not limited to the following: 'self-paced tutorials', 'displays and exhibits', 'role-plays and simulation', 'data visualisations and simulations', 'historical recreations and re-enactments', 'machinima construction' and 'treasure hunts and quests'. Both Ryan's 'ways' of using *Second Life* and Kay and FitzGerald's types of educational activity in *Second Life* bear likeness on a number of fronts to the 'educational activities' dimension of the taxonomy developed by Jiang (2008) as an outcome of his analysis of virtual worlds in higher education. This dimension is one of six dimensions in Jiang's taxonomy, which he used to classify the literature reviewed for his Masters research and also as a framework for discussing institutional case studies of the use of the technology in three UK universities. The categories in this dimension are 'virtual quests', 'collaborative simulation', 'collaborative construction', 'virtual laboratory', 'virtual fieldwork', 'role-play', 'game-based learning' and 'attending lectures/classes'. Hew and Cheung's (2010) international meta-analysis of studies reporting on 3D VLE use in K-12 and higher education culminated in the identification of three much broader categories describing the main purposes for their use: as communication spaces, for simulation of space (spatial) and as experiential spaces ('acting' on the world).

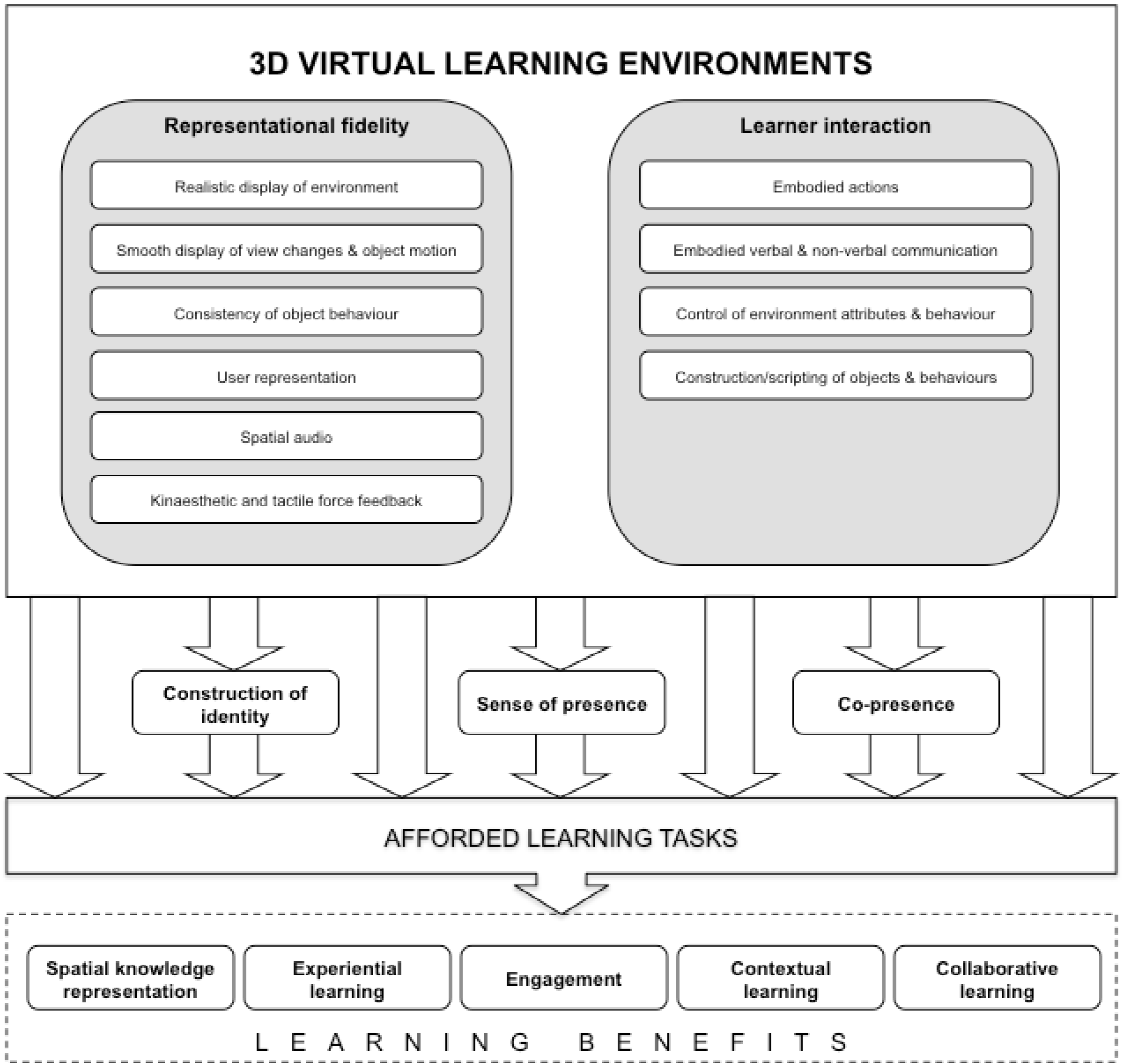

Figure 1: A model of learning in 3D VLEs (Dalgarno & Lee, 2010)

While evidence of the actual learning benefits brought about by the use of 3D VLEs is sparse (Dalgarno & Lee, 2010; Lee & Wong, 2008; McLellan, 2004; Mikropoulos & Natsis, 2011), much has been written in recent years about the possible and purported benefits, fuelled again by the burgeoning interest of educators in the current generation of 3D virtual world platforms. One approach to understanding the benefits of learning technologies is to consider their use from an affordance (Gibson, 1979, Norman, 1988) perspective. In the most basic terms, an affordance of a tool is an action made possible by the availability of that tool. Hollins and Robbins (2008), for instance, discuss five broad educational affordances of virtual worlds – ‘identity’, ‘space’, ‘activity’, ‘tools’ and ‘community’ – drawing on their observations and data collected through their experiences as tutors, researchers, long-term residents of *Second Life* and players of other massively multiplayer online role-playing games (MMPORPGs). Warburton and Pérez García (2009), in their review of educational uses of virtual worlds focusing particularly on *Second Life*, characterise the main educational affordances of *Second Life* as being the creation of opportunities for ‘extended or rich interactions’ between individuals and communities, between individuals and artefacts, and among intelligent artefacts; ‘visualisation and contextualisation’ through the production and reproduction of otherwise inaccessible content; exposure of learners to ‘authentic content and culture’; ‘individual and collective identity play’; ‘immersion’ in the virtual environment; ‘simulation’ of contexts that may be prohibitively expensive, impractical or impossible to reproduce in real life; ‘community presence’ in the way of promoting a sense of belonging and purpose; and ‘content production’ opportunities enabling the creation and ownership of the learning environment and objects within it. Lastly, Lim (2009) derived a framework that he dubbed the ‘Six Learnings of *Second Life*’, based on his own experiences and reflections of using *Second Life* in his teaching and research. He recommends that in-world curricular interventions be designed to target one or more of the ‘Learnings’ of ‘Learning by exploring’, ‘Learning by collaborating’, ‘Learning by being’, ‘Learning by building’, ‘Learning by championing’ and ‘Learning by expressing’. These ‘Learnings’ may be viewed as types of affordance of 3D VLEs for learning.

In much of the extant literature in this area, including many of the aforementioned sources, there is no clear differentiation between the affordances and benefits of the use of 3D VLEs; the two concepts are often treated as one and the same. One exception is the work of Dickey, who has published the findings of a number of studies aimed at examining and comparing the affordances and constraints of specific 3D VLE platforms, including *blaxxun interactive* (Dickey, 1999), *OnLive! Traveler* (Dickey, 1999), *Active Worlds* (Dickey, 1999, 2003, 2005, 2011), *Adobe Atmosphere* (Dickey, 2005) and most recently, *Second Life* (Dickey, 2011). The approach taken in some of these studies (Dickey, 2003, 2011) has been to attempt to determine the affordances of the environment in question from the perspective of the user through methods such as participatory observations, class logs and interviews with students and teachers, while in others (Dickey, 1999, 2005) the affordance analysis has centred around a review of the software by the researcher to identify specific features and functionalities.

In proposing our model of learning in 3D VLEs (Dalgarno & Lee, 2010, see Figure 1), we adopt a view that is consistent with the conception of Norman (1999), who differentiates between ‘real’ and ‘perceived’ affordances and argues that until an affordance is perceived it is of no utility to the potential user. Our view that what is ‘afforded’ is not specific learning benefits or outcomes, but rather the tasks that educators/educational designers and learners perceive the technology as being useable for. The model recognises that the technologies themselves do not directly cause learning to occur, but that the afforded learning tasks *may* give rise to certain learning benefits. Importantly, our model is explicitly framed and presented as a theoretical one that encapsulates what scholars are asserting to be the distinguishing characteristics and potential learning benefits of 3D VLEs, as well as those that are implicit in the design of 3D VLE applications described in the literature. As argued in Dalgarno and Lee (2010), many of these assertions and implicit assumptions are in need of further empirical investigation and validation; the research reported in this paper is an attempt to partially address this need. Specifically, the aims of the research were to:

1. determine the extent to which higher educators perceived the five learning benefits in Dalgarno and Lee’s (2010) model to be occurring when using 3D VLEs with their students; and
2. explore the relationship between the afforded learning tasks (as identified through a grounded analysis of the higher educators’ descriptions of the 3D VLE-based learning activities their students undertook) and the perceived learning benefits.

Methods and data sources

The research described in this paper was part of a larger scoping study on the use of 3D virtual environments for learning and teaching in higher education in Australia and New Zealand (Dalgarno, Lee, Carlson, Gregory & Tynan, 2011a). The scoping study was sponsored by the Distance Education Hub (DEHub at http://www.dehub.edu.au/), a federally funded cross-university research consortium, during 2010 and 2011. It included an online questionnaire completed by 117 academic staff from higher education institutions across Australia and New Zealand, as well as follow-up semi-structured interviews with a number of those staff. Several educational designers/developers and information technology support staff were also interviewed.

This paper reports on the responses of the 53 academic staff who indicated in their questionnaire responses that they had used 3D VLEs in their teaching, then proceeded to describe in detail their use of the technology with their students in a particular subject or unit. Specifically, responses to the following questions are reported here:

> Question 116. *Please describe the main learning activities that your students undertook within the 3D immersive virtual world environment.*
>
> Question 120. *With respect to the outcomes you have observed in this subject/unit, please indicate the extent of your agreement with each of the following statements. The use of 3D immersive virtual worlds:*
> *a) assisted learners in developing familiarity with a place and the objects within it;*
> *b) was motivating and engaging for learners;*
> *c) led to improved transfer of learning to real situations;*
> *d) led to more effective collaborative learning;*
> *e) allowed learners to learn through experience in context.*

Question 116 was an open-ended question designed to obtain a descriptive account of the learning activities carried out by students. Data from this question were inductively analysed using the constant comparison method (Corbin & Strauss, 2008), with each of the responses initially being read at face value to produce a preliminary (candidate) list of codes. The codes were gradually refined as subsequent passes were made through the data and the content was reviewed in greater detail, allowing common strands to be factored out. As part of this iterative process, codes were added, deleted, merged, split and renamed. Ten categories eventually emerged from this analysis, as discussed in the next section.

Question 120 required responses on a seven-point Likert scale ranging from ‘Very Strongly Disagree’ to ‘Very Strongly Agree’. The five categories of learning outcome were intended to align with the five learning benefits in the Dalgarno and Lee (2010) model.

Results

Categories of learning activity

The responses to Question 116 were each assigned one or more of the following 10 grounded categories of learning activity emerging from the analysis:

- Place exploration;
- Concept exploration;
- Task practice;
- Role-play;
- Gaming;
- Communication;
- Slide show;
- Building or scripting;
- Instruction; and
- Machinima.

The types of learning activity assigned to each category are discussed in the subsections below. It is important to note that the categories are not mutually exclusive, that is, some of the responses (indeed, most of them) described learning activities belonging to more than one category. Conversely, some responses did not fit into any of the categories and were thus assigned an ‘Other’ category. One of the responses was unable to be coded based on the information provided.

Place exploration
These are activities in which learners visit and experience simulated places. The virtual places visited may be models of real-world places or may alternatively be virtual spaces designed to exemplify particular aspects of the real world. For example, a Religious Studies lecturer described an activity in which her students explored virtual spaces modelled on places of worship and were presented with informative note cards, landmarks and links at various points during their exploration.

Concept exploration
These are activities in which students explored visualisations and interactive examples of concepts in action. For example, a lecturer of a foundation-year Management subject described an activity in which students explored and manipulated a simulation of a business environment to develop an understanding of specific theoretical concepts.

Task practice
Activities in this category focus on the practising of procedural tasks in a virtual simulated environment. Such tasks might be overly expensive, dangerous, time consuming or inconvenient to practise in the real world. For example, one respondent described an activity in which Midwifery students used a simulated environment to practise the management of a postpartum haemorrhage.

Role-play
In these activities, students take on and act out roles as part of a given scenario in order to develop an understanding based on firsthand experience from the perspective of one or more of the roles occurring in the modelled situation. One respondent described an activity in which Criminal Law students role-played the delivery of trial submissions within a simulated virtual courtroom environment.

Gaming
Activities assigned to this category sought to challenge learners as they worked towards the achievement of individual or cooperative goals. Typically, in these activities, there was a sense in which the student 'won' the game once the goal was met. For example, an Education lecturer described a game in which educational psychology theories and concepts had to be mastered in order to achieve the goals within the game.

Communication
Many respondents described activities that had communication between students as a central purpose, for instance to discuss the ideas within a subject or to work on group project tasks. As an example, one respondent described an activity in which students worked collaboratively to develop accessible web sites for organisations and used *Second Life* to meet with clients based in other countries.

Slide show
This category included activities in which students viewed or created slide shows within the 3D VLE. For example, PowerPoint images, photographs and other two-dimensional graphical content are able to be rendered on a 'screen' in *Second Life* with the help of a special slide projector object. The content can be browsed independently by students or used as visual aids during a lecture or other synchronous class activity.

Building or scripting
Activities in this category required students to construct places and objects, and in some cases write programs or scripts, within the virtual world. In one activity, Information Systems students created software artefacts embedded in objects in *Second Life* and integrated them into scenarios to model processes applicable to a real business case.

Instruction
In this category were activities in which teachers delivered lectures, tutorials or content-based presentations to their students within the 3D VLE. It also included activities in which the students themselves delivered their own 3D VLE-based presentations.

Machinima
A few respondents' learning designs involved students creating or using pre-created 'machinima' – animations or 'movies' that record action occurring within a 3D virtual environment. Respondents described the use of machinima sequences for various purposes, including as introductory material to foreground exercises and concepts to be covered in face-to-face lessons, as well as to provide a narrative context and scaffolding for 3D VLE-based activities. In some cases the students viewed the machinima clips while immersed within the 3D VLE; in others, the clips were embedded in a subject/unit website or courseware package external to the 3D VLE.

Reported learning benefits

Responses to the five parts of Question 120, which asked respondents for their degree of agreement with a series of statements about the possible learning benefits of the 3D VLE-based learning activities, were scored from 1

(Very Strongly Disagree) to 7 (Very Strongly Agree). The responses in relation to each possible learning benefit are summarised in Table 1. Most noteworthy here is that most respondents agreed with all five statements, that is, regardless of the design of the particular activity, it would appear that most respondents thought that all five learning benefits occurred. The following section, then, looks at the relationship between the category of learning activity based on the analysis discussed above, and the reported learning benefit.

Table 1: Summary of responses relating to the reported learning benefit of each virtual world implementation

Reported learning benefit	**Frequency (*N* = 53)** Very Strongly Disagree (1)	Strongly Disagree (2)	Disagree (3)	Neutral (4)	Agree (5)	Strongly Agree (6)	Very Strongly Agree (7)	***Mean***
Assisted learners in developing familiarity with a place and the objects within it	2	0	5	8	16	19	3	***5.0***
Was motivating and engaging for learners	0	0	0	3	13	21	16	***5.9***
Led to improved transfer of learning to real situations	0	0	2	11	8	20	12	***5.5***
Led to more effective collaborative learning	1	0	1	6	12	23	10	***5.6***
Allowed learners to learn through experience in context	0	0	1	5	9	26	11	***5.8***

Comparing learning activities to reported learning benefits

In order to determine whether there was a difference between the learning benefit perceived to have occurred by respondents that were using different categories of learning activity, a Multivariate Analysis of Variance (MANOVA) procedure was carried out, with the 11 categories of learning activity as independent variables and responses to the five parts of Question 120 as dependent variables. Table 2 shows the mean response to the parts of Question 120 relating to each of the five learning benefits, broken down according to the categories of learning activity identified. Where the MANOVA procedure indicated there was a significant difference in response between those whose reported activities were assigned a particular category and those whose reported activities were not, this is also shown in the table.

Table 2: Mean response to questions about learning benefits for each category of learning activity and MANOVA results showing where a significant main effect of learning activity was found

	Learning benefit (1 = Very Strongly Disagree – 7 = Very Strongly Agree)				
Learning activity category	Assisted learners in developing familiarity with a place and the objects within it	Was motivating and engaging for learners	Led to improved transfer of learning to real situations	Led to more effective collaborative learning	Allowed learners to learn through experience in context
Place exploration (n = 9)	5.6	5.4	5.6	5.2	5.6
Concept exploration (n = 7)	4.0	5.9	5.7	6.1	6.3
Task practice (n = 5)	6.0	5.6	5.6	6.4	5.0
Role-play (n = 23)	6.0	5.7	5.6	6.0	5.0
Gaming (n = 1)	5.0	5.0	5.0	5.0	4.0
Communication (n = 21)	5.8	6.0	5.8	6.0	5.0
Slide show (n = 7)	6.2	5.7	5.7	6.0	4.8
Building or scripting (n = 9)	5.3	5.7	5.7	6.1	5.2
Instruction (n = 12)	6.1 *significant* $F(1,40)=4.841$, $p = 0.034$	6.2 *significant* $F(1,40)=4.136$, $p = 0.049$	5.8	6.3	5.4
Machinima (n = 6)	6.2	5.7	5.7	6.0	4.8
Other (n = 11)	5.6	5.3	5.0	5.9	5.5
Uncoded (n = 1)	7.0	7.0	7.0	7.0	6.0
Mean **(N = 53)**	***5.0***	***5.9***	***5.5***	***5.6***	***5.8***

Discussion and recommendations for future research

Based on the theorised relationship between learning activities and learning benefits within our model (Dalgarno & Lee, 2010), we hypothesised that the perceived learning benefits of each implementation would vary depending on the characteristics of the learning activities undertaken by the students. For example, we expected learning activities categorised as ‘place exploration’ to be more likely to ‘assist learners in developing familiarity with a place and the objects within it’, and to allow ‘learners to learn through experience in context’. We also expected learning activities involving ‘task practice’ or ‘role-play’ to result in ‘improved transfer of learning to real situations’, and learning activities involving ‘communication’ to lead to ‘more effective collaborative learning’. However, there were statistically significant differences according to the category of learning activity in the responses for only two of the learning benefits, namely those relating to place familiarity and motivation and engagement. In both cases, respondents whose learning activity included ‘instruction’ had a higher mean response rate, while there were no significant differences for any of the other learning activity categories. The finding that instructional learning activities were perceived to result in higher levels of place familiarity and engagement than other activities such as place exploration and gaming is surprising, as is the absence of any other significant main effects of learning activity on perceived learning benefit.

There are a number of possible explanations for the results of this analysis. One explanation relates to the fact that a majority of the learning activities were found to belong to more than one category. This suggests that the tasks set by the educators for their students were often quite holistic, perhaps involving a number of quite different learning activities. For example, if a learning task required students to take in instruction, then explore locations within the virtual environment, and while doing so communicate with one another using the tools provided, it would not be unlikely for multiple learning benefits to occur. Additionally, a wide range of 3D VLE-based learning activities are likely to be intrinsically motivating and engaging, so a lack of difference in perceptions about the degree to which this learning benefit occurred across different learning activities is understandable. Nevertheless, one would still expect to find that across the sample, differences in perceived learning benefits between tasks that involve a particular type of learning activity (e.g. place exploration or communication) and those that do not would still be detectable.

Another possible explanation for the lack of significant differences lies in the very high levels of agreement expressed by the respondents with regard to all five statements about the learning benefits arising from the activities (see Table 1). An earlier finding from the Australian and New Zealand scoping study of which the present research is a part was that there are substantial barriers to the use of the technology, and that institutional support is often limited (see Dalgarno, Lee, Carlson, Gregory & Tynan, 2011b). Given this, we might expect that many of the respondents to the questionnaire were passionate and enthusiastic adopters of 3D VLEs who were prepared to use such environments in their teaching despite the obstacles and challenges that exist. If this was indeed the case, it is possible that the respondents' tendency to agree or strongly agree with all five statements about the learning benefits could be more a reflection of their enthusiasm and positive attitude towards the use of 3D VLEs than an evidence-based assessment of the actual learning benefits occurring from the specific activities their students undertook.

In light of the above, future research needs to consider alternative ways of exploring the relationship between learning activities in 3D VLEs and the actual learning benefits occurring. One approach that could be considered is the use of controlled studies where the actual learning outcomes of students undertaking activities in a 3D VLE are compared with those of students undertaking equivalent, non-3D VLE-based activities (e.g. using other online technologies, or in a face-to-face environment). As pointed out by Clark (1994), however, it is very hard not to confound instructional method with media in such studies, and consequently, such studies are unlikely to identify learning benefits caused solely by the virtual environment. The use of controlled studies of this type in an authentic university context is also problematic because of the ethical issues involved in providing some students with access to a particular learning experience while denying others access to it. Another alternative approach would be to collect data from students to gauge their perceptions of the learning benefits of a particular 3D VLE-based learning activity. Given the fact that many students are initially somewhat cynical of the benefits of such activities (see Dalgarno et al., 2011a), student responses to a questionnaire on the learning benefits of a particular activity could possibly be more realistic than those of the academic who has enthusiastically designed the learning tasks, often investing a substantial amount of his/her own time. Care would need to be exercised in the construction of such a questionnaire to ensure that the terminology used is understandable to students. Terms like 'motivation' and 'engagement' are likely to be reasonably well understood; however, notions such as 'transfer of learning' may require some explanation and clarification.

Furthermore, just as future studies should consider students' perceptions of learning benefits in addition to those of educators, so too should they seek to recognise the differences in perceived affordances (Norman, 1999) between students and educators. In the present study, the various categories of learning activity were derived from educators' descriptions of the activities undertaken by their students within 3D VLEs. It would be worthwhile to ask students to describe what they consider to be appropriate and/or valuable uses of 3D VLEs for learning and teaching and how they would like to see the technology integrated into their courses, to serve as a basis for comparison with the educators' views and intentions. The ways in which students interpret assigned learning tasks and carry out activities (Goodyear & Ellis, 2007; see also Goodyear, 2000) within 3D VLEs and how these might be influenced by the affordances they perceive in the technology also warrant further investigation, as these factors may impact upon both the perceived and actual learning benefits arising from the activities.

Conclusion

The study reported in this paper, which sought to extend our earlier theoretical work as presented in Dalgarno and Lee (2010), explored the relationship between the characteristics of 3D VLE-based learning activities and the learning benefits perceived to have occurred, as reported in an online questionnaire completed by Australian and New Zealand academic staff who had used 3D VLEs in their teaching. There was almost no statistical difference between respondents' degrees of agreement with five statements about the learning benefits across different categories of learning activity. Two plausible explanations for this unanticipated result are firstly, the possibility that many of the learning tasks set for the students involved multiple categories of learning activity and consequently led to a wide range of learning benefits, and secondly, the possibility that respondents' high levels of enthusiasm for the use of 3D VLEs may have caused them to perceive learning benefits beyond those actually occurring. Further research exploring this issue will need to consider alternative approaches to measuring the learning benefits, including, for example, elicitation of students' perceptions as well as assessment of actual learning outcomes achieved, although the latter in particular will not be without its difficulties. Studies are also needed that take into account the perceived affordances of 3D VLEs from the point of view of students, and the effect these might have on their interpretation of learning tasks and performance of learning activities.

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Using technology to encourage self-directed learning: The Collaborative Lecture Annotation System (CLAS)

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The rapidly-developing 21st century world of work and knowledge calls for self-directed lifelong (SDL) learners. While higher education must embrace the types of pedagogies that foster SDL skills in graduates, the pace of change in education can be glacial. This paper describes a social annotation technology, the Collaborative Lecture Annotation System (CLAS), that can be used to leverage existing teaching and learning practices for acquisition of 21st Century SDL skills. CLAS was designed to build upon the artifacts of traditional didactic modes of teaching, create enriched opportunities for student engagement with peers and learning materials, and offer learners greater control and ownership of their individual learning strategies. Adoption of CLAS creates educational experiences that promote and foster SDL skills: motivation, self-management and self-monitoring. In addition, CLAS incorporates a suite of learning analytics for learners to evaluate their progress, and allow instructors to monitor the development of SDL skills and identify the need for learning support and guidance. CLAS stands as an example of a simple tool that can bridge the gap between traditional transmissive pedagogy and the creation of authentic and collaborative learning spaces.

Keywords: self-directed learning (SDL); lecture annotation; learning analytics; motivation; self-management; self-monitoring; metacognition.

Introduction

More than four decades ago, adult educator Malcolm Knowles (1970) argued that the Information Age and the speed of technological development would necessitate constant re-training and re-skilling in most careers. Knowles maintained that to meet future workforce requirements, individuals would require the skills, attributes and dispositions that would allow them to assess their current level of skills and knowledge, and determine their ongoing learning requirements as they progressed through their professional careers. This notion of need for continuous learning (formal, non-formal or informal), with an emphasis on learner independence, has been captured in the term ‘lifelong learning’. As Sharples (2000) argued there is no authoritative definition of lifelong learning. However, the intent of the concept of lifelong learning is well captured by Candy (2000) in noting that the pace of “social, technological, cultural, economic, legal and educational change …emphasizes the need for people who are adaptable and responsive; in short, who are capable of continuing lifelong learning” (p. 102). While education policy and vision statements have rapidly embraced the *ethos* of lifelong learning, it is questionable whether contemporary teaching practice has fully achieved the goal of developing in students the skills necessary for lifelong learning - that is, the skills that allow them to become self-directed and social learners (McWilliam, 2011). This failure is not the result of any lack of appreciation of the importance of developing self-directed learners, but instead most likely reflects the reality that any change in pedagogical practice necessitates a change in our teaching habits (McWilliam, 2005). And habits are notoriously difficult to change.

Few educators would deny the importance of implementing teaching practices that aim to promote and foster the skills associated with becoming autonomous, self-directed learners, as demonstrated by the depth of educational research and discussion in the field of self-directed learning (for review see Knowles, Holton & Swanson, 2011). Although the premise of SDL is now well accepted, there remains much debate over an authoritative definition. Knowles (1970) first defined SDL as:

> The process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing learning strategies, and evaluating learning outcomes. (p. 7).

Although the definition of self-directed learning (SDL) has evolved since Knowles's early work, the core message has remained the same. That is, the primary responsibility for learning resides with the learner (Merriam & Caffarella, 1991). This does not imply that SDL is a solitary and isolated process. Rather, SDL is characterized as comprising the skills and abilities necessary for engaging in independent and social learning processes as determined by the individual learner (Brookfield, 2009).

Where early researchers approached SDL from sociological (e.g. Tough, 1971) and pedagogical (e.g. Knowles, 1970) perspectives, the field has since expanded to include psychological dimensions (Pilling-Cormick & Garrison, 2007). Building on the work of Long (1989) and others (e.g. Brookfield, 1986), Garrison (1997) proposed that the kind of educational experiences which effectively promote and facilitate SDL are those that motivate learners to engage in continued learning, and that offer learners opportunities to practice self-management and self-monitoring. Contemporary educational structures and pedagogical practices, on the other hand, remain entrenched in an industrialised model (i.e. a model that emphasises linearity and standardisation) (Robinson, 2000), and learning environments remain overwhelmingly content-centric and transmissive (Conole & Alevizou, 2010). Short of revamping entire educational systems, do tools and approaches exist that can enable and foster SDL outcomes even within the constraints of contemporary learning environments?

We argue in this paper that SDL skills can be developed and promoted within such environments through careful design of interactive tools that extract the artefacts of existing practice to encourage self-management, self-monitoring and motivation (core factors in Garrison's 1997 SDL model). As an example of such tools, we describe an in-house developed educational technology, called the *Collaborative Lecture Annotation System* (CLAS). This web-based annotation resource has been designed to leverage the primary products of existing pedagogical practice (lectures) and student learning approaches (note-taking and review of important highlighted points) in a manner that encourages both the development of lifelong learning skills and reflection on teaching practice. We begin the paper with an overview of the basic architecture and functionality of CLAS, before discussing the theory and principles that underpin it and that have informed its design and functionality. We conclude by suggesting future directions and research related to the application of learning analytics, media and social annotation tools in order to provide further impetus for pedagogical change.

How the Collaborative Lecture Annotation System (CLAS) Works

CLAS allows annotation of educational media

CLAS is a web-based video annotation tool, designed in the first instance to enable students to flag points in a video that they believe to be significant for their learning. Using CLAS, students can annotate lecture videos in the same way that they highlight important sections in text passages within a prescribed course reading. CLAS can be used in the classroom during live lecture presentations that are also recorded and uploaded at a later stage for student and instructor review. Alternatively, students and instructors can use CLAS to interact directly with any previously uploaded multi-media content (e.g. podcasts, vodcasts, or lecture capture). In essence, CLAS has been designed to allow for a cohort of students to share annotations, review peer annotations and allow for instructor feedback in the one collaborative space.

During a lecture, or during later review of a captured lecture or other multimedia resource, all learners can add a 'point-based' (flag) annotation (via laptop or mobile device) to indicate that something of personal significance or importance occurred at that specific point in time (Figure 1) (Risko, Foulsham, Dawson, & Kingstone, In Press). Each individual point-based annotation is time-stamped (post login), and later synchronised with the recorded lecture (post upload). During the lecture, or at a later time, students can also add textual annotations for personal review and reflection or for sharing with peers post-lecture (Figure 1).

On completion of the lecture or lecture review, student individual annotations are saved in a file on the server. All student annotations are graphically presented in an individual annotation timeline (see Figure 1). Students can navigate through their individual timeline by clicking on the specific annotation points. Clicking in the annotation timeline repositions and plays the video (i.e., the lecture) from the point in time corresponding to the selected region. This feature allows students to click on the points in the lecture that they had previously indicated were important and be taken directly to those points in the lecture video. Additionally, when all student annotation timelines are presented, students can readily navigate and review areas of the lecture or multimedia resources that may have fallen outside of their consideration earlier.

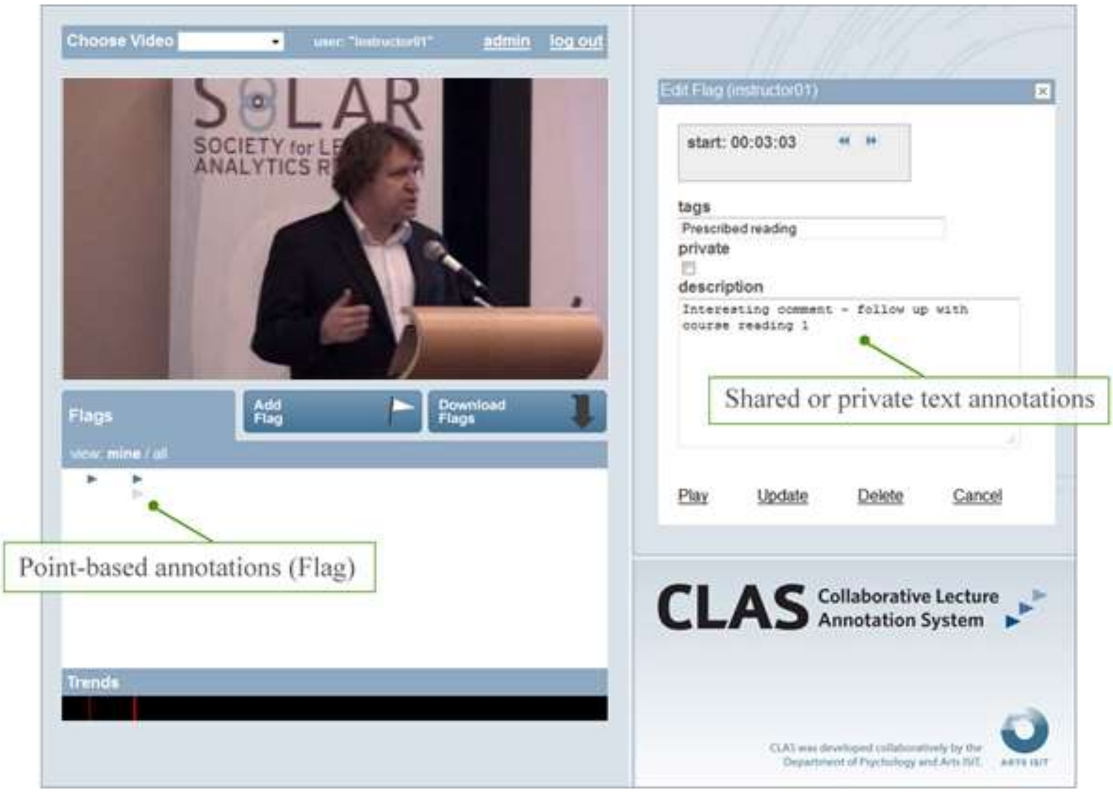

Figure 1: Point-based annotations that are aligned with the video time stamp. This figure illustrates the application of CLAS during a live recorded presentation.

Learners and teachers can view group annotations

Most importantly and whether it is used with live lectures or archived media, CLAS allows both learners and instructors to 'see' areas of learner convergence and divergence with respect to key points in, for example, a lecture presentation (Figure 2). This information can be used by both students and teachers to evaluate learning progression and the effectiveness of the presented materials (Risko et al., In Press). For example, students can assess their own interpretation of important points against those of their peers; instructors, meanwhile, can determine whether students are recognizing and understanding important concepts or material in their lecture materials (identification of areas of convergence and divergence; Figure 2). In this way, visualization and interpretation of captured student interactions can inform decisions regarding future teaching strategies and practices in order to address any identified gaps in the learning process or student understanding (Risko et al., In Press).

Figure 2: Point-based annotations from a student cohort indicating sites of convergence and divergence.

CLAS analytics allow sophisticated student tracking and support

Learning analytics relates to the collection, analysis, reporting and interpretation of user data in learning and teaching contexts (Siemens & Long, 2011). Data may include, for example, learner tracking data in a learning management system or library resource. Analytics models are used to discover patterns, learning and teaching information and social connections particular to individual learners and to learning communities. While this emerging inter-disciplinary field has the potential to support and improve learning and teaching practice and institutional decision making, institutional implementation of learning analytics methods thus far has largely been directed towards decision-making around student admissions, and predicting student attrition rates. Learning analytics nevertheless offer learners new opportunities for tracking their own progress and can motivate students to invest new effort in their learning (Fritz, 2011; Macfadyen & Dawson, 2010). They also permit predictive modeling of student success/failure and can allow educators to identify, early, those students requiring additional learning support (Ferguson, 2012).

CLAS provides learners and teachers with a set of data visualizations and analytics (Figure 3) that may assist in the evaluation of student understanding and guide the learner towards core SDL outcomes. CLAS provides the functionality to analyze:

- the changes students make to their lecture annotations after viewing aggregated class data;
- the number of times an individual accessed a particular lecture or media resource;
- student ‘dwell time’ on a particular media resource;
- the length of textual annotations made by users;
- outliers (students whose flags and/or annotations differ significantly from their peers) (Figure 2).

For learners, comparison of personal data with group data can act as a strong motivator to sustain or increase contribution to and engagement with the class learning community (Gibbons, Blanton, Gerrard, Buunck, & Eggleston, 2000), and can serve to promote self-reflection.

For educators, learning analytics data can assist with identification of individual students who may need additional learning support. Such data can also allow educators to assess the impact of teaching activities or resources and offer critical feedback on student and cohort understanding. For instance, a review of annotations may indicate a common misunderstanding of the core concepts provided within a lecture. Conversely it may also indicate strong understanding with minimal outliers requiring further follow-up. Within the large class context, instructional feedback of this kind is critical for ensuring that each lesson is well scaffolded and builds on student understanding, rather than being tied strictly to a curriculum schedule.

Figure 3: Example analytics on user annotations and interactions.

Design of the CLAS Tool

CLAS was designed with the goal of creating opportunities for students to acquire and practice skills of self-directed learning within existing and often fairly 'traditional' learning contexts. It offers features that are designed to facilitate educational experiences which motivate student engagement, and which promote self-monitoring and self-management – the three core dimensions of Garrison's framework for self-directed learning (1997). To this end, three central principles shaped its design:

1. Learning for the 21st century requires SDL skills and attributes. Educational practice is, however, slow to change (Bates, 2000). Rapid promotion of SDL skills and attributes calls for the implementation of new tools and processes that can leverage existing teaching and learning practices within the current educational landscape.
2. The integration of CLAS into teaching and learning practice must motivate student engagement with learning materials, peers and learning opportunities; and must provide opportunities for self-management of learning resources and activity engagement.
3. CLAS must include features that provide instructors and students with the ability to monitor/ self-monitor learning progression.

Principle 1: Leverage existing teaching and learning structures

Although much continuing educational practice operates on the assumption that learning is largely an individualized activity, current learning theory contends that learning is, overwhelmingly, a social process (Bandura, 1977; Vygotsky, 1978). McWilliam (2011) emphasizes this point, noting that past and future models of education need to move away from individualized instruction (lecture) and re-engage with the idea of a 'café society'. She writes: "When we ignore the educative traditions of café society, we fail to appreciate that *the proper location for lifelong learning is better understood as the café, not the school*" (McWilliam, 2011, p.2). Reflecting contemporary educational theory, McWilliam's 'café' represents the multiplicity of possible sites for learner engagement - sites for dialogue and sharing of social and cultural perspectives that facilitate the collective construction of knowledge. The traditional lecture format, however, offers only limited opportunities for diverse discussion and debate.

CLAS has been designed to facilitate both self-directed and collaborative learning opportunities using easily captured video- or audio- recordings of in-class lectures, and offers the possibility of turning transmissive pedagogy and solitary learning into moments of rich engagement. The tool was designed to make the extraction of key content from multi-media (e.g. lecture capture, vodcasts, podcasts, etc.) a more collaborative and interactive process for students, who can annotate a lecture video either with a simple flag or with their own expanded reference notes. The one-click point-based annotation allows students to highlight important sections of the lecture or video without undue cognitive load or disrupting flow.

CLAS facilitates the sharing of student annotations, and allows benchmarking of progress and understanding against that of peers. While this tool is only a partial substitute for more discursive peer to peer engagement, it represents a significant step in leveraging the artifacts of the lecture format to provide a more socially grounded learning experience. For instructors, CLAS joins the group of available easy-to-use tools that encourages experimentation as they navigate the transition from transmissive pedagogy to creation of a more authentic and collaborative learning space.

Principle 2: Motivate learner engagement, create opportunities for self-management

The importance of motivation in influencing student learning is well established (Pintrich & Schunk, 1996). While educators may disagree about whether motivation must originate in the student, or whether it can or should be imbued by the teaching/learning process (Ramsden, 1997), there is little debate about the importance of motivation for future academic success (Dweck, 2000; Hodges, 2004; Pintrich, 1999). Proficiency in SDL necessitates not only a certain degree of motivation to engage in the learning process, but also the capacity to assess achievement and performance against established criteria or goals (Nicol & Macfarlane-Dick, 2006). Garrison (1997) separates the dimension of motivation into two sub-components: motivation to select and establish "goals and intentions" (p. 27) for learning; and "task motivation" – the motivation to 'stay on track' and complete the required learning activities.

A key element influencing student task motivation is feedback. While student motivation to persist is also influenced by a range of intrinsic and extrinsic factors (e.g. grades, future career goals, instructor, assessment), it is critically impacted by the level and quality of feedback received (Butler & Winne, 1995). More traditionally, learner feedback has been provided via a set of assessment tasks (formative and summative). Self-reflection, and peer engagement can, however, offer additional opportunities for learner feedback and can therefore assist with maintaining task motivation and persistence. CLAS was designed to promote peer-peer interaction and collaborative and active construction of knowledge through sharing of annotations and multi-media resources. These forms of social interactions present additional opportunities for students to obtain feedback and assess their level of understanding against group norms. Depending on course design, CLAS can also provide additional opportunities for private or public instructor feedback, via textual or video annotations.

Learning analytics derived from CLAS activity offer a further source of potentially motivating feedback to learners. By aggregating student annotation timelines, CLAS gives all learners the opportunity to observe, compare and evaluate the level of their engagement efforts, and overall learning annotations with those of peers. For learners, this form of social comparison provides a critical source of feedback that can motivate continued engagement and learning (Fritz, 2011; Gibbons et al., 2000). Although learning analytics data do not provide low performing students with guidance on specific learning strategies to adopt, they do indicate the sites of difference in the perceived importance and written annotations occurring between students (figure 2). This process of social comparison is now being adopted across the field of learning analytics and educational data mining - that is, the comparison of an individual's level of engagement with course materials and activities presented in a learning management system against that of peers. For instance, the Purdue University Signals project makes use of group comparison data to provide automated early warning signals to students regarding their progress in a particular course (Arnold, 2010).

In addition to encouraging student motivation, CLAS allows students to self-manage their own engagement with available learning resources and with peers. The degree and style of interaction with each captured lecture or media resource depends entirely on the needs and preferred learning strategy of the individual student. For example, learners may or may not choose to share their own annotations with others; they may simply review their own 'highlights', and/or can choose to search and browse group annotations based on social tagging (see figures 1 and 2). Depending on assessment tasks and learning activities designed by the instructor, CLAS offers additional possibilities for learner engagement: captured video from class activities may be used for self-reflection, peer review or instructor feedback; compiled personal or group video annotations may form the basis for self-reflection or collaborative writing.

A core goal of CLAS is to build on ‘traditional’ lecture content, and offer learners an enriched set of opportunities for more socially oriented and participatory learning. As with all socially mediated technologies, the greater the number of students engaged in the process, the greater the number of learning resources generated. The increased numbers of available resources provides a direct positive feedback loop for further enhancing motivation.

Principle 3: Offer tools for monitoring and self-monitor learning

Perhaps the strongest benefit that CLAS offers learners is the capacity for self-monitoring: reflection on new information (meta-cognition) gained through adoption of a particular learning strategy (cognition), and the subsequent construction of personal meaning (Garrison, 1997). Meta-cognitive proficiency, in particular, is tightly correlated with academic success and problem solving ability (e.g. Butler & Winne, 1995; Pintrich, 1999; Zimmerman, 2002; Zimmerman & Schunk, 2001). The capacity for self-monitoring has direct impact on the level and quality of study and therefore, overall learning progression and academic achievement (Dunlosky & Thiede, 1998). Kruger and Dunning (1999) elaborate this point, noting that “the skills that engender competence in a particular domain are often the very same skills necessary to evaluate competence in that domain” (p.30). More simply put, poor performers also have poor self-evaluation skills. As with all aspects of education, not all students enter university as adept learners with a high level of meta-cognitive capacity. However, this meta-cognitive proficiency can be improved through on-going training and feedback (Thiede, Anderson, & Therriault, 2003).

The CLAS workflow directly provides a self-monitoring and feedback strategy intended to hone student cognitive and meta-cognitive processes. CLAS allows learners to create defined point-based annotations and textual annotations on meaning and relevance, with the goal of encouraging learner self-reflection, benchmarking and collaborative opportunities. In the first instance, and as described earlier, learners have the option of reviewing and comparing their own flags and textual annotations with those of individual peers. With particular reference to textual annotations, the CLAS tool provides students with a corpus against which to compare and clarify their perception and understanding of key concepts in captured lectures (or other multi-media content).

In addition, CLAS develops aggregated group annotation metrics for further comparison. These are calculated by recording the frequency of individual annotations that occur in a particular time bin – currently 10 seconds in length – and dividing this by the total number of group members, giving a relative measure of perceived importance for each time segment of a lecture or resource. This group graph offers a consensus representation of the important elements in the media under consideration. CLAS then allows students to review their individual point based annotations against the aggregated group graph (Figure 4). While not implying that the group consensus is always ‘correct’ presentation of these data is intended to prompt student reflection on their individual input and understanding relative to that of the group. The creation of such a ‘feedback loop’ provides learners with a level of internal validation that is essential to self-monitoring, and also provides opportunities for external guidance from the instructor (who may also review individual performance and group norms).

For instructors, CLAS also provides data on the extent to which students review and alter their initial responses (point-based annotations). These captured data allow instructors to better track the outcomes of self-monitoring within their class(es). Records of frequency and timing of student actions upon self-reflection can serve as an indicator of development of meta-cognitive proficiency.

Overall, CLAS has been designed to capture, aggregate and re-present data to learners, creating opportunities for review, reflection and benchmarking that assist in shifting the responsibility of learning from instructor to learner, regardless of the pedagogical approach adopted in delivery of in-class lectures. The implementation of CLAS can actively encourage individual self-monitoring of learning progression, and can motivate students to alter their learning strategies in order to achieve their learning goals.

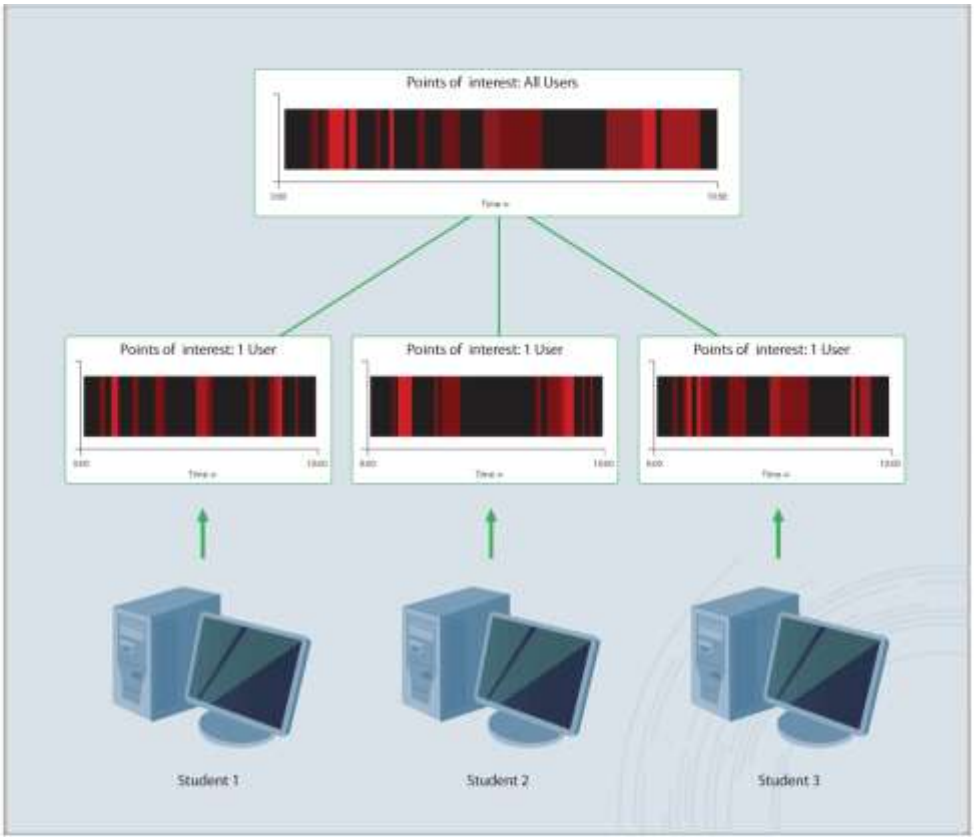

Figure 4: Relative measure of perceived importance for each video time segment.

Conclusion

The CLAS tool represents a starting point for leveraging existing teaching and learning practices to better promote and foster the necessary 21st Century skills within today's learning environments. Despite calls for changes to pedagogical practice to give new graduates the skills they need to become self-directed lifelong learners, the lecture remains the primary pedagogical approach in institutions of higher around the world. While technology adoption may have increased, there is scant indication that a pedagogical tipping point will be reached in the near future to dramatically change this transmissive model of education practice (Conole & Alevizou, 2010). This reality calls for the implementation of approaches that will allow learners to leverage 'traditional' lecture based instruction towards new ends. In this paper, we have outlined a technology that allows learners to annotate captured lectures and other multimedia content, and to share and reflect on these annotated learning resources as part of an enriched educational experience. The technology was developed with Garrison's (1997) multidimensional view of SDL in mind, and with the goal of creating – through the implementation of relatively simple technologies – opportunities for learners to build on lecture materials and develop skills necessary for self-directed learning (self-management, self-monitoring and motivation). Adoption of the CLAS tool is underway in a number of disciplinary areas in our institution, embedded in a variety of different course designs and activities. Ongoing research will seek to monitor and assess the impact of CLAS use on student learning and skills development.

Of great interest, also, is the learning analytics functionality of the CLAS tool, and the additional potential that it offers for students to take greater responsibility for their learning and for instructors to monitor the development of necessary SDL skills and evaluate areas of learning support and guidance. Within the field of learning analytics, the impact of giving data to learners (rather than simply to instructors and administrators) is in its infancy. Further empirical research is required to better understand the relationship between CLAS analytics and aspects such as student motivation, and meta-cognitive proficiency.

While presentation of learning analytics data may be significant for student motivation (as described above), the field of learning analytics also has much to offer educators in terms of predictive modeling and early identification of students requiring personalized learning support. By interrogating the data evolving from user interactions in various educational technologies it is possible to establish patterns of behavior and groupings of students based on lead indicators of academic performance. An understanding of the significant variables leading to high and low academic performance, may, in turn, permit early targeted learning support. Moreover, learning analytics data may allow assessment of student capacity and maturity for self-direct learning. This is hinted at by Biswas *et al.* (2010) who evaluated student self-regulated learning strategies through analysis of activity logs. Two important conclusions can be drawn from the Biswas *et al*. (2010) study. First, student application of self-regulated learning strategies is positively correlated with performance. Second, students employing (or not employing) specific learning approaches can be identified through analysis of activity log data. What this study and many others relating to learning analytics demonstrate is the capacity for student online interaction data to provide significant lead indicators of meta-cognitive skills (Biswas et al., 2010; Kinnebrew, Biswas, & Sulcer, 2010), academic performance (Finnegan, 2006; Macfadyen & Dawson, 2010) and learning support (Dawson, 2010). We anticipate that ongoing investigation of the learning analytics data generated by the CLAS tool and related applications will continue to expand our understanding of the utility of learning analytics data for supporting teaching and learning.

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Can Digital Natives Level-Up in a Gamified Curriculum?

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The compulsion to include games and game related mechanism in education is great among educators who want to engage and motivate today's students and the latest buzzword in this domain is gamification. However, without a thorough understanding of what a gamified curriculum looks like, how it can best be applied and why it might engross students, it cannot be effectively applied. This research examined a gamified course curriculum structure and evaluated its use in two university level subjects. The objective was to gauge student enjoyment and engagement with a heavily gamified curriculum and to understand the aspects that make the practice useful in education. Exploratory factor analysis of the dataset revealed the possibility of a six dimensional model of curriculum gamification worthy of future study.

Keywords: gamification, curriculum, game-based learning, engagement.

Introduction

Computer game players willingly devote many hours problem-solving and honing their skills within the context of games (Gee 2003). McGonical (2011) supports this, citing studies in which players willingly spend between 17 and 22 hours per week in the massively multiplayer online game World of Warcraft. This amounts to some 50 billion collective hours in the game with players paying for the pleasure. McGonical calls this feeling blissful productivity. It is this blissful productivity in student behavior that is the holy grail of the educator. In an attempt to elicit this in students, educators are always seeking a new pedagogy or technology that might engage and immerse their students. Computer games became one of these foci when Prensky (2003) coined the term 'digital native' and promoted games-based learning as a playful way to engage the new generation of students who have grown up with games and technology. Sometime after the entertainment computer game boom in the 1980s, in the mid-1990s educators were getting excited about the potential of *edutainment* (Hogle, 1996) or *educational games* as a way of mixing the youth engaging technology of the day with educational content. The push for edutainment was mostly unsuccessful, due to a lack of foresight in both educators and game designers who thought the simply addition of educational content with existing game mechanics would *just work*. Following this in the mid-2000s *edutainment* matured into purpose built *serious games* (Sawyer, 2007) and quickly found their place in the military, health and business domains. Today, the latest buzzword surrounding the use of games for motivation and engagement is *gamification*.

It has been suggested gamification can also be used in the classroom to invigorate the curriculum with competition, leaderboards and other awards providing students with recognition resulting in positive work attitudes (EDUCAUSE 2011). However, it could be argued that these mechanisms are nothing that hasn't been used in the classroom and other training environments for many years. Using leaderboards, having in-class competitions and the giving out of rewards have been implemented by teachers for decades. The curriculum may not have been structured as gamification, under the current definition, however elements of it have always existed. Indeed gamification is an example of an extrinsic reward system; the pedagogical effects having long been the subject of vigorous debate (Bruner 1977). The points and reward systems of gamification are little more than a modern application of the token economy (Kazdin & Bootzin 1972). Token economies are applied for a wide variety of reasons usually for behavior management of psychiatric patients, school children and others. In the system, tokens are given out for good behavior and can be exchanged for rewards when enough are accumulated.

Sheldon (2011) describes the gamification of his classroom as a meta-world in which students have avatars, with personalized fantasy names, compete in teams named guilds, complete quizzes and exams (known as defeating monsters), do reading assignments (quests) and accumulate experience points (XP). The XP are exchanged for grades at the end of the semester. He aligns all of the normal classroom activities with terminology and tasks in typical role-playing games (RPG). Sheldon's work however, provides little analysis of the outcomes from teaching in this way other than student course evaluation surveys.

There has been much literature published in recent times pertaining to the use of gamification in the classroom inciting engagement among students. However, there is very little quantitative evidence describing or supporting its use. Furthermore, in addition to adding another playful layer atop the existing curriculum, it is not known if gamification helps or hinders student learning and progression. The motivations behind this study are two-fold. First it presents a simple gamified curriculum structure in response to the author's colleagues asking, "What does it look like?" The objective being to take an existing university level course and apply a points system to each and every student activity from attending lectures to working on assignments and taking exams. Second, it provides a preliminary analysis of student attitudes towards a gamified curriculum and suggests a possible quantified model based around student attitudes.

This paper begins with an examination of some popular gamification mechanics. Next, the curriculum designed for use in the study is presented. This is succeeded with an analysis of the curriculum's first use in two university level courses with respect to student attitude and course outcomes. Finally, suggestions for how gamification can enhance the curriculum and directions for future work are given.

Gamification Mechanics

The following list, while not exhaustive, is a set of the most popular strategies employed by games that have migrated across into other domains.

Points

People play games to earn points. The winner of a game is determined by comparing the total points of all players. Points are the rewards accumulated during gameplay when a player achieves a particular goal. Points can be found in use in the banking system in which customers are aligned to reward programs that allow for the accumulation of points for each dollar spent on a credit card. Frequent Flyer schemes, offered by airlines, are also an example of a point system.

Levels

Many computer games contain levels. A level represents a discrete subdivision, story chapter, a set of challenges or set of resources in a game world. Players progress from lower levels to higher levels through the collection of points. When the number of points reaches a set threshold, the player goes on to the next level. As a player progresses through the levels, they become harder. A player's character may also become more powerful as they ascend the levels. Moving from one level to another is known as leveling up.

Leaderboards

Keeping a list of high scores in a game is reminiscent of the old arcade and digital pinball machines that display a list of player nicknames and their scores proudly on the main display while the game is not being played. This leaderboard acts as a challenge to others while encouraging top scorers to keep playing in order to maintain their status.

Badges

Badges are the visible recognition of completed challenges. They exude status and provide recognition for positive effort. In games badges are given out when a player successfully completes an activity or gathers sufficient resources. According to Antin & Churchill (2011), badges have five purposes in social psychology. First, they assist players with goal-setting by revealing all the activities and challenges available in a particular system. Second, they encapsulate information about a player's interests and expertise providing others with summative knowledge about reputation and status. Third, badges affirm a player's status within the system as well as advertising it to others without explicit bragging. Next, they provide instruction about the types of challenges and activities available to a player by embodying the social norms of a system and exemplifying highly valued behaviors. Finally, badges bind a group of users together around a set of shared experiences by providing a sense of positive group identification.

Quests

In games a quest is a small challenge a player attempts as part of the larger game, taking players on a journey through gameplay and story narrative. Role-playing games are well known for having numerous quests. For example, in Bethesda's Skyrim the player can select from hundreds of quests. While the ultimate goal of the game is to determine why after so many years the dragons have returned to wreak havoc on the citizens of a mythical land, the players can take themselves off the main narrative track to explore dungeons and hunt down buried treasure to accumulate extra points. The player does not have to complete all the quests in Skyrim to complete the game, however, the quests give the player extra points and experience they would not otherwise have. Of course not all games structure quests in this way. Some quests are compulsory and some are not.

Social Engagement Loops

Another mechanism used frequently in gamified experiences is viral marketing. This method derives from what is called a social engagement loop. In this loop, a person is constantly engaged and reengaged with a core product. It begins with a motivating emotion that leads to re-engagement followed by a social call to action then a reward. The objective of the reward is to emotionally motivate and hence complete the loop. For example, the structure of YouTube exhibits a social engagement loop. A person connects by creating and uploading their own videos thus emotionally connecting them with the site. The person is reengaged when others start to recommend their video to others. The social call to action occurs through the ability to post comments on others videos and the rewards are by way of video ratings and channel subscribers. This in turn motivates more video uploads and the loop continues.

This is a brief examination of just some of the mechanics used in gamification and of all the mechanics the most likely few to seem familiar to educators. At first consideration one might think the education systems is already designed in a gamified manner. However, more in-depth analysis reveals some key differences.

Is Education Already Gamified?

Given the game mechanics outlined in the previous section it is not difficult to see how gamification and the education system align. Students receive points for completing assessments, levels based how these points add up at the end of the semester and are given a variety of badges and placed on leaderboards according to their academic success. Quests are the many challenges, problem-solving activities and assessment faced and social engagement is a natural part of being in a class. However, Smith-Robbins (2011) argues that if education is already gamified it is certainly a weak example. Education systems may be structured, on the surface, as a gamified experience, however they differ greatly as students can misunderstand the game they are playing. Gamified experiences are much more engaging as they make fully transparent the goals, points, status and levels. A player knows where they stand at all times and what they need to do next. In the education system, assessment items are not all weighted equal. Early assessment items are given lower weights assuming they require less subject knowledge to complete. Often final exams are worth extraordinarily large weights. In addition, the time and knowledge required to complete assessment items do not necessarily align with the individual marks given. Furthermore, one assignment worth 15% might be marked out of 100 while another assignment worth 25% might be marked out of 50. Compared with the transparency of a gamified points and level system, academic grading is confusing and overly complicated.

Another way in which education differs from gamification is in collaboration and competition. As Smith-Robbins (2011) eloquently states:

> If the goal [of education] is intellectual growth, then classmates and faculty are teammates. If the goal is to beat the system and earn more money, then classmates are competition and faculty are obstacles to be overcome.

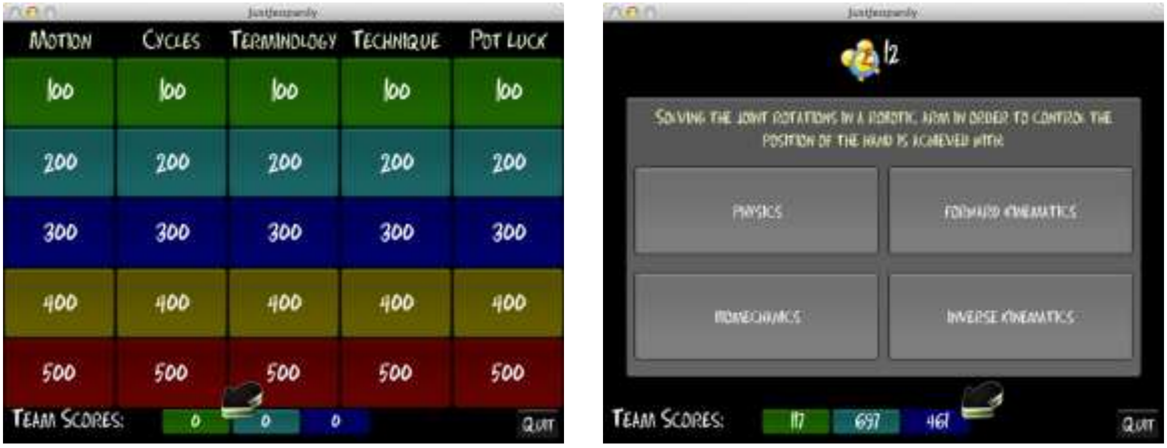
In many universities students are given final grades that must align with a bell curve. Numerous checks, balances and extra weights are often applied to ensure this is the case. This system places all classmates in the category of competition as their results are certain to impact on a student's position on the curve and it could mean the difference between failing or passing. In contrast however, a gamified experience places no such restrictions on players. It might be that player's scores form a bell curve, but player's are free to accrue points and level up irrespective of what other player's are doing. If gamification is to work in the classroom it should not add an extra layer of complexity over the top of existing grading systems. In addition, it should not cheapen the learning experience or trivialize the educational content. What follows is the outline of a gamified curriculum. The traditional assessment and marking system is dispensed with and all student activity allows for the accumulation of experience points (XP).

A Gamified Curriculum

For this study the curricula of two undergraduate subjects were restructured; Game Design and Logic (GAME11-140) and Animation (MMDE13-340), at Bond University, Australia. Grades and assessment weightings were replaced with XP, a weekly classroom team-based game of Jeopardy was added and a leaderboard integrated with the students' Blackboard logins. The assessment plan, breaking down every student activity into XP, was presented at the beginning of the semester. It included compulsory and non-compulsory items that attracted maximum possible totals of 525 and 300 XP respectively. Students were required to achieve at least 50% of the XP for each type in order to be considered for a passing grade. XP was attributed to each assessed item at a rate of 5 XP for every 2 hours of expected student effort.

Non-Compulsory Activities

Non-compulsory activities were only available for a week at a time. These included lecture and tutorial participation and theoretical and practical challenges. Students would pick and choose from the non-compulsory items throughout the semester. The XP attributed to the non-compulsory was assigned on a pass/fail basis in which a student completing the activity satisfactorily received the full XP. Non-satisfactory or no completion resulted in 0 XP. Each completed non-compulsory activity was worth 5 XP up to a maximum total of 300 XP. While it was possible for students to accumulate over this, they were informed it would always be rounded down to 300 as a maximum. Participation at lectures and tutorials also counted for XP. At the beginning of each lecture students were divided into small teams and a game of JustJeopardy, quiz software developed by the author, based on the television show Jeopardy, was played. A large game board, as shown in Figure 2, was projected onto the whiteboard and teams selected. The teams took turns picking and answering the questions for points. The questions contained in the game board were based on the content of the previous lecture. Every student received XP for playing and the winning team received a bonus 2 XP.



(a) (b)

Figure 2 JustJeopardy (a) The JustJeopardy game board showing categories along the top and coloured buttons for selecting a question. The numbers on the buttons indicate the number of points they are worth. The questions worth more points are believed to be more difficult, but not always. On selecting a button, the question appears as shown in (b). An answer is selected by clicking on the button with the chosen answer. The lecturer operates the game from a computer in the lecture room hooked up to a projector. As each team has a turn, the score appears across the bottom of the game board.

To achieve the XP for tutorial participation, students were required to turn up and complete the set activities for each session. This involved working on a step-by-step project with specialized software in the computer laboratory followed by a challenging applied task extending the project. The theoretical and practical questions were posted on Blackboard after the lecture and the deadline for the student's answers was before the lecture the next week. Theoretical questions required students to carry out research beyond content provided in the lecture and practical questions asked students to complete an applied exercise. The theoretical questions were made competitive in that they were posed to give more incentive to students completing them earlier. For example, after the lecture on the history of animation in MMDE13-340, students were asked to write a short biography on a technical pioneer of the animation industry who was not mentioned in the lecture. No two students were allowed to write about the same person. All student answers were posted into the same blog to ensure other students could see which pioneers had already been written about. Students posting first had the advantage of a larger pool of pioneers from which to select. The later a student left the exercise, the more they would have to research to find someone who had not been mentioned. Practical questions asked students to complete an activity using skills and knowledge obtained from the tutorials. For GAME11-140 it would be to program with specific algorithms explained in class or extend a given game program. For MMDE13-340 it included small 3D modeling or animation tasks.

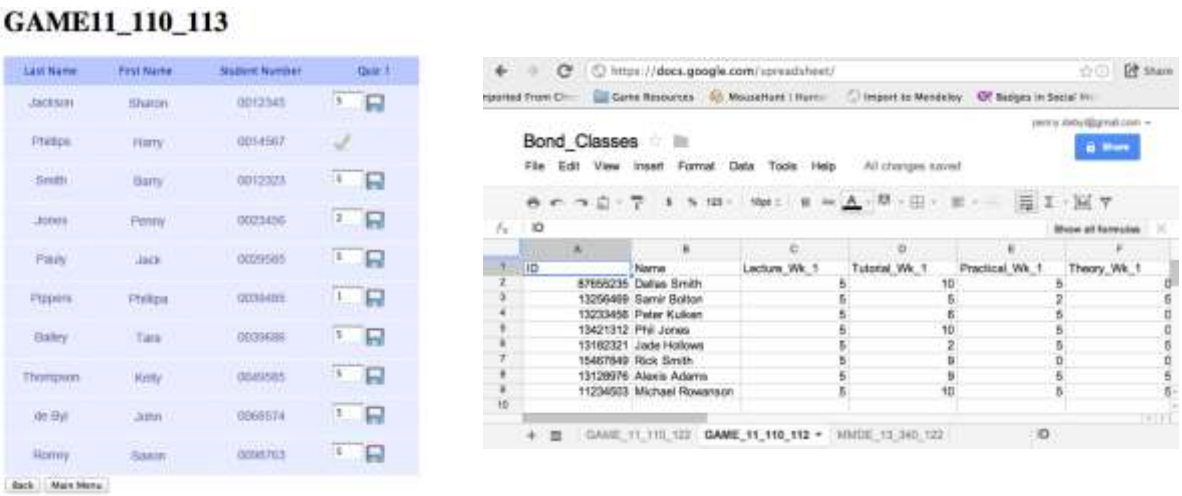
Just before the next lecture the questions were closed and students could no longer achieve these XP. From time to time, unbeknown to the students, some more challenging, non-compulsory questions included bonus XP. This would allow them to make up any previously missed XP due to missing a lecture, tutorial or question failure.

Compulsory Activities

The compulsory activities included assignments and exams the students had to attempt. For these, each had to be attempted and submitted for marking in order for the student to be considered for a passing grade. There were 3 assignments and 2 exams in each subject. The assignments were worth 25, 50 and 150 XP in turn. The mid semester exam was worth 100 XP and the final exam worth 200 XP. Each exam contained a theoretical and practical element. The theoretical part consisted of questions taken from the JustJeopardy game and the practical part involved students in a hands-on exercise to complete programming challenges or create 3D models and/or animations.

The Leaderboard

After each class, the lecturer and/or tutor would update a simple online database with the XP accumulated during the corresponding activity. The first iteration of the gamified curriculum used a teacher managed database and website for data entry as shown in Figure 3 (a). For the second iteration it was decided to introduce a freer and more intuitive format by way of a spreadsheet which the teacher did not have to self-manage. In this case, Google Docs was chosen as shown in Figure 3 (b). For the non-compulsory activities, updating the XP was a matter of selecting the item in the online form and clicking on the ticks next to the student's name. For compulsory items, the XP would be entered manually as it was possible for partial marks to be awarded.



(a) (b)

Figure 3 The web interfaces for the leaderboard database. (a) The original self managed interface and database, (b) The new version using Google Docs,

XP data going into the database would then be made instantly available on the student's leaderboard when they logged into Blackboard. The leaderboard, shown in Figure 4, is written in PHP and hosted on an external website. A short JavaScript program references it when the course homepage is loaded inside Blackboard. The student's Blackboard id is securely sent to the PHP program that extracts their XP from the database and draws the graph. The graph shows each student their total XP, the minimum, average and maximum for the class as well as the grade cutoffs. Students cannot see each other's totals.

Figure 4 The Leaderboard

Methodology

The study included two classes of undergraduate students enrolled GAME11-140 and MMDE13-340; 22 students in total. The classes were run with the exact same structure as outlined in the previous section. At the end of the semester all students were surveyed to establish the effect the course structure had on their engagement as well as address the gamification of education concerns of student patronization and over complication of learning and teaching. Many of the questions were inspired and adapted from the National Survey of Student Engagement (www.nsse.iub.edu). The survey consisted of 16 questions measured on a 5 point Likert scale: 1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, and 5 = strongly disagree. Two items (indicated with * in Table 1) were reverse-coded to anchor positive attitudes in the same direction across all questions.

Results and Analysis

Internal consistency was assessed using Cronbach's α (e.g. Cronbach, 1951) on all 16 items resulting in acceptable internal consistency ($\alpha = 0.74$). To explore the dimensional structure of the survey, the items were examined for multidimensional scaling structure using exploratory factor analysis. An important issue affecting the quality of factor analysis, according to MacCallum et al. (1999) is overdetermination or the ratio of factors to variables. In this case, the ratio is 3.2. This meets with their requirements. However, this is an exploratory study and these results should be treated with caution. Nevertheless, they reveal a potential multidimensionality worthy of further exploration in future research. Consistent with the exploratory framework, Principle Components Factor Analysis was used with minimum Eigenvalues (EV) for each factor set at 1.0; Varimax Method was used to force orthogonal rotation so that individual survey items were forced onto unique factors. The loadings for this factor model are presented in Table 1.

Casewise deletion was unnecessary with this sample because all participants completed all items. Five factors were produced in 11 iterations using this method. Using face-validity, the following labels were assigned: Playfulness (EV=4.4, h2=0.28), Comparative Pedagogy (EV=3.0, h2=0.19), Instrumentalist (EV=2.0, h2=0.12), Status (EV=1.5, h2=0.09) and Performance (EV=1.1, h2=0.07). Subsequent internal consistency tests support the multidimensional structure. To reduce this number of variables for future studies and to adequately represent the domain exploratory factor analysis was undertaken. Emerging from the data were five scales; Playfulness (a = 0.79, items = 3), Comparative Pedagogy (a = 0.77, items = 4), Instrumentalist (a = 0.85, items = 3), Status (a = 0.67, items = 3) and Performance (a = 0.54, items = 3).

Table 1 Factor loadings for the factor analysis of the identified scales

Item	Playfulness	Comparative Pedagogy	Instrumentalist	Status	Performance	Mean (n = 21) 1= strongly agree	SD
1. I prefer the XP structure for grades in this class to the way grades are calculated in my other classes.		0.66				1.7	0.85
2. I prefer begin able to see my exact grade status on the XP chart on a day by day basis as opposed to not knowing what it is until the end of the semester				0.50		1.4	1.07
3. Getting XP for weekly theory and practical challenges made me do more out of class work for this course than my other traditionally run courses.		0.78				2.0	0.80
4. The structure of the course encouraged me to research and learn about related content I might not have otherwise explored.		0.58				2.1	0.85
5. I found the XP structure for course grading condescening. *			0.91 *			3.5	1.29
6. I would not mind my XP status being visible to other students. *				0.83 *		3.2	1.30
7. I prefer my XP status to be visible only to me.				0.82		2.3	1.35
8. I checked my XP status for this course more than I check mark/grade status in my other courses.		0.82				1.5	0.68
9. I found the weekly Jeopardy game useful in revising course content.	0.82					1.6	0.97
10. Getting weekly XP for the Jeopardy game encouraged me to turn up to class.	0.86					1.4	0.68
11. I felt the course structure added unnecessary complexity to the course distracting me from my studies.			0.88			3.5	0.98
12. The weekly Jeopardy game in class encouraged me to participate with other students.					0.54	1.7	0.72
13. I only do extra weekly exercises and study if I know it contributes directly to my grade.					0.59	2.2	0.93
14. I am only interested in passing the course. Any higher grade would be a bonus.			0.81			3.8	1.12
15. I want to get the highest grade possible.					0.75	2.0	1.07
16. The weekly Jeopardy game in class encouraged me to participate more in class than I usually would.	0.75					12.0	0.97

* reverse-coded

Discussion

An underlying problem with predicting whether a new pedagogical approach will be successful is largely due to an understanding of student attitudes, reaction and behaviour. Through an attempt to understand and in turn modify student behaviour, pedagogy can reach students on a whole new level. Gamification works because it addresses fundamental human desires such as reward, achievement, status and altruism. While these too are the needs of students there are also other elements within the student psyche that contribute to the level at which they are engaged and immersed in a curriculum. The analysis in this study has revealed five dimensions contributing to student responsiveness to a gamified curriculum; playfulness, comparative pedagogy, instrumentalist, status and performance.

A description of these five dimensions as it relates to the study follows:

- Dimension 1: Playfulness. These questions related to student attitudes toward the Jeopardy game used in classroom for content revision, attendance and class participation. The game brought the fun factor and friendly competition into the classroom. This factor accounted for most of the variance (28%). The question with the highest loading related to Jeopardy encouraging lecture attendance and the second using Jeopardy for revision. These questions appear to reflect the students' acceptance and motivation toward using games for learning and teaching.
- Dimension 2: Comparative Pedagogy. This factor suggests student interest and acceptance of other teaching methodologies. It accounted for 19% of the total variance. The relationship between curricula structure

appears to be characterised by the XP grading structure, how it motivated students to complete their homework and the checking of their total XP. The question loading highest on factor was "I checked my XP status for this course more than I check mark/grade status in my other courses."

- Dimension 3: Instrumentalist. This factor accounted for 12% of the variance. Loading highest on this factor was "I found the XP Structure for the course condescending." Followed by "I found the course structure added unnecessary complexity to the course distracting me from my studies." The third loading was "I am only interested in passing". All of these questions suggest the XP structure as instrumental in course progress.
- Dimension 4: Status. These questions relate to student grades and the visibility thereof. This factor accounted for 9% of the total variance. The highest loaded question on this factor was "I would not mind my XP status being visible to other students." followed by "I prefer my XP status to be visible only to me. " and "I prefer begin able to see my exact grade status on the XP chart on a day by day basis" respectively. This factor suggests student interest not only in their grade and standing in the class but also in having timely information about this status.
- Dimension 5: Performance. This factor suggests student attitudes to their overall performance in the class including class participation and completing homework. There are three loadings on this factor, the highest being "I want to get the highest grade possible." The second highest was "I only do extra weekly exercises and study if I know it contributes directly to my grade." followed by "The weekly Jeopardy game in class encouraged me to participate with other students."

It not unexpected that the major dimension revealed in this gamified domain is playfulness as this is the fundamental underlying principle upon which gamification is found and is very integral in learning environments, first eluded to by Plato (as cited by Pappas 2003) and reiterated by Prensky (2003). Play is not only for the digital natives, but is the essential mechanism through which human understanding develops. Play has been described as the motivation of choosing some rules in order to see what happens when you follow them and the freedom of choice behind them (Araya 2010). In the education system the rules are often difficult to ignore and not dictated by students. In this study however, the curriculum was designed to give students some freedom of choice on the activities that they chose to complete. The Jeopardy game was introduced to add an extra fun factor into the classroom. In the survey the students strongly agreed that the Jeopardy game encouraged them to come to class and helped them with revision. Although it, in itself, is not gamification, it did contribute to the students' XP each week. During one class, a team of students was so thrilled with their win that they stood up, took a photo of the projection of the game and score and posted it to Facebook.

As a dimension in a potential multidimensional model of gamified curriculum, at the two extremes of the Playfulness scale would be students who are very playful and those who are not. If gamification is assumed to be more effective on playful students then it might disengage those who are not. Furthermore, in considering what this dimension might mean learning styles should be examined. Playful learning is described across a variety of learning styles with different strategies for implementing play in each (Rice 2009). This would suggest all students in one way or another are playful. As the very aim of gamification is to engage those who wouldn't otherwise play games, it could be the nature of gamification itself teasing out the playfulness even in those who wouldn't otherwise participate in it. Despite the seemingly extrinsic nature of gamification, play itself is considered an experience with intrinsic motives (Henricks 1999). Hence, the nature of revealing Playfulness as a dimension of gamification suggests this reward system may provide students with acceptable mechanics keyed at deep and independent motivated learning.

If Prensky's (2003) digital native premise is generalized it could be said that educational materials deemed acceptable in the past now fail to engage students who are more attuned to high quality entertainment software, mobile devices and interactive multimedia. The comparative pedagogy factor may demonstrate that students are open to other pedagogical approaches. Although, there has been a large amount of literature criticizing typical lectures they remain the cornerstone of teaching practices at most educational institutions. The long history of technology use in education shows an inclination to use it in the same traditional manner as old technologies even with new media. This methodology neither produces change nor improves education. Gamification of the curriculum does not have the same barriers to implementation found with new technologies, as it is essentially the picking up and dusting off of the token economy. It can be applied without technology. In the questions relating to comparative pedagogy, students agreed with the premise that the gamified structure encouraged them to more out of class work. They also, strongly agreed to being more engaged in checking on the feedback for the activities they had been doing to achieve more XP. This could be due to the fact that every item of student participation in the class achieved XP in contrast to other courses and therefore they had daily and weekly opportunities to gather more XP. This also illustrates the social engagement loop at play with students challenged to submit work, receiving feedback and XP and being motivated to submit more work.

Comparative Pedagogy as a dimension could better help understand the usefulness of a gamified curriculum providing attitudes of students on learning and teaching structure on a scale from those students who thrive in a traditional classroom environment to those who prefer experimental and innovative pedagogy. This then raises the question that while a gamified curriculum may be novel now and effective for students who like experimental learning and teaching environments, what will occur when gamification becomes ‘old hat’? Strategies for course completion are also part of the curriculum that encourages student progression. Educators can motivate students by clearly communicating success criteria and depicting success as a realistic objective (Strong et al. 1995). The third factor in this study, Instrumentalist, may suggest student attitudes toward having a clear progression plan are significant. Gamification provides a transparent plan for students to follow breaking each activity down into equally weighted XP. In the curriculum presented herein, each XP equated to two hours of student effort. The students knew if they could demonstrate this effort they would receive points. For the questions constituting this factor, student responses imply the gamified meta-system did not add any unnecessary complexity to the curriculum, nor did they find it condescending. Although the results do not support it, gamification of the curriculum in this way, provides students with a clear step-by-step progression through the course from start to finish.

As a dimension, Instrumentalist would scale students from those who require extreme structure to those that can cope with flexibility and change. According to Skinner & Belmont (1993) teachers can deliver structure through clear communication of expectations, predictability and offering instrumental help and support. They also believe that structure is independent of allowing students autonomy and that high curriculum structure does not mean students do not have freedom of choice in their learning experiences. Autonomy in learning environments is considered to contribute to intrinsic motivation. As with the Playfulness dimension, a Instrumentalist dimension would provide further support to a debate against gamification being purely external. The accumulation and presentation of XP, as it is for the Instrumentalist factor, supports the fourth factor; Status. With the personalized leaderboard being generated whenever the student logs into Blackboard, they could clearly see their ranking in the class. Although other individual student XP was not displayed they could tell if they were the highest or lowest in the class. During one class, two students were comparing each other’s XP with one complaining the other had knocked them out of the top spot. The leaderboard also displayed, from the very first week of class, the final grade cutoffs. As students accumulated XP they could see their progress toward the grades. In this study students strongly agreed that they preferred seeing their current grade rather than having to wait until the end of semester. On the questions of whether students would dislike having their XP status currently displayed, the answers were neutral.

The final and most weak factor, performance, is also related to XP. Sadler (1989) argued that in order for students to succeed, they must know 1) what good performance is; 2) how their current performance rates with respect to good performance; and, 3) how to turn their current performance into good performance. Gamified systems make this information available giving players options of ways to gain more points and to reach higher levels. In an education system however, knowing how to better ones self is not that easy. Once an assignment has been completed, if the student receives a poor mark or even fails they do not often get the opportunity to retry for the marks. Indeed in the gamified curriculum presented herein, each weekly opportunity to gain experience points lapsed at the beginning of a new week and compulsory assessment items could only be attempted once. The question then beckons if students are being assessed on their timely abilities or their overall achievement of learning objectives. As Wormeli (2006) states:

> Grading policies such as refusing to accept late work, giving grades of zero, and refusing to allow students to redo their work may be intended as punishment for poor performance, but such policies will not really teach students to be accountable, and they provide very little useful information about students' mastery of the material.

In summary, all revealed factors suggest a strong linkage to the XP mechanic implemented in this curriculum structure. It provides a playful dynamic to the classroom enticing friendly competition and rivalry, it exposes the marking system, offers students goals for which to aim and provides rapid feedback on progression and class ranking. This component of gamification may be nothing more than a modern version of the token economy and with it will bring forth the many opponents of such extrinsic reward systems. On the other hand, it could address a deeper issue embedded into traditional education systems, laying bare the grading system, helping students make sense of it and providing a meaningful comparison of student cohorts from year to year.

Conclusions and Further Work

As the gamification craze inevitably finds its way into the classroom, the way in which it will impact on learning and teaching is also a concern. In an exploratory paper on Gamification in Education some apprehensions about reducing education to a points and levels system, albeit ironically, are raised (EDUCAUSE 2011). The idea of reorganizing classroom content as a game may trivialize the learning content. While students are left feeling patronized, unsatisfied by winning in these situations and that the course structure is too complex. The study herein goes some way to alleviating the before mentioned fears with respect to its implementation in the classroom. When used as a meta-structure atop existing curriculum it has the potential to engage and motivate students adding elements of play and transparency. This ensures the educational content is not compromised and students aimed at leveling-up do progress toward mastery of the key learning objectives.

The compulsion to include games and game related mechanism in education is great among educators who want to engage and motivate today's students. However, without a thorough understanding of what a gamified curriculum looks like, how it can best be applied and why it might engross students, it cannot be effective. To this end, the research herein, presents a gamified course curriculum structure and evaluation within two university level subjects. The objective being to gage student enjoyment and engagement with a heavily gamified curriculum as well as understanding the factors that may make the practice useful suggesting a multidimensional model of student attitudes that could assist in future gamified practices in education.
One of the assumptions of data reduction as performed on this study is that a large data set is available. However, herein, this is not the case. The data analysis presented is amazingly robust given the small sample size. This justifies further exploration through the data reduction of larger studies. Through additional study a multidimensional model of gamification in education will be proposed. As the research moves forward opportunities to extend the game mechanics within the curriculum will be explored. These will include giving student's earlier opportunities to level-up, giving them more choice on how XP can be achieved and improving the social feedback loop through peer observations and assessment.

Gamification affords the transparency and rapid feedback required to keep students motivated. It is the new token economy worthy of further investigation.

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Using reward contingencies in online activities to facilitate engagement in a statistics class

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This paper presents the use of an online learning management system to establish a system of reward contingencies to facilitate student engagement in a statistics class. Based on a behaviourist framework, the proposed system uses immediate rewards for weekly studying. It also incorporates punishment to discourage breaking patterns of consistent weekly study. Student evaluations at the end of the semester showed students' acknowledgement that the system led them to study more frequently and consistently than they otherwise would have, and that the feedback made the study more effective. However, some students reported feeling that the punishment system was unfair. An alternative system is suggested in response to this criticism.

Keywords: Statistics teaching, Rewards, Elaborated feedback, Self-control.

Introduction

The current Australian Higher Education landscape, with the increasing number of incoming students resulting in large lecture sizes, poses a number of problems for the implementation of effective student engagement strategies into the future. Student engagement, defined as "the time, energy and resources that students devote to activities designed to enhance learning at university" (Krause, 2005, p. 3), has been shown to be correlated with positive outcomes, not only academically, but also in terms of student satisfaction (Kuh, 2007). It is well understood that a student's baseline level of academic preparation upon entering university is also positively correlated with engagement and success. However, it is important to note that this baseline academic preparation does not only consist of the knowledge of basic subjects, but that it also includes the "study habits and behavioral patterns" (Kuh, 2007, p. 4) that will be associated with success at university.

Krause (2005) reports that in 2004, first year university students in an Australian sample reported devoting a mere 11 hours per week to study outside the classroom. Given the same students reported having an average of 16 contact hours per week, the reported amount of study time is in stark contrast to the idea that students should spend around two hours of study for every hour of class time (Krause, 2005). The reduced amount of time devoted to study may in part be due to a lack of training or understanding of the kinds of activities that constitute study for a particular subject. While it is common practice to give students lists of required readings and other exercises, the relatively small number of hours devoted to independent study is an indication that students are not engaging with the material in the expected manner.

Having students who do not devote the expected amount of consistent weekly effort (as measured by study time) to their university units is particularly problematic in the case of units for which the initial level of motivation is low. This is the case of units such a statistics for behavioural sciences (e.g., Bude et al., 2007; Wiberg, 2009), where motivation has been found to be an important predictor of achievement (e.g., Tremblay, Gardner, & Heipel, 2000). It is important to note that the effect of motivation on achievement in statistics courses for non-statisticians has been found to be mediated by behavioural factors such as persistence and emotional factors such as finding statistics enjoyable or interesting (Bude, et al., 2007). Thus, motivational operations that may increase the likelihood of students engaging in study behaviours may lead to increase engagement and, in turn, achievement. The research on the ways in which statistics can be rendered more interesting and enjoyable has been extensive (for a review, see Zieffler, et al., 2008). However, there do not seem to be as many documented efforts towards establishing persistent study patterns that may facilitate students' engagement with the subject matter. It is possible that the assumption that students will be or should be motivated enough, at an intrinsic level, to engage in independent study is incorrect. From a behaviourist perspective, it is possible to train students to engage in regular and consistent study practices by establishing reward contingencies that support precisely those behaviours (Mazur, 2009).

In a behavioural framework, every behavior is believed to be the result of a choice. That is, every time we are about to do something, we can be said to be facing a choice, at the very least, between performing that behaviour and not performing it. Each of these courses of action is associated with particular consequences, and each of those consequences can be characterized in terms of features that make them more or less preferred, such as the consequence's magnitude, its probability, immediacy, etc. The combination of these features determines the subjective value of the rewards and, in doing so, affects our preferences and, in turn, our choices. The basic assumption of these models of choice is that the decision maker will always maximize value (e.g. Rachlin, 1995). That is, the agent, at every point, actively chooses the most preferred course of action given the circumstances. Behaviours that lead to more preferred consequences (or rewards), will be chosen more often than behaviours that lead to less preferred consequences (or rewards).

This characterisation of the environment has been useful in the study of self-control dilemmas. In this framework, a self-control dilemma can be characterised by the choice between a smaller immediate reward and a large delayed reward. This choice is said to pose a dilemma when the preference for an immediate small reward is at odds with the long term pattern of behaviour required to obtain the delayed larger reward (Rachlin, 2000). For example, in the context of studying in a first year statistics for behavioural sciences unit, students can be considered to be facing repeated choices between studying and not studying. For students who do not typically engage in studying, one can assume that studying is less preferred to not studying (which is why they do not engage in frequent studying on the first place). However, the mere fact that they have enrolled in the unit means that, at the very least, the student must prefer passing the unit to failing it. These two sets of preferences are at odds with each other (hence, the dilemma). If at every point when the choice is available, the student follows their preference for not studying, they are unlikely to attain the long term reward of success in the unit. Like the dieter who must avoid the chocolate which is preferred right now in order to be thin in the long run, the student must avoid the pleasantries of doing things other than study if they want to be successful in the unit in the long run. If this is a correct characterisation of students' choices, the introduction of immediate rewards for smaller routine study-related tasks should facilitate students' engagement in those behaviours (making them more immediately attractive than before). Current online learning management systems (OLMS) provide a unique opportunity to introduce some such measures. This is because they facilitate the delivery of working exercises on a frequent basis even in classes involving large cohorts of students. Further, OLMS also facilitate the provision of fairly detailed feedback for performance, which has also been shown to be correlated with engagement (Kuh, 2007) and which is likely to increase preference.

In the present paper, I present an initial attempt at establishing a set of contingencies aimed to increase the likelihood and consistency with which students in a statistics unit engaged in study behaviors (keeping up with readings and lecture notes). This was achieved via the delivery of weekly online exercises (OEs) consisting of multiple choice questions on the topics covered each week in class. In particular, the OEs were designed so that students received immediate, detailed feedback on their responses. Further, the program included contingencies that reinforced regular weekly work. The program presented here was developed in an attempt to (a) increase the frequency of study behavior and (b) provide students with detailed feedback on their learning.

A program of incentives for studying

The first year statistics unit for students enrolled in psychology degrees at the Australian Catholic University is an introductory statistics unit covering basic concepts of measurement, data display, and descriptive as well as some inferential statistics (e.g. t-tests and correlation). The unit in its present form was first taught in Semester 2, 2011 and had an enrolment of 232 students. It consists of two hours of lecture time per week plus one hour of tutorial time. Attendance at lectures is required for all students, but is not monitored. The tutorial sessions take place in groups of 25 to 27 students and involve activities in which student participation is required. Students in this unit had a final exam at the end of the semester. In addition, they submitted a written assignment.

To encourage students to study consistently during the semester, ten weekly OEs, consisting of 20 multiple choice questions, were introduced in week 3. The questions required students to understand statistical concepts and the relationships between them (e.g. the inverse relationship between standard error and sample size), and to apply them to simple problems. Immediately after the student submitted their answer to a question, they were told whether their answer was correct or incorrect and provided with detailed feedback on the reasons why that was the case. This form of feedback (i.e., elaborated feedback, see Dempsey, Driscoll, & Swindell, 1993), has been shown to facilitate deeper conceptual understanding (Bangert-Drowns, Kulick, Kulick, & Morgan, 1991).

Online exercises opened every week at the same time and closed exactly seven days later. Students were allowed to complete the OE any time during that seven day period from any computer with access to the university's OLMS. Students were encouraged to make use of the book and the lecture notes while completing these exercises, as it was emphasized that the purpose of the exercises was to encourage study. Each OE was worth up to two points towards the final mark in the unit. Strict rules were in place for the establishment of a regular and consistent study pattern. First, students had to complete the exercise during the week that it was available. If they did not complete it during that seven-day period, they could no longer have access to it (other than for study purposes at the end of the semester). Second, in order to ensure that students kept up with the material, a system of rewards was introduced such that in order for students to have access to a weekly exercise they had to have completed the previous one in time (i.e. if a student missed one exercise, they did not have access to any of the subsequent weekly exercises). Third, to avoid chance performance, students had to answer at least six questions correctly to get any points. Students were told the rules of the OE system at the beginning of the semester. These rules were explained in detail during the first two lectures and the first two tutorial sessions, before exercises were introduced. In addition to this, on Tuesday, Thursday and Saturday of every week, students who had not yet completed that week's exercise were sent an email reminder that the exercise would close on Sunday.

Outcomes

The average student performance across the ten weekly OEs was M=60.86 (SD=10.35). Further, and not surprisingly, average performance in the OEs was significantly correlated with the final exam mark, r=.35, n=205, p<.001. Figure 1 shows information relative to the percentages of students missing completion of the exercises every week. Note that every week a very small proportion of students missed the exercise relative to the number of students who could have completed it (open circles). This, of course, results in an increase in the cumulative number of students who had missed an exercise (closed circles). When looking at the open circles, note that the first point is fairly high (almost 10%) but the line flattens and remains low at around 4% until exercise number nine, at which point it increases (to 8.9%). Further, the highest point in that line is the point for the last exercise, for which 16.9% of students who were eligible to complete it, missed it. This result supports the usefulness of the contingencies that were introduced regarding the sequencing of exercises, as at that point the consequences of missing an exercise are not as severe as at the beginning.

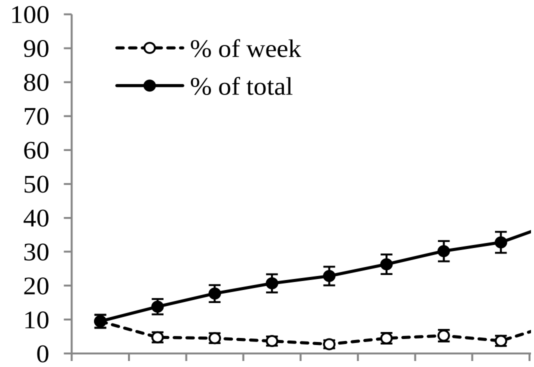

Figure 1: Percentage of students who missed an online for every week it was available (± one SE). Open circles represent the percentage of students who missed the exercise each week; closed circles represent the cumulative percentage of students having missed exercises each week.

During the unit evaluations (which consist of a series of standard Likert scale items), students were encouraged to provide additional written feedback regarding the OEs. Of the 50 students who made any references to the OEs, 31 had positive comments and 19, negative comments. All negative comments referred to the fact that the contingency was believed to be unfair. Positive comments included three main types of content, namely (a) those that stated finding the exercises useful because they "forced" them to study, (b) those that pointed out that the feedback had been useful and (c) those that made explicit reference to both criteria.

Conclusions

The present paper presents an initial attempt to establish a system of reward contingencies that encourages students to partake in regular, consistent study practices. It is important to note that the purpose of this program was not to assess performance per se, but to provide students with the opportunity to (a) track their own progress, (b) motivate study and engagement with the relevant material on a weekly basis, and (c) provide opportunities for the students to understand how to focus their study. Given that this unit, in its present form, was running for the first time when this intervention took place, there are no baseline data to compare it to. However, the students' reflections show that students are aware of the fact that the contingencies, "forced them" to engage in weekly study. Specifically, they note that these activities led them not only to read the book and their notes, but to do this in the context of the completion of a specific task. Second, in noting that the exercises "forced them" to study, students are also acknowledging that this is not the behaviour they would have necessarily chosen to engage in had these contingencies not been in place. Finally, students' comments also show that the provision of detailed feedback, allowed students to better direct their learning and, in their own words, understand what was wrong about an incorrect answer.

On the other hand, the implemented program also led to complaints and displeasure regarding the punishment associated with the missing of an exercise. Students who, after having missed one exercise, missed all the subsequent ones, believed this to be an unfair system. In response to this criticism, the strict reward contingencies will be removed next time the unit is taught. It will be interesting to examine the effect of this change on study behaviour and exercise completion rates, as well as on the final performance of students in the unit. Alternative systems of reward contingencies for the purpose of encouraging engagement in the unit are also possible. In particular, it is possible to develop a system in which students get rewards for every completed exercise but also get a bonus cumulative reward for the number of weekly exercises successfully completed in sequence (i.e., without omissions). This alternative system would not only provide an immediate reward for the performance of each individual weekly exercise, but it would also provide rewards for the consistent long-term pattern of study behaviour (rather than providing punishment for breaking the pattern).

The adoption of a behaviourist framework could provide part of the answer for the issue of student engagement, understood as "the time, energy and resources that students devote to activities designed to enhance learning at university" (Krause, 2005, p. 3). The present paper does not attempt to claim that this type of interventions would have an effect on intrinsic motivation, as this was not the focus of the intervention. Rather, the claim is that if the interventions increase engagement in effective study practices, they will have effects in learning outcomes. The OLMS currently used by all universities in Australia and abroad provide a unique opportunity to implement this kind of contingency programs in the future. This is because they facilitate the management and delivery of such programs in classes with a large number of enrolled students. In doing so, they may provide with an opportunity to facilitate student engagement. Whether these would in turn lead to changes in attitudes towards statistics and feelings of self-efficacy over the long-term or not, remains an empirical question.

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Building teacher educator TPACK: Developing leaders as a catalyst for change in ICT Education

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Teacher educators with TPACK are critical to the development of the ICT competence of the next generation of teachers. To effect real change in ICT education leaders must be developed amongst teacher educators as well as teachers. An Australian university implemented a supported program of professional development for teacher educators as they implemented innovative ICT-rich practice. This paper reports on data collected before, during and after the process to inform planning. Areas identified where teacher educator TPACK was lacking were used to inform the professional development process. For a variety of ICT competences teacher educators were generally convinced of the usefulness but not so convinced of their own confidence. Enablers of learning identified by teacher educators, who had engaged in innovative practice, showed that they were building TPACK that would equip them to be leaders and thus catalysts for change in ICT education.

Keywords: TPACK; teacher educator; leader; competence; ICT education; change catalyst; TTF

Introduction

The current focus on ICT in education makes it a necessity that all teachers develop their competence in this area. This is equally applicable for teachers at all levels of education, thus teacher educators need to develop these competences to model best practice for future teachers. Part of the challenge in ICT education is having catalysts to inspire the change that is necessary. Important catalysts for such change are technology leaders but transformation of ICT education only occurs these leaders are involved with pedagogy and learning (Tan, 2010). This paper reports on the building of teacher educator Technological Pedagogical Content Knowledge (TPACK) (Mishra & Koehler, 2006b) at an Australian regional university in an attempt to develop leaders who can be catalysts for change within the delivery of teacher education. In a climate of change in education it is critical to identify competences that can be used to inform the process of developing leaders. Through awareness raising and targeted professional development, teacher educators at the institution were supported in implementing innovative ICT-rich teaching. This helped to build their TPACK and thus, as leaders, contribute to changes in the way that ICT education is addressed. Data is reported that was collected to inform the process and effect change.

A climate of change

Education is undeniably immersed in a climate of change. In the last two decades education has moved from a focus on the 3Rs, reading, writing and arithmetic, to include Information and Communication Technology (ICT). ICT in education, or ICTE (E for Education), now refers to what was previously called Information Technologies (IT) in education. The term IT was believed to place too much emphasis on technical skills and not enough on the cognitive skills needed to be ICT literate (ICT Literacy Panel, 2007). While communication with peers and accessing information are frequent uses of ICT, there has been less frequent use of ICT that involves creating, analysing or transforming information (MCYEETA, 2007). Changed expectations are evident in the ICT Literacy definition: "using digital technology, communications tools, and/or networks to access, manage, integrate, evaluate, and create information in order to function in a knowledge society" (ICT Literacy Panel, 2007, p. 2).

The teacher is one of the driving forces contributing to change, a process influenced by both the school organisation and the local environment (ten Brummelhuis & Kuiper, 2008). Desire to integrate ICT into their teaching is not sufficient to effect this change, teachers also need confidence and competence (Bingimalas, 2009).The impact of those driving forces can be viewed through Finger and Russell's (2005) two cyclical modes of influence on ICT adoption in schools: societal expectations and government policy.

Societal expectations are that Australian students will leave school with the necessary skills and knowledges that will allow them to take their place in the community as confident and productive users of ICT who understand the impact of ICT on society (MCYEETA, 2007). Such expectations are not restricted to Australia. For example, Katz (2005) explained that in the United States of America (USA) society expects that college leavers have skills in researching and communicating via technology to enable them to function in society. Societal expectations have been a catalyst for governments to review, develop and implement policies pertaining to ICT in education.

Public policy has developed to the extent that the implementation of ICT in education has become a key component of election campaigns. Election promises have included putting computers on every student's desk from Year 9-12 and grants for schools (public and independent) to upgrade their ICT infrastructure and/or hardware. The *Digital Education Revolution* (Department of Education, 2008), implemented following a successful election campaign, committed to: new computer equipment in secondary schools; the rollout of *National Broadband Network;* and increased access to online content. After the Australian Government recognised the need to train teachers to teach using these new technologies, a follow-up initiative, the *Teaching Teachers for the Future* (TTF) project (http://www.ttf.edu.au/), was implemented to enable pre-service teachers to increase their level of proficiency in ICTE. Training pre-service teachers was considered to be more effective than training existing teachers, many of whom are either resistant to change (Watson, 2006) or within ten years of retiring (Owen, Kos, & McKenzie, 2008). Teacher educators with sufficient TPACK were essential to the TTF project.

To effectively build teacher educator TPACK, and to measure the achieved levels of knowledges, some guidance is required as to what competences are necessary. There is limited literature available specifically on teacher educator TPACK but as teacher educators are teachers the literature on teacher competence in ICT education is considered relevant. In the quest to develop leaders amongst the teacher educators it is also necessary to investigate literature on leader competence in ICT education.

Teacher competence in ICT education

Teacher competence in ICT education has been defined as "a collection of knowledge, skills, understandings and attitudes that are inextricably bound up with context and pedagogy" (Webb & Downes, 2003, p. 2), just being able to perform basic computer functions (skills) is no longer sufficient as ICT competence for teachers. Since then ICT knowledges have been clarified by Wen and Shih (2008) as encompassing explaining, organising, analysing, assessing and synthesising. While ICT skills are relatively easy to measure, the testing of cognitively-related ICT knowledges is more difficult and makes the articulation of teacher competence in ICT education more challenging. To date there has been no internationally recognised test of ICT knowledges that measures the ICT competent individual (Perez & Murray, 2010)**.** However four frameworks for assessing teacher competence in ICT education, which have been developed and used, are now presented.

First, the *ICT skills test*, developed by the Department for Education (United Kingdom), tested pre-service teacher ICT competencies. This was a mandatory component of teacher qualification but has since been abolished "as new teachers have greater abilities in ICT than they had 10 years ago" (Department for Education, 2012)**.** Such skills-based tests only measure ICT skills (Lim, Chai, & Churchill, 2010) and not ICT literacy, that is, the ability for teachers to use ICT actively, collaboratively and constructively.

Second, the *ICT Literacy Assessment*, launched in the USA in 2005 by the Educational Testing Service (ETS), measured ICT proficiency, cognitive proficiency and technical proficiency (ICT Literacy Panel, 2007). This assessment was designed to support initiatives to improve ICT literacy on college campuses and involves simulations of authentic technology environments in which critical-thinking skills must be used to perform tasks (ETS, 2004). The *ICT Literacy Assessment* is now called the *iSkills* assessment.

Third, an instrument to assess teacher *Technological Pedagogical Content Knowledges* (TPACK), has been developed by Mishra and Koehler (2006a). The TPACK framework (Figure 1), has been used by many institutions and projects, including the TTF project, as a self-audit survey of teacher, teacher educator and pre-service teacher TPACK (Schmidt et al., 2009). The survey, and its many adaptations, aim to measure teacher knowledge of content, knowledge of pedagogy and knowledge of technology and the various intersections of these knowledges.

Fourth, the *ICT Elaborations* (AITSL, 2011b) were designed as a framework to assist pre-service teachers to provide evidence of their ICT-based practice as aligned with the Australian *National Professional Standards for Teachers* (AITSL, 2011a) when applying for accreditation. The development of this framework was based on the TPACK framework. Thus far these elaborations have only been developed for the graduate teacher level and not for the proficient, highly accomplished or lead levels.

Comparing these four frameworks, it has become clear that since the *ICT skills test* was developed more than a decade ago the description of teacher competence in ICT education has placed a much stronger focus on cognitively-related aspects of using ICT. While the above frameworks describe certain competences necessary for all teachers there are further competences teachers need to be leaders in ICT education. The frameworks described above did not articulate different levels of competence. Following is a consideration of frameworks that describe levels of competence in an attempt to identify what is important in leader competence in ICT education.

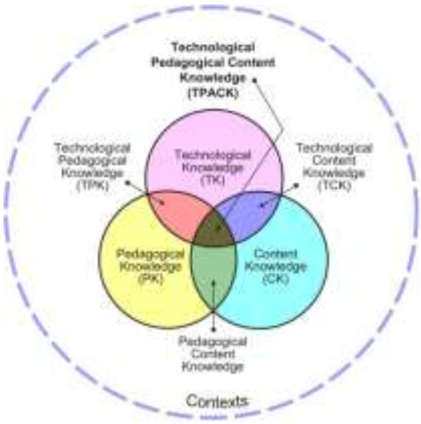

Figure 1: TPACK framework and its knowledge components (Mishra & Koehler, 2006a)

Leader competence in ICT education

What makes a leader competent in ICT education? There has been little research in this area and to date there has been no definition of leader competence in ICT education published although one study in Australian schools in 2002 investigated school principals as ICT leaders (Tan, 2010). However, some researchers and organisations have worked towards describing underpinning principles for a framework to identify an ICT competent leader. These are considered below to assist in identifying key competences necessary to be a leader in ICT education.

In 2002 the *Raising the Standards* project published a proposal for the development of an ICT competency framework for teachers, as ICT had the unrealised “potential to transform how, what, where and why students learn what they do” (DETYA, 2002, p. 3). This was the first framework to include leader as a stage in the development of ICT competence. The Dimensions of ICT use (Figure 2) show four stages of ICT development; *Minimum*; *Developmental*; *Innovator* and *Leader*. Four aspects of the proposal are of interest to defining leader competence. First, the clarification of the difference between the Innovator and the Leader stages of ICT development. For Innovator, the dimension of ICT use indicates an impact on how students learn and what they learn, while for Leader the dimension indicates impact on the organisation and the structure of schooling itself. Second, the target groups for the Leader stage include teacher educators as well as school leaders and educational leaders. This is one of the few times that teacher educators have been explicitly included in competence documents and that teacher educators are therefore expected to be leaders. Third, the descriptions of two of the key groups, school leaders and teacher educators, makes it clear that teacher educators have a further responsibility to inform their own practice and to provide effective role modeling for the pre-service teachers. Fourth, practicing teachers who are highly accomplished users of ICT are distinguished from school leaders in the descriptions of the key groups. The expectation is that a school leader fosters appropriate role modeling and develops a vision to support staff, policies and structures to ensure that ICT education is realised.

Dimensions of ICT Use	Stages of ICT Development	Target Groups
ICT as a tool for use across the curriculum or in separate subjects where the emphasis is on the development of ICT-related skills, knowledge, processes and attitudes.	Minimum	Underpins all teaching practice in the same way as other literature
ICT as a tool for learning to enhance students' learning outcomes with the existing curriculum and existing learning processes	Developmental	For beginning teachers and practicing teachers beginning to use ICTs
ICT as an integral component of broader curricular reforms that change not only how students learn but what they learn	Innovator	For practicing teachers who are accomplished/highly accomplished users of ICT
ICT as an integral component of the reforms that alter the organisation and structure of schooling itself	Leader	For school and educational leaders and for teacher educators

Figure 2: Dimensions of ICT Use (DETYA, 2002, p. 21)

A *Lead* level of competence was also distinguished from a *Highly Accomplished* level in the *National Professional Standards for Teachers* (AITSL, 2011a), in particular for ICT competence in Focus area 2.6 *Information and Communication Technology* (ICT). The highly accomplished level of competence expects teachers to “model high-level teaching knowledge and skills and work with colleagues to use current ICT to improve their teaching practice and make content relevant and meaningful” (p. 11), whereas the lead level of competence expects teachers to “lead and support colleagues within the school to select and use ICT with effective teaching strategies to expand learning opportunities and content knowledge for all students” (p. 11). This is similar to the expectation in the *Raising the Standards* proposal.

An empirical study of school technology leadership research allowed Tan (2010) to identify eight major knowledges, skills and attribute areas for technology leader competence: leadership and visioning; learning and teaching; productivity and professional practice; support, management and operations; assessment and evaluation; knowledge of problem solving and information technologies; social, legal and ethical issues; organisational relations and communications. Whilst these have been important areas of competence there is no indication of what these would look like at a leader level. Of these eight areas which cover similar competences to teaching standard frameworks, there are two which do not appear at levels below leadership. These are: leadership and visioning; and support, management and operations, both of which involve engagement at the institutional level and not necessarily at the classroom level.

So, what does leader competence (LC) look like in ICT education? The following set of seven competences was developed from the above analysis of leader competence. First, a leader must have achieved the ICT competence standards for teachers at a highly accomplished or innovator level. This provides three relevant competences: LC1- integrate technology with content and pedagogy (TPACK) to impact on how students learn and what they learn; LC2 - model high-level ICT-rich teaching knowledge and skills; and LC3 - collaborate with colleagues to use current and innovative ICT to improve their teaching practice and make content relevant and meaningful to expand learning opportunities for all students. Then there are four further competences which would only be expected of leaders: LC4 - foster appropriate role modeling of ICT-rich teaching knowledge and skills; LC5 - contribute to the operation of the organisation to facilitate ICT-rich learning; LC6 - contribute to the development of a vision to support staff, policies and structures to ensure that ICT education is realised; and LC7 – take responsibility to inform their own practice.

This set of competences is proposed as a framework to inform the development of leaders in ICT education in any educational institution. It should be noted that leadership qualities can be exhibited without being in an official leadership position. This proposed framework, combined with the TPACK framework, underpinned the research-facilitated development of teacher educator TPACK and teacher educators as potential leaders in ICT education at the University of New England.

Context

Teacher education at the University of New England is delivered by academics in the School of Education (SoE). The research being reported was undertaken during 2011 when the SoE had 79 non-sessional academic staff and more than 2600 students. A major rewrite of the SoE awards to address Australian Curriculum (ACARA, 2012) requirements and to reconfigure the placement of professional experiences provided an ideal opportunity to also consider the place of ICT Education and to address the lack of explicit teaching of TPACK. This process was supported by the SoE participation in the national *Teaching Teachers for the Future* (TTF) project that aimed to improve delivery of teacher education so that graduating pre-service teachers were able to demonstrate effective and innovative use of ICT in education.

The TTF project targeted the four Australian Curriculum areas, English, Mathematics, Science and History, with each of the 41 institutions involved being expected to implement strategies in two of the four areas. Although UNE focused on Science and Mathematics as their "designated" curriculum areas, work was also undertaken in English and History. Teacher educators were provided with support, an ICT Pedagogy Officer (ICTPO), as they planned, implemented and evaluated innovative ICT-rich learning experiences for the pre-service teachers. For the designated curriculum areas, there was a higher level of innovativeness in ICT inclusion and of ICTPO support uptake. For more detail see Reading and Doyle (2012).

Study

As a major component of their commitment to the TTF project, the SoE worked towards building the TPACK of their teacher educators. The progress of this knowledge building was tracked through the collection of data at three critical phases in the process: Phase 1 *Mapping of Pre-service Teacher Education Units*; Phase 2 *Teacher Educator TPACK Survey*; and Phase 3 *Teacher Educator Most Significant Change Stories*. As well as the three data collection phases, there was an intervention in the form of professional development and support for the teacher educators. The research reported in this paper covers all three phases, Phase 2 in detail and the other phases in summary form as the detail has been reported previously, Phase 1 in Reading and Doyle (2011) and Phase 3 in Reading and Doyle (2012).

Phase 1 aimed to clarify what was currently being done in existing units in relation to ICT use in the delivery of content and to the teaching of TPACK. This was designed to clarify that there was an issue in relation to what the teacher educators were delivering in the undergraduate units offered. The intervention, throughout 2011, involved provision of professional development and support for the SoE teacher educators, especially through the ICTPO. This included personalised support for the teacher educators in the four targeted-curriculum areas and more general group-level support for those in other teaching areas. Phase 2 aimed at measuring the TPACK of the teacher educators to inform planning for both professional development and rewriting of units. This data collection, undertaken during the intervention, was designed to show the magnitude of the issue. Phase 3 aimed to study the four cases of the teacher educators who had been the main focus of the intervention. This data collection, undertaken after the intervention, was designed to capture detail of the significant changes that had occurred, from those most directly involved in the intervention.

Methodology

Phase 1 collected data in May 2011 from the unit descriptions and unit coordinators. The mapping was completed across eight criteria that covered two perspectives*: ICT aspects of Unit Delivery*, with the criteria, Curriculum, Pedagogy, Assessment and Resources; and *ICT Knowledges*, with the criteria, Technological Knowledge (TK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and Technological Pedagogical Content Knowledge (TPACK). Each criterion was scored at one of four levels: Undeveloped, Fundamental, Proficient and Innovative, as defined by Lim et al. (2010).

Phase 2 was designed in close alignment with the survey completed by the pre-service teachers as part of the national TTF project (ESA, 2012) and was similar to other surveys developed for such purpose (e.g., Schmidt et al., 2009). The survey included demographic items and likert-scale items related to a variety of aspects of the use of, and teaching with and about, ICT. The wording of these questions is included in the figures provided in the results sections. All teacher educators in the SoE were invited to complete the survey online.

Phase 3 was designed to follow the Most Significant Change Story protocol provided by the TTF project (ESA, 2012). In each of the four curriculum areas two-page stories were created, from focus group discussions, about the learning that took place as the teacher educators changed their thinking about ICT whilst undertaking the implementation of innovative ICT in teaching. Identified enablers of learning were categorised as either exogenous (non-manipulative) or endogenous (manipulative) and the endogenous enablers were further categorised as associated with contextual learning, active learning, social learning or reflective learning.

Results

Phase 1 Mapping of Pre-service Teacher Education Units

The mapping involved 13 pre-service teacher education awards with 125 different units and 51 unit coordinators. Generally teacher educators were better at using ICT to deliver the curriculum than addressing ICT Knowledges within the curriculum. Occurrences of proficient and innovative levels of practice are reported as these provide a benchmark for identifying potential leaders. Teacher educators provided a variety of reasons why they were not teaching about ICT and not using ICT to support teaching but did state that were keen to learn new ICT skills; appreciated resources suggested by pre-service teachers; lacked time to learn due to excessive workload; and needed help with ICT skills.

There was proficient use of ICT in the support of pedagogy and provision of ICT tools as part of the resources in many units. The use of ICT in assessment occurred mostly at the fundamental level. For many units where ICT use was addressed in the delivery, there was a sustainability issue because this was not described well in the curriculum documents. An innovative level of ICT use only occurred in three units and this was spread across pedagogy, assessment and resources.

Proficient teaching about TK only occurred in two units and when less proficient teaching occurred it was often achieved through the requirement to use ICT rather than explicit teaching of ICT skills. Proficient teaching about TCK was evidenced in units teaching about specific curriculum areas, especially Mathematics, Science and English. Teaching TPK was evidenced in very few units and not at the proficient level. Teaching about TPACK that transforms learning was only evident in a few units and even then only at a fundamental level. An innovative level only occurred in three units, and was across the TK, TCK and TPK criteria.

Phase 2 Teacher Educator TPACK Survey

There were 29 respondents from a possible 102 teacher educators. Demographic data collected indicated that they were representative of the SoE academic staff with: 20 female and 9 male; and an concentration of age with 22 between 50 and 59 years old; only 2 less than 50 years; and 5 more than 59 years.

The data is reported as teacher educator (TE) use of ICT (Tables 1 to 3) and TE support of pre-service teacher (PST) use of ICT (Tables 4 to 6). As there were only 29 respondents, the likert-scale items (from 0 to 6 for confident/useful level) have been summarised to reflect how *Confident (C)* as any response at a level of 3 or greater (i.e., moderately confident to extremely confident) and, similarly, how *Useful (U)* as any response at a level of 3 or greater. A count of less than 20 (out of 29) is considered less than satisfactory. Those not represented in these counts were either less confident/useful or unable to judge. Generally the number *unable to judge* is low but where it is above 3 (approximately 10% of 29, considered a reasonable limit) the result is indicated in the relevant table.

Table 1 shows the number of respondents who indicated confident/useful to competences in relation to TE use of ICT in professional knowledge. This clearly shows that while the TEs believed these competences were useful, they were not yet confident in their own abilities. A clear lack of confidence exists in: personalising learning activities, in particular for Aboriginal and Torres Strait Islander PSTs.

Table 1: Teacher educator use of ICT in professional knowledge

(n=29 respondents)	C*	U**
demonstrate knowledge of the range of ICT to engage pre-service teachers	21	25
teach strategies that are responsive to pre-service teachers diverse backgrounds	21	25
teach strategies that are responsive to pre-service teachers learning styles	20	25
teach strategies to support pre-service teachers from Aboriginal and Torres Strait Islander backgrounds	14	25
teach strategies to personalise learning activities for pre-service teachers	19	26
access, record, manage, and analyse pre-service teachers assessment data	24	28
teach specific subject areas in creative ways	23	28
engage with colleagues to improve professional practice	25	27
collaborate for professional purposes, such as online professional communities	23	27

* How *confident* are you that you have the knowledge, skills and abilities to use ICT to…
** How *useful* do you consider it will be for you, as an academic, to be able to use ICT to…

Table 2 shows the number who indicated confident/useful to competences in relation to TE use of ICT in professional practice. Again, this clearly shows that while the TEs believed these competences were useful, they were not yet confident in their own abilities. A clear lack of confidence exists in: demonstrate how ICT can be used to support literacy learning; demonstrating how ICT can be used to support numeracy learning; designing ICT activities that enable PSTs to become active participants in their own learning; and evaluating how ICT use has helped to achieve specific subject area goals.

Table 3 shows the number who indicated confident/useful to competences in relation to TE use of ICT in professional engagement. Although useful was low for a couple of competences, it is still clear that the TEs believed these competences were useful but they were not yet confident in their own abilities. A lack of confidence exists in: manage challenging pre-service teachers behaviour by encouraging the responsible use of ICT; and being aware of digital citizenship to promote pre-service teacher demonstration of rights and responsibilities in using digital resources and tools.

Table 4 shows the number who indicated confident/useful to competences in relation to TE support of PST use of ICT in professional knowledge. Again, useful was high but it is still clear that the TEs believed these competences were useful and that they were not yet confident in their own abilities. The only competence that demonstrated reasonable confidence was in being able to support PSTs to use ICT to provide motivation for curriculum tasks and to demonstrate what they have learned.

Table 5 shows the number who indicated confident/useful to competences in relation to TE support of PST use of ICT in professional practice. The TEs believed these competences were useful but they were not yet confident in their own abilities. There was no competence where the TE demonstrated reasonable confidence.

Table 2: Teacher educator use of ICT in professional practice

(n=29 respondents)	C*	U**
design learning sequences, lesson plans and assessment that incorporate ICT use by pre-service teachers	23	26
select and organise digital content and resources	22	28
use ICT for reporting purposes	24	27
demonstrate how ICT can be used to support literacy learning	19	26
demonstrate how ICT can be used to support numeracy learning	17	23
design ICT activities that enable pre-service teachers to become active participants in their own learning	18	28
select and use a variety of digital media and formats to communicate information	21	29
evaluate how ICT use has helped to achieve specific subject area goals	19	25

* How *confident* are you that you have the knowledge, skills and abilities to use ICT to…
** How *useful* do you consider it is for you, as an academic, to be able to use ICT to…

Table 3: Teacher educator use of ICT in professional engagement

(n=29 respondents)	C*	U**
manage challenging pre-service teachers behaviour by encouraging the responsible use of ICT	19[1]	21[2]
be aware of digital citizenship to promote pre-service teacher demonstration of rights and responsibilities in using digital resources and tools	18[3]	23
demonstrate an understanding of safe, legal and ethical use of digital information and technologies	20	25
identify personal and professional learning goals in relation to using ICT	21	26
reflect on relevant ICT research to inform professional practice	23	27
use a range of ICT resources and devices for professional purposes	24	27

* How *confident* are you that you have the knowledge, skills and abilities to use ICT to…
** How *useful* do you consider it will be for you, as an academic, to be able to use ICT to…
[1] 7 unable to judge; [2] 4 unable to judge; [3] 4 unable to judge

Table 4: Teacher educator support of pre-service teacher use of ICT in professional knowledge

(n=28 respondents)	C*	U**
provide motivation for curriculum tasks	20	24
develop functional competencies in a specified curriculum area	17	22
actively construct knowledge that integrates curriculum areas	19	23
actively construct their own knowledge in collaboration with their peers and others	19	23
analyse their knowledge	18	23
synthesise their knowledge	19	24
demonstrate what they have learned	21	24
acquire the knowledge, skills, abilities and attitudes to deal with on-going technological change	17	24

* How *confident* are you that you have the knowledge, skills and abilities to support pre-service teachers' use of ICT to…
** How *useful* do you consider it will be for you, as an academic, to ensure pre-service teachers use ICT to…

Table 6 shows the number who indicated confident/useful to competences in relation to TE support of PST use of ICT in professional engagement. Again, the TEs believed these competences were useful but they were not yet confident in their own abilities. The only competence that demonstrated reasonable confidence was in being able to support PSTs to gather information and communicate with a known audience.

Phase 3 Teacher Educator Most Significant Change Stories

The four stories, one for each of Science, Mathematics, English and History, provided interesting insight into the experiences, and related enablers of learning, of the teacher educators as they developed innovative practice in ICT-rich education. Of most interest are the 18 endogenous enablers (Table 7) identified because these can be manipulated to optimise teacher educator learning. Context appears to have impacted on responses from the teacher educators. One example is the teacher educator who became involved in the experience through personal interest and demonstrated strong awareness of the impact of Social Learning and Reflective Learning enablers. Another example is the teacher educators who worked most collaboratively with the ICTPO clearly and demonstrated a strong focus on pre-service teacher learning, including pre-service teacher capabilities and enthusiasm, rather than their own learning.

Table 5: Teacher educator support of pre-service teacher use of ICT in professional practice

(n=28 respondents)	C*	U**
integrate different media to create appropriate products	16	23
develop deep understanding about a topic of interest relevant to the curriculum area/s being studied	17	21
support elements of the learning process	19	24
develop understanding of the world	18	22
plan and/or manage curriculum projects	19	23
engage in sustained involvement with curriculum activities	18	23
undertake formative and/or summative assessment	17	26
engage in independent learning through access to education at a time, place and pace of their own choosing	19	24

* How *confident* are you that you have the knowledge, skills and abilities to support pre-service teachers' use of ICT to…
** How *useful* do you consider it will be for you, as an academic, to ensure pre-service teachers use ICT to…

Table 6: Teacher educator support of pre-service teacher use of ICT in professional commitment

(n=28 respondents)	C*	U**
gain intercultural understanding	17	23
acquire awareness of the global implications of ICT-based technologies on society	18	22
communicate with others locally and globally	19	22
understand and participate in the changing knowledge economy	19	22
critically evaluate their own and society's values	17	21
facilitate the integration of curriculum areas to construct multidisciplinary knowledge	18	24
engage in sustained involvement with curriculum activities	17[1]	22
critically interpret and evaluate the worth of ICT-based content for specific subjects	16	24
gather information and communicate with a known audience	21	25

* How confident are you that you have the knowledge, skills and abilities to support pre-service teachers' use of ICT to…

** How *useful* do you consider it will be for you, as an academic, to ensure pre-service teachers use ICT to…

[1] 4 unable to judge

Table 7: Endogenous enablers of teacher educator learning (about ICT in education)

Contextual Learning	have a personal interest; participate in webinars; raise awareness through ICTPO contact; recognise potential of use of ICT for learning
Active Learning	learn in the workplace; teach in a unit with ICT embedded; utilise technical support; utilise ICTPO support; identify with ICTPO as mentor
Social Learning	collaborate with ICTPO; collaborate with others; learn together through teaching together; learn together with pre-service teachers; become part of a learning community
Reflective Learning	ask colleagues for ideas; challenged by others; change perspective on ICT use in education; change view of lecturer & pre-service teacher relationship

Discussion

Based on the framework of Leader Competences (LCs) developed, the mapping and the TPACK survey indicated that there were few innovators in ICT education amongst the teacher educators in the SoE at UNE and potentially only one leader. This provided a challenge for those tasked with developing leaders to be catalysts for change in ICT education. First, innovators had to be nurtured and then with prolonged engagement came the hope that some of them would develop into leaders. These first two phases provided detailed information about TPACK in teaching and learning and identification of aspects where improvement was needed. The intervention to support teacher educators was designed specifically to address three of the recommendations that came from the mapping: ICT Knowledges be incorporated into all units, enthusiasm for new ICTs be nurtured amongst teacher educators; and ICT innovation be reconceptualised for teacher educators. The survey showed teacher educators agreed that most competences listed were useful but the general lack of confidence in their competence helps to explain why the teacher educators were not using ICT more widely or more innovatively in their practice, as shown by the lack of proficient and innovative practice in the mapping. The survey also showed that the teacher educators were more confident in the use of ICT to deliver their units, i.e., their own TPACK, than in teaching about ICT knowledges, i.e., helping the pre-service teachers develop their TPACK.

In the intervention, the teacher educators in the designated curriculum areas were especially encouraged to develop their TPACK (i.e., LC1), model teaching with ICTs (i.e., LC2) and to collaborate with colleagues (i.e., LC3) and thus operate at an innovative level. The intervention was designed to provide the opportunity to research practice (i.e., LC7), which was embraced by the Science, Mathematics and English teacher educators. Those in Science also fostered appropriate role modeling (i.e., LC4) by teaching in a virtual world where the pre-service teachers would also teach. The teacher educator change stories made it clear that they were collaborating with colleagues (i.e., LC3) and changing their perspective on ICT education (i.e., ready for LC6).

Conclusion

Awareness-raising through the mapping and survey, together with the professional development offered to all members of the SoE, has helped to build teacher educator TPACK at UNE. While positive steps have been made towards the development of leaders they do not yet exhibit all the necessary competences of leaders in ICT education. However, these potential leaders are already catalysts for change. Since the completion of the project some of these teacher educators have continued to develop their competence, for example, in English two more teacher educators became role models for their pre-service teachers with the encouragement of the teacher educator directly involved in the project (i.e., LC4).

There are two main limitations to this study. First, the low number of survey respondents, 29 out of 102, together with a high concentration of respondents in the age category 50 to 59 years, means that the confidence levels reported may not be truly reflective of the SoE. Second, the survey was a self-audit of ICT knowledges and self-audits have been shown in the past to generally show a higher level than actual performance (see, e.g., Braddlee & Mathews-DeNatale, 2006).

This study has implications for both teaching and research. The UNE SoE created an action plan to further the work begun by the TTF project in building teacher educator TPACK. This plan especially encourages actions to assist more teacher educators to become leaders in ICT education and thus catalysts for change. Already, some are requesting assistance to develop their own TPACK and incorporate TPACK in their teaching. Other institutions could use the proposed leader competence framework (LCs) to inform the progression of their teacher educators towards leader competence in ICT education. Obvious implications for research are to: develop a more formal description of leader competence in ICT education; and develop alternatives to self-audits for reporting TPACK. All teacher education institutions should continue to build teacher educator TPACK so that more leaders are developed to be catalysts in this ICT education climate of change.

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Applying a Reverse Induction Process for Improved Definition of Higher Education Technology-Supported Research Projects

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Scoping out the detail of a Higher Education research project can be a time-consuming and frustrating experience. The excitement of a research project is frequently stifled by the tedious process of mapping out project activities, estimating required resources and developing project schedules.
Reverse induction provides a fresh approach to defining technology-supported research projects. In much the same way as new product development must be guided by an understanding of customer needs, reverse induction focuses on research outcomes before formulating research aims. Using a systematic process of backward reasoning, researchers can define a project concept in a structured and efficient manner. There is significant potential for reverse induction to deliver time and cost savings in a complex and challenging Higher Education environment.

Keywords: project management, technology, learning

Background

Academics are struggling to manage existing workloads, and almost 30% of academics have either a long-term or a short-term intention to move to an academic position in another country (Bexley, James & Arkoudis, 2011). One of the reasons contributing to academic job dissatisfaction is insufficient funding for research. Research undertaken at the University of Melbourne indicates that almost half of academics surveyed (49.1%) are not confident that they can get research grants.

Graves, Barnett and Clarke (2011) have estimated that the average amount of time spent on preparing each research application submitted to the National Health and Medical Research Council in 2009 was 22 days, and the average cost of preparing each application was $17,744. Once an application is submitted, the assessment process is costly and subject to a high degree of randomness owing to variation in panel members' assessments. The relatively poor reliability in scoring by panels is to be expected given the complexity of the assessment task and the subjective nature of the assessment process.

In the case of technology-supported research projects, defining a project concept can be particularly challenging:
- Are the project outcomes applicable to one type of technology or a range of different technologies?
- Does the project seek to enhance technology-supported learning outcomes for the student or teacher or both?
- How do you demonstrate the sustainability of project outcomes when the technology itself may be obsolete within a short period of time?

If researchers can minimise the time required to scope out a Higher Education technology-supported research project, they can prepare and submit a greater number of funding applications, increasing their chances of funding success.

Overview of reverse induction

Reverse induction, or backward induction, is the process of reasoning backwards in time to determine a sequence of optimal actions. Backward induction is considered to be a more complex but efficient procedure than a (forward) exploration strategy (Seyed-Allaei, Amati & Shallice, 2010).

Marketing was an early discipline to apply the principles of reverse induction. Marketing focuses on consumer needs as the best route to product development (Kotler, 1972). "Given the customer's needs, the industry develops backwards, first concerning itself with the physical delivery of customer satisfactions" (Levitt, 1960).

Marketing myopia and the ‘better mousetrap’ fallacy are avoided by identifying consumer needs and developing a product that satisfies those needs.

Reverse induction is also used in game theory to solve finite sequential games. The iterative process starts with determining the optimal strategy of the player who makes the last move of the game. The optimal action of the next-to-last moving player is determined taking the last player’s action as given. The process continues backwards until all the players’ actions have been determined (Shor, 2005).

Defining Higher Education research projects

Traditional technique of defining research projects

The traditional technique for defining research projects starts with the research aim. The researcher then specifies each activity necessary to achieve the research aim. The research outcomes evolve during the process and with some minor manipulation, the research aim and outcomes can be aligned with funding scheme priorities. If not, the researcher will need to identify an alternative funding scheme, or make further adjustments to the research aim, outcomes, and activities (refer to Figure 1).

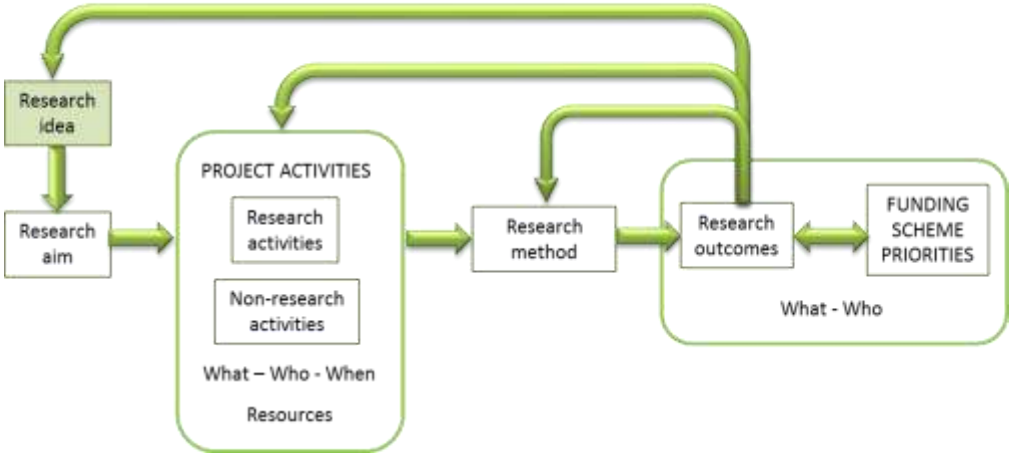

Figure 1: Traditional technique for defining technology-supported research projects

Reverse induction for improved definition of research projects

Reverse induction, as it applies to project definition, is the process of backward reasoning, whereby the optimal process for a technology-supported research project is achieved by starting with the research outcomes. By focusing on the research outcomes, and working backwards to the project aim and objectives, academics will be able to define research projects in a more structured and time-efficient manner (refer to Figure 2).

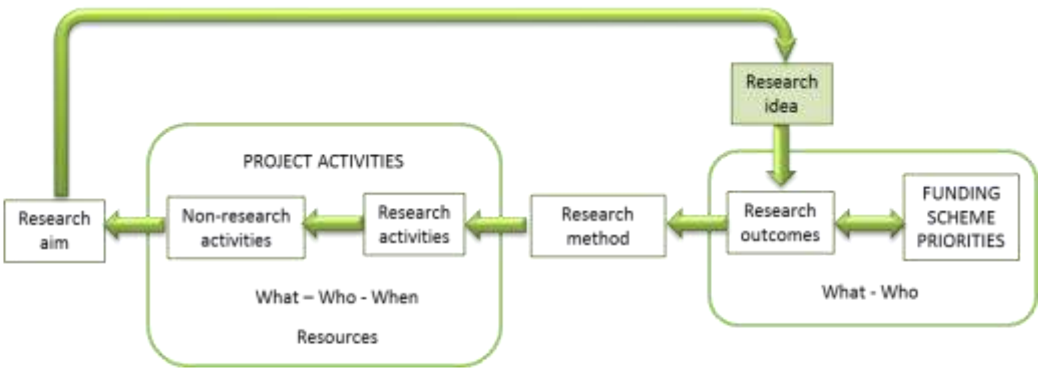

Figure 2: Reverse induction technique for defining technology-supported research projects

At each stage of the reverse induction process, activities are identified as outlined in Table 1.

Table 1: Activities identified at each stage of the reverse induction process

Research idea	Articulate an initial project concept. This should be a broad overview of the research project. It should not be a detailed explanation of the anticipated research aims or outcomes, but an overarching statement of the research intention.
Research outcomes	Detail specific outcomes in terms of what will be developed/produced and who will benefit (the sector, the institution, leaners, teachers, etc). These should be broadly aligned with relevant funding scheme priorities. CHECKPOINT: Do the research outcomes match the funding scheme criteria?
Research method	Provide an explanation of the method that will be used to generate the outcomes – the focus is on the most appropriate choice of research. Options may include action based research, design based research, etc. CHECKPOINT: Is the research method appropriate for the research outcomes?
Research activities	Provide details of the specific research activities that need to be undertaken. Options may include focus groups, surveys, etc. Research activities must be aligned with the research methodology and be able to justify the research outcomes. CHECKPOINT: Are the research activities aligned with the research methodology? CHECKPOINT: Will the research activities enable the research outcomes to be achieved?
Non-research activities	Provide details of all the non-research activities that need to be undertaken to support the research activities – developing the surveys, trialing the surveys, determining method of selecting research participants, arranging focus groups, ethics clearance, etc. Each activity will have resources allocated to it ($, people, place, etc) Identify all other non-research project activities (establishment of legal agreements, purchasing activities, etc) and allocate resources. CHECKPOINT: Are the project activities (research and non-research) sufficient to enable the research project to be undertaken?
Research aims	Review the research methodology and research activities. Develop a research aim based on the research activities, methodology and outcomes. CHECKPOINT: Are the research aims aligned with the research outcomes? If there is any discrepancy, review the research outcomes and adjust them. Check that the funding scheme criteria are still being met.

The cyclical nature of the process enables the initial research idea and research outcomes to be adjusted to align with the emergent research aim.

At all times, the focus is on research – project activities are secondary. The premise of the backward induction technique is that if you can accurately determine the research outcomes, activities and aim, the project will be better defined to reflect the true work required. Superfluous activities are minimized.

Early results

Since early 2012, the reverse induction technique has been trialed at the Australian Digital Futures Institute. The process has proven to be an effective approach for scoping out technology-supported research projects in the areas of electronic publishing, mobile learning and multiple-channel delivery of Higher Education content.

In one particular case, an Early Career Researcher used the reverse induction technique to efficiently isolate the research aim and clarify the research proposal. By following the process, and focusing on research outcomes rather than project activities, the researcher was able to synthesise his initial research idea into a condensed and precise research aim. This was a vast improvement on the vague and overwhelming project concept originally articulated (refer to Figure 3).

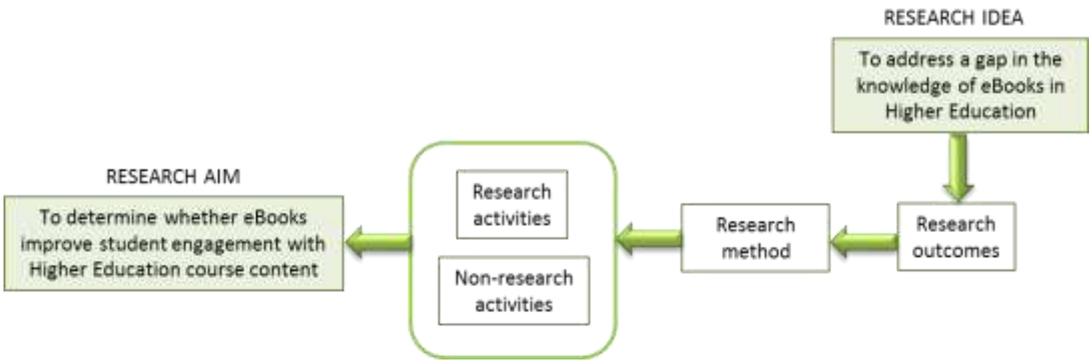

Figure 3: Improved articulation of research aim using reverse induction

Although difficult to quantify savings, it is estimated that the process of mapping out a technology-supported research project using reverse induction achieves a 40% reduction in time over traditional processes for defining projects.

Further trials of the reverse induction technique will continue throughout 2012/2013 to provide a better understanding of comparative time and cost savings against funding success rates.

Conclusion

This paper is about applying a reverse induction technique to define Higher Education technology-supported research projects. Reverse induction is a backwards mapping approach that can be used to streamline the scoping of research projects. The approach uses research outcomes as a starting point which is in contrast to the traditional activity-focused technique of mapping projects. The research activities and research aim evolve during the mapping process, and because they are outcome-focused there is little need to re-work the project scope to match funding opportunities. Early results of this technique are encouraging. The simple yet structured approach is proving to be a time-efficient process for researchers to define technology-supported research projects.

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Using a blogging tool to assess online discussions: an integrated assessment approach

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This paper presents a summary of an experimental assessment design in a fully online undergraduate course. It details a task design relating to assessing discussion forum contributions and how lessons learnt from the original design have impacted on the current course design. From a task that often resulted in 2500 posts across a semester – impossible to read and assess in a fair and equitable manner to the combined design offered today. The task is equitable and manageable with the aim of building students' capability as active learners.

Keywords: online discussion, blog, peer review, self review, assessment strategy

Online discussion forums have been widely used to support learning and teaching activities in Higher Education. Today, educators are more aware of the varied affordances of online discussions, in particular, the opportunities they offer to build students' knowledge and capacities for the future, such as digital literacy, communication skills, critical and reflective thinking skills. While some teachers focus on how to engage and motivate students to participate in online discussions, the course, which will be reported in the paper, faced a new challenge – the unexpected high online participation volume posed threat to desired learning goals and the fairness of marking.

When current task design cannot meet the requirements of learning and teaching, changes to the assessment are expected to take place in order to effectively improve students' learning experience and, meanwhile, keep the task manageable and sustainable. Advices on task design and assessment strategies for online discussions are made available by experienced teachers and educators. Strategies that are focused on student-centred learning have been reported as successful in practice, including having students as moderators (Ashcroft & McAlpine, 2004) and encouraging students to nominate their posts based on given criteria (Wozniak & Silveira, 2004). Rubrics are adopted to facilitate a well informed and effectively communicated learning and assessing process, which include the use of informative marking rubrics (Nandi, Chang & Balbo, 2009), performance based clarifications for assessing effectiveness of contributions (Edelstein, & Edwards, 2002), criterion-based discussion assessment (McNamara & Burton, 2010) and the adoption of holistic and analytic scoring tools (Hazari, 2004). It is also strongly recommended that interactions should not be the only focus when designing an online discussion task. Tasks that facilitate cognitive presence are more likely to encourage students to adopt deep learning strategies (Garrison & Cleveland-Innes, 2005).

By combining what were recommended in the literature and what needed to be addressed in practice, a new assessment design was developed. It is to build a learning task that is equitable and manageable with the aim of building students' capability as active learners.

Background

Undergraduate students at the University of New South Wales are required to complete two General Education courses as an integral part of their studies. The courses must be taken externally to the student's Faculty. The purpose of this requirement is to encourage students to expand their learning beyond their chosen discipline and take a more flexible and active role in their own education. The General Education course discussed in this paper is offered by the School of Mining Engineering. The rationale for this course is to provide a broad overview of the impact mining has had on the Australian physical, social and economic environment. It targets students from diverse academic backgrounds, who are interested in mining but have little or no prior knowledge of the topic.

The course was one of the first General Education courses to be offered fully online, first via WebCT and later via Blackboard over a period of 12 weeks. Currently, it runs three times per year with an average enrolment of 150 students in each semester. Apart from current teaching materials, the course offers stimulating learning activities, ranging from multimedia learning modules, class polls, online discussions, group projects to quizzes and essays, for both formative and summative purposes. Online discussion is undertaken throughout the semester and is attributed 15% of the total assessment mark. The extensive use of online discussion facilities is to address the following aligned learning outcomes across all the General Education courses:

- To enable students to evaluate arguments and information
- To provide structured opportunities for students from disparate disciplines to interact co-operatively within a learning situation
- To provide an environment in which students are able to experience the benefits of moving beyond the knowledge boundaries of a single discipline and explore cross and interdisciplinary connections.

In addition, online discussion provides the opportunity for students to form an online learning community through the promotion of student engagement in evidence-based discussion and debate.

Each week, students are given a specific topic to discuss. Instead of relying on personal beliefs or opinions based on the popular media, students are expected to post their considered understandings and evidence-supported opinions on the forum. It is envisaged that material posted on the forum will stimulate interest in researching a topic to a greater extent, leading to the development of the final writing task that requires students to demonstrate their research skills, skills of filtering fact from opinion and writing skills.

Soon after the course was introduced in the online format, students' contributions for the discussion were much greater than expected. Both students' intrinsic interests in a General Education subject and the controversial nature of many mining topics - for example, questions like *would you support electricity generation from Nuclear Power being developed in Australia?* – contributed to heated lengthy discussions. It was soon discovered that this course could have in the vicinity of 2,500 posts over the period of the 12-week semester. This inevitably led to another question – how could teachers fairly and efficiently assess the large volume of student discussions?

Issues associated with the original assessment design

Originally, the assessment strategy involved allocation of a participation mark based on quantity of posts, which acted as a replacement for a tutorial attendance sheet in the face-to-face learning environment. Later, it switched focus from the quantity of students' contributions to the quality. Specifically, students were required to contribute at least ten meaningful and evidence-based posts across the semester. Marking criteria were made available to students at the beginning of the semester.

There were two major issues that arose from this model of assessment. The first issue was related to marking load. Due to resource constraints, only one lecturer was responsible for marking all the assessment tasks. The lecturer spent enormous time and effort on locating each individual student's contributions and then skim-reading the discussion thread in order to make an academic judgment on the quality of the post. Due to the growing volume of posts and conflicted marking time with the final essay task, the marking process for the discussion task became unmanageable. At times, the lecturer had no choice but to delay the release of marks, which resulted in student complaints.

The second issue was related to an uneven distribution in the quality of students' discussions. Some students rushed into the discussion board in the later stages of the course and posted to meet the minimum requirements of the assessment task, instead of engaging in meaningful and considered discussion. Some students still posted opinions from anecdotal experiences or used simple expressions to merely agree or disagree, rather than engage with the thread post. In some cases students made excessive posts, in the hope that the lecturer would go through their work and identify the best posts. This issue was not only identified by the lecturer but also observed by fellow students who reported it in their course satisfaction survey.

New assessment design and its pedagogical and managerial benefits

The new two-step approach aims to foster an *assessment as learning* environment in which students gain autonomy and take initiative. Criteria on quality of discussions are used as scaffolds that are designed to improve students' understandings and performance rather than rules for awarding or deducting marks. Instead of presenting everything they have done and waiting passively for the lecturer to select and mark, students are required to pro-actively make their own selections and articulate reasons for their decisions. A blogging tool is used as the platform for students to post their reflections. Details of the new assessment design are as displayed in the table below.

Table 1: Assessment descriptions for each of the component tasks – information for students

For this task, you are required to contribute at least **ten** discussion posts on graded forums and write at least **three** blogs based on your reflections on the class discussions.	
5%	Step 1: By the end of week 6 of this course, you need to have: posted at least **five** posts in total on graded forums, **and** contributed at least **one** blog post to the online Participation Blog *Select one post contributed by your fellow students from graded forums, which you think is of a good standard, and explain why*
10%	Step 2: By the end of week 12 of this course, you need to have: posted at least another **five** posts in total on graded forums, **and** contributed **two** blog posts to the online Participation Blog *Select one thread post and one response post contributed by yourself from graded forums, and explain why they are your best contributions*

The purpose of step one is to promote and enhance a collaborative learning environment by encouraging students to review and learn from each other's work. It is also to help the learning community to be engaged in the process and build a consensus on the criteria. During this period, students are required to make online contributions and participate in discussions as well as reflect on and select from their peers' work.

The purpose of step two is to encourage students to apply what they have learnt from the peer review process to conducting an effective self-evaluation. After synthesising fellow students' discussion post together with marks and feedback from the teaching staff in the mid-term, students are expected to gain a better understanding of what constitutes a good online discussion. With this improved understanding, students continue to make online contributions on the forum. By the end of semester, they are expected to make selections from and write evidence-based reflective posts on their own work.

The blogging tool is used to provide a suitable platform for students to post their reflections. It is to separate the assessable reflective posts, from the actual non-assessable discussions. This provides students with more time to concentrate on the quality and relevance of their discussion posts. The public nature of the blog helps students to gain self-confidence when their posts are selected by peers. It helps to minimise plagiarism because students are required to make their self-selected post available to the cohort.

Another benefit brought by the new design is that the marking load for the lecturer is significantly reduced. The lecturer is no longer required to follow all discussions, which may exceed 2,500 posts, in order to ensure the fairness and reliability of the marking. Instead, he needs to read 450 blog posts, which are in fairly similar format. The marking period for blog posts is divided into two - one is due by mid term and another one is due by the end of the term - which also effectively helps to distribute the marking load across the semester and provide additional feedback to the student.

Implementation and findings

The new assessment structure was first trialed in 2011. On the Blackboard course, a special content page was dedicated to the task. The criteria on good discussions were displayed as the first item on the page, posing as learning guides for students. The link to discussion forums was the second item and the third one was the link to the blog with a recommended writing template.

Students reported no confusion on how to complete the task and what needed to be done. The numbers of discussion posts was reduced slightly but the quality of discussions was improved significantly in a more evenly distributed way. Students spontaneously interacted with each other not only on the discussion board but also on the blog.

After the first trial, the lecturer gave very positive feedback in terms of improved quality of online discussions and largely reduced marking load. The number of student complaints about poor quality of discussion posts and delayed return of marks was significantly reduced.

The new assessment design has successfully addressed the desired learning outcomes of General Education courses. It helps to promote students' enthusiasm and curiosity for learning, guides them to be active learners, engages them in the assessment process and develops their abilities to make evidence-based judgments. The design also takes marking efficacy and efficiency into consideration, making the assessment task manageable for teachers.

The design, now, has been trialed in several mainstream courses in the School. More empirical studies will be conducted in order to investigate further on the effectiveness of the assessment design and its impact on students' learning.

Implications

More and more technologies have been introduced into the field of learning and teaching in order to help students to build capacities for the future. Along with benefits and opportunities, challenges and associated issues are also emerging. As a result, educators need to be more aware of pedagogical implications of technologies and take a more holistic approach on task design rather than being restricted by particular technologies. Assessment design is considered as a dynamic process. It is to ensure that the desired learning outcomes will be addressed without compromise whilst maintaining a manageable and sustainable, assessment task.

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Beyond the afterglow: Transfer of learning in an online "applications" course - preliminary results of a mixed methods study

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This exploratory study examines aspects of student experiences both during an online applications course in the University of British Columbia's Master of Educational Technology (MET) programme, and subsequent to having completed the course in the realm of professional educational practice. Transfer of learning (Caffarella, 2002) related to specific learning activities, a learning community-centered/community of practice course structure, and the overall course design were examined Broadly speaking, transfer of learning was significant for nearly all study participants; specific learning activities designed to foment this did so successfully for most participants. However, the community of practice aspect during the course (Lave and Wenger, 1991), whilst strong, was not as evident after the course ended. This paper represents a preliminary analysis of the findings from the quantitative (questionnaire) portion of a larger, mixed methods study.

Keywords: online, transfer of learning, adult education, learning technologies, mixed methods

In the flush of a recently completed—or soon to be completed—course[1], student evaluation of teaching (SEoT) data can be rather positively skewed: Learning Technologies: Selection, Design and Application (ETEC565A), is, in this regard, not exceptional. But what happens after the warm glow has cooled, and the flush of excitement and novelty have passed? What sort of impact does such a course have on practice?

Unlike many other courses, however, ETEC565A has been designed to give learners a range of competencies transferable to their professional practice as education professionals. In other words, it has transfer of learning—"the effective application by program participants of what they learned as a result of attending an education or training program"—purposefully infused within its design (Caffarella, 2002, p. 204), in terms of learning activities, assessment and interactivity.

With a first cohort having completed ETEC565A over three years ago (in August 2009), we now have a population whose members have had between a few months to several years to try and transfer what they have learned from ETEC565A to their educational practice—beyond the afterglow.

Method

This mixed methods, exploratory study seeks to rigorously examine aspects of student experiences both during ETEC565A and subsequent to having completed the course, in the realm of professional educational practice. The research questions for this study are:

- What are the perspectives of students who have completed ETEC565A with respect to the course and its subsequent value?
- What sort of impact has ETEC565A had on their practice as educators, if any?

The study has two phases. The first is quantitative and consists of a self-administered online questionnaire; the second is qualitative and consists of key informant interviews. Data collection for phase one ended on 15 June 2012: this paper reflects preliminary analyses of phase one questionnaire findings. Interviews for phase two commenced in August 2012. The questionnaire included the following domains of inquiry:

1. Professional experience
2. Programme experience
3. Active learning course component
4. Elearning toolkit wiki course component
5. Formative assessment course component
6. Summatively assessment course component

7. Learning communities and communities of practice
8. Impact on practice
9. Demographic information for classification purposes

The questionnaires were developed based on a review of the current literature, the documentation from the design team for ETEC565A and in collaboration with colleagues knowledgeable about learning technologies, transfer of learning and scholarship of teaching and learning methodology. Five item Likert-scale questions were often used (example: Strongly Disagree - Disagree - Not Sure - Agree – Strongly Agree), which were in some instances collapsed down to three item scales (Disagree - Not Sure - Agree).

Questionnaire invitations were sent via the university's student information service in early May 2012. Reminders were sent mid-May and early June. Out of 269 students who were invited to participate in the study, three had email addresses that bounced back, making an adjusted population of 266. A total of 86 completed the survey, for a response rate of 32 per cent. The survey was delivered via VoVici, a Canadian-based online survey development tool, since local privacy laws preclude using server-based technologies based outside of Canada. Statistical analyses were done using VoVici and SPSS 20 for Mac OS X. University Behavioural Research Ethics Board approval for the study was granted (UBC BREB Number - H12-00986).

Note: many of the alumni of ETEC565A work as public school teachers at the primary, intermediate or secondary level. Others work in different contexts as educational professionals—and not always as teachers (or instructors or facilitators). These include programme managers, instructional designers, and school leaders. Thus the study design (and language) needed to allow for this breadth of professional educational practice to be captured. Hence the use of "educational professionals" rather than "educators" or "teachers".

The participants

Mean and median age for respondents were both 42 years at the time of survey completion. Sixty-two per cent of respondents were female, 30 per cent male (two per cent preferred not to answer; six per cent skipped the question). Fully 74 per cent had completed a bachelor of education programme. Educational attainment levels were skewed towards having completed one or more magistral degrees (seventy-three per cent); in many instances the programme itself). Three per cent had completed a doctorate. Most respondents—68 per cent—worked full-time (35 hours per week or more), viewed themselves as "early adopters" of new technologies (84%) and "learning technologies leaders" (83%); a somewhat smaller number considered themselves "learning technologies innovators" (67%).

Respondents worked in a range of contexts. Forty-three per cent worked in primary or secondary education, with the rest distributed across post-secondary education, adult and community education, and other sectors. Of the 26 per cent who selected "Other", roles included educational technologist, instructional designer, school district administrator or coordinator, project manager, school principal and consultant. Eighty-seven per cent have been an educational professional for five or more years: only one per cent were in the first year of their education career. Just under half (49 per cent) have worked five or more years in their current role. Only six per cent were in theirs for less than one year.

Of their reasons for enrolling in the program, "an interest in learning technologies" was the most commonly cited reason: eight out of ten survey respondents indicated this. Career advancement, being a lifelong learner, and the programme being a wholly online programme were also commonly cited. Conversely, only one in ten cited the absence of any face-to-face graduate programme available near their home community as a reason. Eighty-seven per cent had enrolled in the programme since 2008, with roughly equal numbers starting in September or January (rather than May). At the time of survey completion, 44 per cent had completed the MET programme (most in 2011); another 24 per cent had completed 7 to 9 (out of 10) courses.

About the programme, about the course

UBC's Master of Educational Technology (MET) programme, a wholly online magistral learning technologies programme (http://met.ubc.ca/) has been in operation since 2002, one of the first wholly online degree programmes at the University of British Columbia (http://ubc.ca/), a major, research-intensive, Canadian university. Since 2002 over 250 students have completed the programme, studying on either a full-time or part-time basis. Programme students include those based in Canada, the United States, Mexico, Asia, Europe, the Caribbean, and South Pacific. From its inception, the programme's emphasis has been on informed, critical analysis of the implementation of technology in learning environments. In addition to core courses in research methods, instructional design, educational technology foundations, and learning theory, students choose from a range of elective courses focused around subject matters such as math and science or liberal arts education. Other elective courses focus on the changing notion of texts in the digital age, indigeneity and educational technology, and ventures in learning technology.

As we began to develop ETEC565A, a new, elective “applications” course, one key question informed our work: *what sorts of core competencies would we expect someone who had completed a post-graduate qualification in educational technology to possess*? For ETEC565A the core competencies we identified were:

- A solid understanding of key literatures related to tool selection, learning theory and learning technology deployment best practices
- Familiarity with professional standards related to educational technology
- Ability to create a learning management system (LMS) course site with a customized graphical user interface (GUI)
- Creation of a sophisticated assessment object (quiz or exam), using a range of question types and assessment strategies
- Development and delivery of a pedagogically purposeful digital story
- Use of weblogs and/or wikis for site design, as learning objects, and as an e-portfolio platform
- Mindfulness of issues related to intellectual property, confidentiality, and data ownership
- Design for accessibility
- An ongoing practice of self-reflection

Early in the development process we identified inculcating a learning community, ideally one that formed the basis of an ongoing community of practice (Lave & Wenger, 1991) after course (and programme) completion, as important. While many focus on Lave and Wenger’s notion of “legitimate peripheral participation (p. 29), we believe a larger message is sometimes lost: peripheral participation is merely one phase or period of community membership for skilled practitioners: to move beyond the rudiments of nascent practice requires a shift towards the centre (rather than remaining on the periphery) of a community of practice. In fact, Lave and Wenger specifically warn:

> In summary, rather than learning by replicating the performances of others or by acquiring knowledge transmitted in instruction, we suggest that learning occurs through centripetal participation in the learning curriculum of the ambient community. Because the place of knowledge is within a community of practice, questions of learning must be addressed within the development cycles of that community, a recommendation which creates a diagnostic tool for distinguishing among communities of practice. (p. 100)

In instructional design terms, community of practice represents a goal, aim, or principle. Our learning community course design seeks to provide learning activities that foment, support, and leverage community and its concomitant interactions. Endeavouring to garner a richer understand these centripetal, ambient, cyclical aspects of community of practice dynamics are therefore also a focus of this study—the qualitative component, specifically.

Across the MET programme’s student community there is a wealth of knowledges and skills: collegial support and advice are positioned firmly at the centre of most aspects of the MET. ETEC565A has been designed in a way that purposefully leverages this, making collaborative learning—formal and informal—as integral to success in the course.

Literature review

Caffarella notes that transfer of learning has “often been thought of in behavioural terms—that is, what is to be transferred can be clearly specified in terms of observable changes in knowledge, skills and attitudes.” (2002, p. 205). Brookfield (2005) describes transfer of learning as “the process by which learners apply, in settings outside of an...educational setting, the skills and knowledge they have learned within that setting” (p. 627). Sork identified “devising transfer of learning plans” as important in the program planning (or curriculum) process, and credits Caffarella with bringing the concept of transfer of learning to the fore, since “most (curriculum) models are silent on this important aspect of planning, or just assume that this will be taken care of when designing instruction” (2011, p. 162). Among numerous transfer of learning techniques identified by Caffarella (p. 217), individualized learning plans, mentoring, portfolios, networking, and reflective practice all feature prominently in the course design for ETEC565A.

Transfer of learning and specific course components

Throughout ETEC565A a series of learning activities are facilitated via the course WebCT Vista discussion forums. These inquiry-, case-, and problem-based learning scenarios were designed to allow students to link the relevant readings to practice, reflect upon their own experiences, and to communicate as an educational professional with their peers. With a disparate range of educational practices, we created scenarios that reflect, in broad terms, the range of contexts in which MET students work. Similarly, the trigger question for each has the scenario protagonist inquiry of the reader (as an educational professional) for their opinion on an idea or strategy in the protagonist's practice. This allows for each student to draw upon their own form of educational expertise in their response.

This strategy was impactful: Sixty four per cent of respondents agreed that the scenarios improved their practice. An even higher percentage—81 per cent—agreed that the scenarios helped them link theory to practice.

The course's Elearning Toolkit (http://wiki.ubc.ca/Course:ETEC565/Elearning_Toolkit) is a wiki-based, self-directed repository of various elearning design elements. Students are encouraged to choose which elements upon which to focus their time, based on their extant skill level and design decisions for their course assignments. We made the toolkit forward facing on the web, in the hope that students would find the resource useful subsequent to having completed the course. We also wanted to model ways in which free social media can be leveraged to facilitate learning—sometimes in ways other than the tool's more obvious affordances.

Seventy-one per cent have indeed used the toolkit wiki since completing the course. Post-course, 38 per cent have found the toolkit useful: thirty-six per cent said it had impacted their practice. Twenty-six per cent had developed a similar resource in their own context. Thus significant transfer of learning related to toolkit—its contents and its pedagogical approach—occurred.

Learning community; community of practice

Nearly all respondent found the learning community design employed in ETEC565A relevant, with two-thirds finding it very or highly relevant. Table One outlines these results:

Table 1: Relevance of learning community aspect of course

Learning community aspect was:	Percent
Highly relevant	43
Very relevant	24
Significantly relevant	25
Marginally or not relevant	8
Prefer not to answer	1

In total, 92 per cent of the study participants saw the learning community aspect significantly, very or highly relevant.

Our aspiration for the MET is that the learning community persists post-programme as a community of practice; this is also a goal for ETEC565A in particular. In fact, almost half of respondents—forty-seven per cent—felt there was a programme-level community of practice. However, only 36 per cent felt ETEC565A's community of practice persisted after the course. A better understanding of why this is the case, including how participants differentiate between a course-level versus programme-level community of practice, are a key topic for the ongoing qualitative interviews.

ETEC565A overall

Writ large, nearly all respondents (over 90 per cent) felt somewhat or very successful in applying what they learned in ETEC565A to their practice. Fifty-eight per cent felt highly successful; thirty-five per cent felt somewhat successful; only four per cent unsuccessful. Of those who felt somewhat or unsuccessful, a range of (non-mutually exclusive) reasons were identified, as outlined in Table Two.

Table 2: Reasons not highly successful

Reasons	Percent
Onerous assessment and prep time	19
Lack of support from my leadership	13
Lack of support at the district level	12
Lack of access to hardware	11
Lack of access to software	9
My priorities have changed	1

Of the reasons selected the sole intrinsic one—the last one, “my priorities have changed”—was selected by only one per cent of respondents. All the others are structural barriers, with workload and various lacks of support the more frequently cited reason.

Participants overall ranked ETEC565A as having great value (72 per cent), with 35 per cent describing it as the most valuable MET course they have taken; another 37 per cent describing it as highly valuable (only six per cent characterized it as having limited or no value). In terms of impact on their practice, nearly half—47 per cent—saw its impact as very significant, with another third seeing it as having had significant impact. Again, only six per cent characterized it as having limited or no impact.

When asked a final qualitative question to address anything not covered in the questionnaire, several respondents spoke to ETEC565A’s transfer of learning. Note: each paragraph represents a different person’s response to the question:

> I felt the most inspired by ETEC565A to advance my tech expertise. I was keen to initiate a community of practice in my chemistry classes immediately. I learned to use tools I had no idea I was capable of creating.
>
> Incredibly practical course. The constructivist nature was frustrating at times, but very valuable. This course has had the biggest daily impact on my teaching career because I use what I learned - the digital story, a blog, and an asynchronous discussion forum in a Moodle shell. Without this course, I would not have had experience with any of these tools and it would have taken me much longer to find the time on my own to learn them, let alone implement them.
>
> The community of practice in this course should be an example for all MET courses. If so, the community of practice will be strong all the way along the programme and will probably continue after in some ways. The collaboration with others in that course is something I will remember... I am still in touch with some of the people I met in that course. That aspect alone means a lot to me. Within other things, the teacher had facilitated that aspect all along the course which I applaud. As an online teacher myself I know exactly how much energy it takes from the facilitator. BRAVO!!!
>
> Thank you for teaching me how to learn.

Clearly there has been significant transfer of learning for these respondents, in terms of skills, but also with respect to ETEC565A’s impact on their practices as educational professionals, as well as their membership in a community of practice.

Conclusion

Sixty per cent of survey respondents were initially willing to participate in a follow-up interview; these will be conducted between July and November 2012. The interview questions have been crafted to clarify ambiguous results from the questionnaires, gather stories related to students’ course and post-course experiences, and to solicit additional feedback related to transfer of learning and the community of practice experience, specifically with ETEC565A and with the MET programme overall.

In addition to the descriptive data included here, additional quantitative analyses will be conducted. In particular we are keen to discern any effects related to gender, years in practice, context of practice (in terms of student audience, teacher versus other educational professional, and jurisdiction), and age on the transfer of learning. We will also analyze the data for any effects related to the gap between completing ETEC565A and completing the questionnaire: do those who completed the course 2 months ago (for example) differ in perspective between those who completed it two or three years ago?

According to Caffarella transfer of learning is, on a fundamental level, about assisting people to make changes, “in themselves, other people, practices, organization and/or society (p. 206).” A richer understanding the extent to which transfer of learning occurs, what facilitates transfer, and what impedes it, serves this aim. Lave and Wenger argue that “development of identity is central to the careers of newcomers in communities of practice, and thus fundamental to the concept of legitimate peripheral participation.” (p. 115) the extent to which participants’’ experiences align with this position—the extent to which their identities as educational professionals have been impacted by completing ETEC565A and endeavouring to transfer the knowledges acquired there to their educational practice—is also something we will explore during the interviews.

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[1] In the Canadian context “course” refers to one unit of study, or “paper”.

Google Analytics as a tool in the development of e-learning artefacts: A case study

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The design, development, and evaluation of e-learning artefacts requires extensive and potentially time-consuming evidence collection in order to verify that the artefact is fulfilling its educational goals. There is a need for inexpensive tools that can facilitate the quantitative portion of this evidence base. This paper explores the use of Google Analytics in this capacity. The needs analysis, design, testing, embedding, and evaluation of APA Interactive – an e-learning artefact targeting students at Massey University – serves as a case study, demonstrating how analytics data can inform all stages in the creation of web-based educational resources.

Keywords: online learning; evidence-based practice; e-learning artefacts

Google Analytics launched in 2005, and rapidly became one of the most prominent on-site web analytics solutions (Clifton, 2012). Analytics can provide website owners with a wealth of data, measuring visitor numbers, the source of those visits, visitor technology, the way in which visitors interact with the site, and more. The data is aggregated in real-time but is not uniquely associated with individuals. Although Google Analytics primarily targets e-commerce sites, it has been drafted by educational technology research as a way to analyse the use and success of educational websites and online tools. Recent studies have employed analytics to improve website navigation (Fang, 2007), identify user needs through search keyword analysis (Yardy & Date-Huxtable, 2011), and track multimedia usage (Betty, 2009).

This paper discusses the ways in which Google Analytics informed development of an educational web tool, APA Interactive, at Massey University. Phillips, Kennedy, and McNaught (2012) describe stages in the lifecycle of an e-learning artefact; in this case study analytics data was a component in five of these stages:

- the original needs analysis
- the design and testing of the APA tool
- embedding in authentic learning environments
- evaluation of its reception and use
- identification of opportunities for future development

The purely quantitative data of analytics is not sufficient on its own to inform these stages, but "usage statistics have some advantages over other site evaluation tools because they monitor how users actually work with a site rather than what they say they would do" (Arendt & Wagner, 2010, p. 38). Analytics provides detailed, granular, and anonymous data that can be compared over years of use, making it a prime candidate to support the evidence base behind e-learning artefacts.

Context

The APA Interactive tool was developed for Massey University's Online Writing and Learning Link (http://owll.massey.ac.nz/). OWLL is a public-facing learning portal covering a wide range of tertiary study topics: time management, critical thinking, assignment writing, referencing, exam preparation, and other aspects of academic literacy. The university's Centre for Teaching and Learning operates and maintains the site.

OWLL is not designed to be a learning environment in itself; a relatively static website has the potential to fall into the "education as information delivery" trap (Herrington, Reeves, & Oliver, 2005) and ignore the authentic environments necessary for effective teaching. Instead, the website is conceptualised as a source that can be used within classes and mediated by the lecturer, or accessed independently by students from throughout the university.

Needs analysis

Analytics data has been collected for OWLL since 2007. The original identification of the gap that APA Interactive was designed to fill relied on three statistics available through Google Analytics: pageviews by section, keywords used in Google searches that led to the site, and keywords used in the in-site search bar.

Pageviews are perhaps the most widely used feature of Google Analytics. They track the number of times a page has been accessed by a web browser – a more useful statistic than server-side data because they exclude the majority of non-browser visits by web crawlers and robots (Clifton, 2012). These pageviews can be categorised by subsection within Google Analytics. Table 1 summarises the most popular sections of OWLL from 2009 to 2011. Referencing was consistently the most popular section by a significant margin.

Table 1: 2009 OWLL pageviews sorted by section

OWLL section	Percentage of pageviews		
	2009	**2010**	**2011**
Referencing	29.6%	37.2%	40.9%
Assignment types	18.6%	15.2%	16.1%
Academic writing	9.1%	11.8%	12.5%
Study skills	7.9%	6.5%	5.8%
Tests and exams	5.7%	4.6%	3.9%
All other sections	29.2%	24.7%	20.9%

Analytics data also divides visits based on the method of entry: direct (visitors typing the address into their browser or following a bookmark), referral (link from other websites), and search (visitors coming from Google, Bing, or another search engine). In the case of visits arising from a search engine, analytics lists the keywords or phrases that led to the site, and this can provide additional data about the topics that are most important to the site's users. In the case of OWLL, 26.4% of the 2009 searches involved keywords relating to referencing: "citation," "APA," "MLA," "footnotes," "referencing," and the like. Likewise, searches from the site's own search bar focused on referencing (11.5% of searches in 2009).

The popularity of the referencing section was reinforced through other channels, such as informal student and staff feedback. That feedback also identified the core problem: referencing involves simple rules, but there are hundreds of those rules. The student need was caught between "information overload" and "I need an answer to my specific (and obscure) question." Few students would need to know how to cite a book with six authors until they encounter that specific situation, but once they do encounter it they require an answer immediately.

Teaching the technical aspects of referencing is not a new problem, and many solutions already exist. The two most common approaches are books and websites with long lists of examples and explanations, and bibliographic management software such as EndNote, Mendeley, or Zotero. The APA Interactive solution targeted the middle ground between these two solutions, incorporating the easy access and low learning curve of a website while avoiding the excessive and static inventory of referencing rules.

Design and testing

Studies in website viewing behaviour consistently emphasize that users prioritise the parts of the webpage immediately visible when the page is loaded – the so-called 'above the fold' principle (Djamasbi, Siegel & Tullis, 2011). However, it can be difficult to determine just what appears above the fold given that users have wildly different screen resolutions.

Google Analytics records the screen resolution of all visitors to the site. In 2009, more than 50% of users had a resolution of 1024x768 or 1280x800, and this data formed the basis of the APA Interactive tool's design. Since that time Google has added a visual breakdown of which sections of a webpage are visible to its users without scrolling (Yahas, 2012).

There are many answers to the 'above the fold' problem: clickable anchors that direct users to the appropriate part of the webpage, hide-reveal script that expands sections of the page, and formatting solutions such as charts and flowcharts. APA Interactive was conceived as a tool that would maximise the amount of information that could be conveyed in a small space, while also preventing information overload by revealing relevant sections only when explicitly required. The final version incorporates more than 6000 words of text, but the entire artefact remains above the fold for most users (Figure 1).

APA Interactive presents a range of basic referencing options (referencing a book, book chapter, journal article, and so forth) and a menu of customisable options (multiple authors, edition numbers, print vs. internet sources). When these are selected, the tool creates a correctly formatted sample of the reference list entry and in-text citation for each option. Several hundred different combinations are possible depending on the options chosen. Clicking on parts of the example opens popups that give further details about that component: where to find the publisher location, for example, or how to capitalise the source's title.

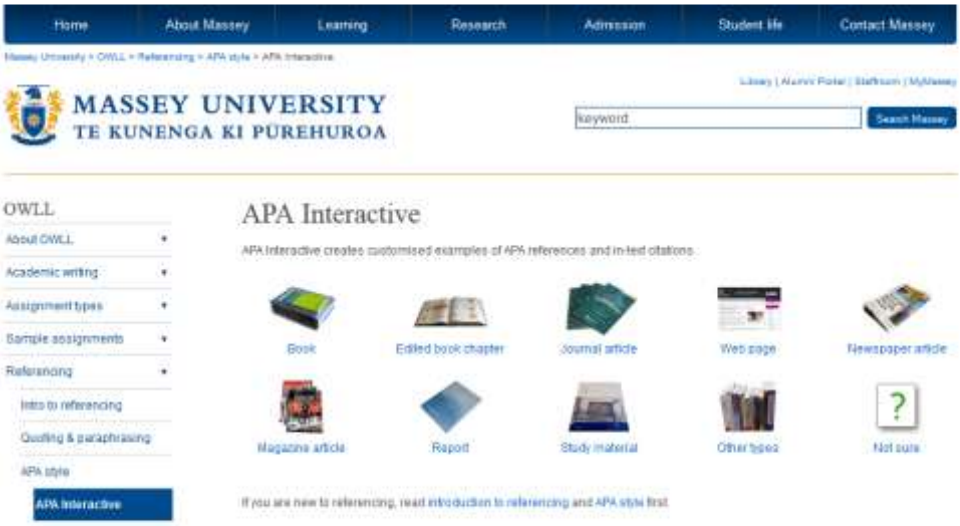

Figure 1: APA Interactive

The tool was coded in JavaScript with the help of the jQuery library. Google Analytics data directed the technical aspects of pre-release testing. If more than 1% of OWLL visitors used a particular browser or system, that environment was tested to ensure that APA Interactive displayed and operated correctly. In 2009, four browsers were above that 1% threshold: Internet Explorer (65.3%), FireFox (25.0%), Safari (5.6%) and Google Chrome (2.8%). The system breakdown at that time was 91.2% Windows, 8.0% Mac, and 0.6% Linux, so the tool was tested on both Windows and Mac systems. The technical specifications of the target audience were clearly identified in the analytics data. Any future changes in those specifications can also be tracked: in 2012 Google Chrome is used by 28.0% of visitors.

Embedding in learning environments

As mentioned earlier, Google Analytics tracks the source of all visits. This proved helpful to identify the learning environments in which OWLL was used. In 2009, the majority of referral links (37.9%) came from within Massey University's Online Learning Enviornment (OLE), WebCT. The development of APA Interactive coincided with the university's shift to Moodle, so connections to the tool were integrated into the new OLE via custom blocks that lecturers could add to their Moodle environment. Teaching development staff also encouraged lecturers to use the tool in assignment instructions and study materials. A significant minority of referral visits (5.9%) came from links on the Massey Library website, so this site was also identified as a potential student entry point.

Evaluation

Quantitative data is only a part of the proper evaluation of an e-learning artefact: "usage logs simply record users' behaviour in an e-learning environment, but they do not explain why that behaviour occurs" (Phillips et al., 2011, p. 997). The quantitative measures of Google Analytics used to evaluate the success of the tool included pageviews, numbers of returning visitors, and average time spent on the page. By all of those measures, APA Interactive has seen significant uptake by students and staff.

Over the first semester of 2012 the page recorded 100,713 views, an average of more than a thousand views per day. Although analytics data on returning vs. new visitors is not a perfect metric (Clifton, 2012), Google Analytics data suggests that only 27% of the pageviews were from first-time users, indicating a high level of repeat usage. In terms of time spent on the page, APA Interactive recorded more than twice the overall site average, suggesting that students are accessing the details provided by the tool.

Future development

Loftus (2012) notes that analytics reports can facilitate iterative improvement. Data can be used to identify and quantify trends in user technology and behaviour, and that in turn can inform future developments. For example, the current movement towards mobile learning and social network integration (Brown & Green, 2012) is reinforced by the data. Google Analytics can identify the ratio of visits from mobile devices. While still small as a proportion of total visits, mobile users in the first semester of 2012 increased nearly sevenfold over 2011. In terms of social network integration, links on Facebook are now the most common non-Massey source of referral visitors.

Conclusion

Analytics provides data beyond a simple headcount of visitors to a page. The method of entry (search keywords and external links), the technical specifications of users (screen size, browser, operating system, and mobile use), and the details of visits (levels of return visits, time spent on the page) can all inform the design, evaluation, and continued development of an e-learning artefact. This data can complement and verify other sources of information, such as student and staff feedback, to ensure that these artefacts are fulfilling their function and will continue to do so in the future.

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An Informal Community of Practice: The Case of the DEHub Virtual Worlds Working Group

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The DEHub Virtual Worlds Working Group has an informal membership of nearly 200 members with an interest in education and virtual worlds within the Australian and New Zealand context. Members come from a variety of academic disciplines and may be teaching or research academics, Research Higher Degree candidates, project managers, virtual world builders and developers. The group acts as an informal Community of Practice, facilitating learning and the transfer of skills through social contact, opportunities to collaborate on projects and publications, and through the sharing of knowledge and experience. This poster provides a snapshot of the activity of this highly active group.

Keywords: community of practice, social learning, informal learning

An informal community of practice

The Australian and New Zealand Virtual Worlds Working Group (VWWG) began in November 2009 as a small group of 10 academics from the DEHub Consortium of the University of New England, Charles Sturt University, University of Southern Queensland and University of Central Queensland. At that first meeting, it was decided to open up membership beyond the DEHub consortium as there was considerable expertise in virtual worlds and education outside of that group of institutions. The group now has a membership of 190 from 55 Australian and New Zealand institutions. From February 2010, the group has met monthly in Second Life at Australis 4 Learning – an island jointly owned by the University of New England, the lead project member of the DEHub, and two other members of the VWWG (Gregory, 2011). The membership of the VWWG has a common interest in using virtual worlds for teaching and learning, though individual's own roles in institutions vary. The majority of the members have roles as teaching academics but there are also research academics, Research Higher Degree students, and virtual world builders and developers. Even within those groupings, there is considerable variation both in the level of experience in dealing with virtual worlds and the teaching disciplines.

Since its inception, the VWWG has acted as an informal Community of Practice. Étienne Wenger defined a community of practice as “a group of people who share an interest in a domain of human endeavour and engage in a process of collective learning that creates bonds between them” (Wenger, 2001, p. 1). Wenger’s theory acknowledges that adults learn through everyday social practices rather than in environments intentionally designed to support learning. Communities of practice differ from other communities in three significant ways:

1. They generally focus on a domain of shared interest;
2. Members interact and learn together by participating in joint activities and discussions, helping each other, and sharing information; and,
3. Members develop a shared collection of experiences, stories, best practices and solutions to problems. Communities of Practice exist only as long as participation has value to their members (Gray, 2004, pp. 22-23).

Methodology and Results

This interpretive study used a multi-method approach based on practices and assumptions of qualitative inquiry. Data sources included a review of newsgroup postings, publications and project reports of participants, Second Life chat transcripts, and a survey consisting of six open-ended questions (Patton, 1990). The study was limited to the experiences of those six members who were selected as being representative of the group (Gray, 2004, p. 24). This pilot is preliminary to a larger study to be undertaken in the latter part of 2012 and beginning of 2013.

The findings in this study suggest that the VWWG does function as a Community of Practice. Motivations to participate included an opportunity to learn new skills and work practices, the opportunity to collaborate, and a means of social and professional connection to colleagues. The response below is typical of those received:

> Belonging to a group of like-minded academics, educators and HDR students has been very intellectually sustaining. Within my own immediate environment there are very few opportunities to discuss things virtual with others who are interested, active in the field, and who actually know something about virtual worlds and education. Through the VWWG I have become much more aware of the work others are doing around Australia and in New Zealand which has made me feel less isolated in my own work. It has also exposed me to collaborative opportunities that I otherwise would not have had.

The findings also suggests that the moderator played an integral role in enhancing the functioning of the community by providing technical support, maintaining group process, nurturing the social aspects of the community, and facilitating learning. As one of the members indicated, the moderator “has been the driving force that kept the momentum going. Without this community leader, I don't think the group would have survived. Sue [the moderator] deserves our gratitude for this effort.”

Members of the VWWG began collaborating with each other on a number of projects and publications soon after the group’s inception. The first was collaboration between the University of New England and Charles Sturt University with a scoping study undertaking a systematic review and environmental analysis of the use of 3D immersive virtual worlds in Australian Universities (Dalgarno, Lee, Carlson, Gregory, & Tynan, 2010, 2011). In November 2010, five institutions from the VWWG were awarded an ALTC (Australian Learning and Teaching Council) grant called VirtualPREX researching virtual worlds for professional experience by pre-service teachers through self, peer and academic assessment, both formative and summative (Gregory, 2011). In 2010, 2011 and 2012 members of the VWWG wrote joint papers for the annual ascilite conference where nearly all members contributed. Members of the VWWG also participate in presenting at other’s institutions, joint presentations at symposiums and papers at conferences. They have also joined together to conduct conferences, workshops and sharing of space in the virtual world (Gregory, 2011). The most recent collaborative project that the group has undertaken is the production of a VWWG book. Extended abstracts were sought from authors worldwide to contribute to the book titled “Virtual Worlds in Online and Distance Education” which will be published in late 2012. This call for papers received 94 contributions, demonstrating the interest and wide expertise of the group. All members who responded to the survey indicated that this collaborative aspect of membership was well-appreciated.

Conclusion

The Australian and New Zealand Virtual Worlds Working Group acts as a Community of Practice for those interested in education in virtual worlds. It has demonstrated how international collaboration can take place. The group currently meets inworld (in Second Life) once per month to discuss current and future collaboration and how to assist each other in achieving their individual, institutional and project goals.

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Bridging the digital divide: bringing e-literacy skills to incarcerated students

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Incarcerated students face a number of additional challenges to those faced by most other students studying at a distance. Lack of internet access is especially problematic for those studying in a sector that is increasingly characterised by online course offerings. This paper reports on a trial project that will attempt to address the digital challenges that hinder access to higher education by incarcerated students, and to provide them with inclusive learning experiences. The trial utilises Stand-Alone Moodle (SAM) and eBook readers with a small sample of incarcerated students participating in the Tertiary Preparation Program (TPP) at the University of Southern Queensland (USQ). This project potentially addresses the digital divide experienced by incarcerated students as compared to the general student population. It is anticipated that students will participate in learning experiences more closely related to those experienced by students who study in online environments, that and they will acquire relevant e-literacy and e-research skills.

Keywords: digital inclusion; distance learning; higher education; prisons; Moodle; eReaders

Introduction

Australia's prison population averaged 29,106 adult prisoners in 2011 (ABS, 2011). Most prisoners are from low socio-economic status (SES) backgrounds and are likely to have experienced social and economic disadvantage. As a result, in comparison with the general Australian population they experience a relatively high chance of unemployment on release, face on-going health and social problems and have limited work experience (Giles, Le, Allan, Lees, Larsen & Bennett, 2004). Contemporary studies demonstrate that the rates of recidivism are significantly lower for prisoners undertaking a post-secondary educational program while incarcerated, compared to the general prison population (Richards et al., 2008; Aceves et al., 2011). Distance education (DE) has traditionally been viewed as a boon to education in prisons, delivering education to students that are unable to undertake traditional face-to-face education (Salane, 2008). However, the increasing reliance on e-learning has resulted in greater challenges for incarcerated students attempting to participate in higher education (HE). Almost universally, prisoners are not permitted any access to the internet, and ICTs often pose an unacceptable security risk.

PLEIADES (Portable Learning Environments for Incarcerated Distance Education Students) is a trial project undertaken by USQ to address some of the barriers to participation in HE by incarcerated students. The aim is to trial the use of e-learning technologies which are independent of the internet, yet still enable students to access USQ courses electronically. The learning technologies to be piloted include an internet-independent version of USQ's Learning Management System (LMS) specifically developed for the project called Stand-Alone Moodle or SAM. SAM will replicate USQ's online learning environment for incarcerated students by enabling them to view and use the same course materials and assessments embedded in the USQ LMS but in a simulated online environment without internet access. The use of SAM in PLEIADES will also be supported by the use of eBook readers. The eBook readers will enable incarcerated students to access course and reference materials in order to extend learning beyond their very limited access to the correctional centre computer lab and into personal and leisure time. In this way, a learning experience comparable to the experience of non-incarcerated students studying the same program at USQ will be provided for incarcerated students. The project will be deployed in Semester 2 2012 with a maximum cohort of 15 incarcerated students enrolled in *TPP7120 Studying to Succeed* as part of the Tertiary Preparation Program at the Southern Queensland Correctional Centre (SQCC).

Current provision of tertiary education in prisons

The role of education in prisons serves two purposes: increasing opportunities for employment after release, but also most importantly, improving self-esteem and self-confidence to assist in avoiding the negative lifestyle temptations that contributed to the initial incarceration of offenders. As a result, a greater emphasis has been placed on education opportunities for prisoners. Studies have found that participation in formal education programs have generally been successful in reducing recidivism (Callan & Gardner, 2007). Even so, participation remains low with 35% of eligible prisoners in 2009-10 participating in accredited education courses. The decision to participate in education depends on a number of factors including the length of sentence, the constraints of sentence management plans, the capacity of Education Officers to provide learning support, the demands of in-prison employment the availability of programs and courses (Giles et al., 2004). Overcrowding and restricted access to computers further limits prisoner access to education (BearingPoint Review, 2003). Prisoners are hampered in their choices by the extent to which courses require students to access online activities. Correctional centres are reliant on tertiary education institutions for the provision of DE for offenders who wish to participate in HE (Dorman & Bull, 2003). Preparatory, undergraduate and some postgraduate programs have traditionally been accessible to prisoners in print-based forms. These materials are sometimes supplemented by visits from teaching staff, depending on the location of the provider. Provision of education services to prisoners is becoming increasingly problematic given the increasing reliance on digital and mobile delivery of materials and assessment.

Information Technology and Lack of Internet Access as Barriers to Prison Education

The 'USQ Connected' initiative is representative of the broader sector's increased reliance on online delivery. Though the increased use of technology does help address the emerging demand for flexibility in learning, it also excludes significant portions of the student population including incarcerated students (Aceves et al., 2011). Currently, supporting incarcerated students to successfully undertake university studies requires Education Officers at correctional centres to spend time liaising with universities, carrying out the online research that students need to fulfill the demands of the course, and printing out that information for the students. A major challenge for future DE provision to this cohort is to identify alternatives that will allow prisoners to access the LMS while maintaining the necessary security. Although the traditional forms of delivery using hard-copy are successful to a certain extent, they do not enable incarcerated students to develop the e-literacy skills that are essential in current education environments. Most prison education centres provide access to computers which inmates may access for a few hours under strict supervision. Some prisons run in-cell laptop programs for students engaged in tertiary studies (BearingPoint Review, 2003). Incarcerated students are unable to access course materials and multimedia supplied via the course LMS (at USQ an instance of Moodle called the 'Study Desk') and they are unable to complete assessment requirements of courses online. Most significantly, they are unable to communicate with other students outside of the facility and even within the facility through course discussion boards. This undermines the social constructive pedagogy favoured in many post-secondary programs (Erisman & Contardo, 2005; Bowden, 2002) and poorly prepares students for a world in which employers expect their employees to be familiar with social networking and other web 2.0 resources. The imperative to address this digital divide for these students is acute.

Addressing digital inequities using secure learning technologies

The PLEIADES project resulted from discussions between staff at the SQCC, Queensland Corrective Services (QCS), the Australian Digital Futures Institute (ADFI) and the Open Access College (OAC) the latter two organizational units being located within USQ. OAC has sought to support students in disadvantaged or vulnerable groups through the provision of a Tertiary Preparatory Program (TPP) articulating into various degree pathways. TPP is offered by the OAC to prospective students over the age of 18 who cannot gain entry via traditional pathways. Typically, these students are from low SES backgrounds and may have experienced educational disadvantage (Klinger & Wache, 2009). If the TPP is to prepare students for university studies that incorporate the use of the online Study Desk, then developing e-literacy skills have to be an integral part of the course (Orth & Robinson, 2010). A significant number of incarcerated students enroll in the TPP and, for this cohort in particular, the educational aims of the program can be difficult to achieve. The course which is the focus of the PLEIADES project is *TPP7120 Studying to Succeed*. Because of their lack of internet access, incarcerated students have received large blocks of printed matter containing course materials and resources. This is costly for USQ to assemble, print and post, and is in no way interactive.

Stand Alone Moodle

The PLEIADES project team determined that in order to provide an equivalent study experience for incarcerated students as compared to non-incarcerated students enrolled in *Studying to Succeed*, it would be necessary to replicate the course Study Desk. This alternate instance of the LMS could have no possible communication to the internet. It would have to be wholly contained on the correctional centre education server with installation and harvesting of results being conducted using flash drives by USQ's Division of ICT or SQCC education personnel. USQ has been working closely with Queensland Corrective Services to define the functionality of the SAM Study Desk that would comply with ICT and security constraints. This modified LMS will be installed on the educational server at SQCC and will be accessed via the network of computers available to students in a designated education lab located at the correctional centre. Incarcerated students will be able to access course materials as well as to complete quizzes and participate in discussion boards via the SAM LMS. The discussion boards will only be accessible to the incarcerated students while located in the correctional centre's education computer lab and under the direct supervision of Education Officers. It is expected that Education Officers will 'strip' the course assessment items prepared by students from SAM and submit them directly into the USQ online assignment submission system. Education Officers will have administrative rights to this system to streamline the process. In this way, incarcerated students will be able to gain many of the e-literacy skills they will need in a simulated online environment without having or needing access to the internet, thus completely avoiding those security risks engendered by prisoner access to the internet.

eReaders

Students within correctional centres are often juggling part-time study with work commitments. An incarcerated student undertaking a part-time study program may only have access to the relevant computer lab one afternoon a week. There is an in-cell laptop computer borrowing scheme that some incarcerated students are able to access. Even so, the opportunities to extend learning beyond the education lab are limited and laptops are not available to students enrolled in the TPP program (these are reserved for students enrolled in degree programs). In response to this need, the PLEIADES project team will pilot an eBook reader scheme to run in conjunction with the SAM trial. eBook readers are small portable electronic devices which can hold a large number of electronic files such as electronic books (eBooks). The eBook readers in the trial will be loaded with course study materials and additional study resources of potential use to the students. The eBook readers selected for use in the trial are Sony PRS-505s, chosen because they do not have any ability to connect to the internet either via wireless or 3G networks. In addition they cannot connect remotely to another device other than through a specific cable which will be retained by the education officers. They have a long battery life that can be measured in weeks or months. The eBook reader batteries are an integral part of the device and cannot be removed or modified without damaging it. For the pilot project, course materials and associated reference material will be vetted for copyright compliance and converted into ePub format for loading onto the Sony eBook readers to be provided to incarcerated students enrolled in the *TPP7120 Studying to Succeed* course. An eBook reader borrowing scheme will be set up by Education Officers at the SQCC, similar to the one that already operates to manage the borrowing of in-cell laptops. The eBook readers are charged using a cord that plugs into a USB port of a computer; in this case, an Education Officer's computer. Students using the devices will be able to hand their eBook readers to Education Officers on specified days for charging. They will be able to take the eBook readers back to their cells to browse readings, watch embedded multimedia, take notes on readings and thereby extend their study into their private time.

Evaluation

The pilot project will be evaluated using a design-based evaluation methodology to determine whether these learning technologies are able to improve access, retention and completion rates of incarcerated students as well as give them an experience comparable to that of distance students who are not incarcerated. The project will be deployed in July 2012 at the Southern Queensland Correctional Centre. An evaluation of the trial project will be carried out, involving the correctional centre education staff, the incarcerated students involved in the project, the course lecturers, and correctional staff responsible for IT security. Much of the research that has been conducted in correctional centres has failed to reflect the views of prisoners themselves (Richards et al., 2008). Consequently, ethical clearance has been obtained from USQ and the Queensland Department of Corrective Services so that quantitative and qualitative data can be collected from Education Officers, course lecturers and most importantly, from the students themselves.

Conclusion

USQ delivers programs to a large cohort of students from regional, remote or rural areas within Australia as well as internationally, in addition to incarcerated students. These students are frequently from low socio-economic backgrounds and they often experience difficulties in gaining access to the internet or using mobile devices. USQ and other distance education providers, therefore, need to address the issue of lack of internet access if they are to continue to remain viable providers of HE within these environments. At present there are very few other prisons in Australia or globally that have successfully implemented electronic or mobile learning for incarcerated students. USQ expends large sums of money and resources on printing materials for students and providing individual alternatives to students who are unable to access online resources. USQ personnel are independently developing alternative approaches on a case by case basis without support from USQ policy or processes. The development of secure learning technologies such as SAM and eBook readers for prison education will result in improved quality and consistency of educational initiatives, encourage student-centred learning and provide learning opportunities that can be tailored to a student cohort that has greater educational needs than most members of the general community. Results from the project outcomes will inform USQ, the Queensland Department of Corrective Services, and other stakeholders on innovative technological approaches to enhancing the digital inclusion of learners who cannot access the internet, and of the needs of students in areas where internet access is not possible such as in corrective facilities, remote Australian Indigenous communities, and other rural and remote communities.

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Rejuvenation Island: Enriching the Learning Journey through Immersion in Virtual Restorative Environments

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Immersive natural environments provide a means of restoration for adults and may present benefits for pre-service teachers who are unfamiliar with the natural world. The use of restorative virtual environments could be extended to schools in urban areas in particular, allowing pupils and their teachers to undertake field trips, and to relax in a calming and restorative context. This paper reports on a project that investigates the potential restorative benefits of immersion in simulated natural environments in virtual worlds. A cohort of pre-service teachers were taken into the simulated environment and reported that the island produced strong positive feelings in respondents, akin to being in a natural environment. However, it was also clear that a lack of familiarity with virtual environments diminishes the beneficial impacts of this immersion.

Keywords: restorative environments, virtual worlds, teacher education, biophilia, effects of nature, restorative therapy, stress management, Second Life

Benefits of Immersion in Natural and Natural-seeming Virtual Environments

This study seeks to evaluate the restorative impact of pre-service teachers' online engagement in a simulated natural virtual world environment. Measures of subjective wellbeing and attention focus were taken before and after the immersion experience with groups taking a survey online. The findings are in accord with emerging research in this field, and consistent with studies by Valtchanov, Barton and Ellard (2010), and Depledge, Stone and Bird (2011), which indicate that immersion in virtual environments has restorative qualities.

Context of the Study

These findings have broader implications in the context where education for creativity and sustainability is noted as a priority (MCEETYA, 2008) for human and environmental health in 21st century Australia. A growing body of international research indicates that engagement in natural environments has positive benefits for children's physical and emotional development (Jones, 2006; Kirkby, 1989) and psychological wellbeing (White, 2004; Wilson, 2008), and the restorative benefits of natural environments upon adult attention span, perceptions of creativity and wellbeing have been reported by Jones and Moodie (2012; 2012) in pilot projects for this study, and by Depledge, Stone and Bird (2011) who documented enhanced recovery of "attentional capacity and cognitive function following intense mental activity" (p. 4660) as a result of immersion in virtual environments.

Conduct of the Study

Participants: 56 participants in total undertook the study. The majority of participants were undergraduate pre-service teachers. A small number (n=3) were postgraduate students undertaking Masters level study in education. Group 1 (n=9) undertook the survey and immersion experience in an on-campus computer studio. Group 2 (n=47) undertook the same experience online and at a distance from the campus. The survey tool: A SurveyMonkey quiz included 8 questions for which participants selected answers on a 5 point Likert scale. After question 1 and 2 participants spent 30 minutes on Rejuvenation Island in Second Life. On their return to the survey, participants responded to questions 3 and 4. These were identical to questions 1 and 2 and allowed a comparison of responses (Figure 1 and 2). A group of 9 participants took the survey and engaged in a Second Life environment in the first group and 47 in the second (n=56). Ethics clearance for the study was granted, and all participants gave informed consent.

Rejuvenation Island

The island (http://maps.secondlife.com/secondlife/RejuveNation/76/197/22) includes simulated flora, fauna and sounds of an Australian bush and beach environment. Sounds of crickets and birds, and the waves washing onto a beach re-create a feeling of being in a real environment. Rivers host native catfish, the beach is inhabited by turtles, and a mixture of rocky and arid and rich eucalypt and grassland offer a range of experiences.

The Findings

As shown in figure 1 and 2, participants indicated that the immersive experience had led to enhanced feelings of wellbeing: “The beach and waves were really calming”. Responses indicated that the island produced strong positive feelings in respondents, akin to being in a natural environment: “The experience allowed an escape from stresses of real life. Had a calming influence and I forgot about day to day worries while in the virtual world.” These observations are consistent with the findings in Figure 1.

However, other feedback made it clear that a lack of familiarity with virtual environments presents an obstacle and diminishes the beneficial impacts of immersion, with one participant noting: “I found it frustrating and very unrelaxing. For students who are familiar with this type of experience it may be restorative”. A third response indicated another layer of complexity: that the experience of exploring and feeling alone in a strange place may bring to the surface anxieties related to perceived ‘real world dangers’ “…at first I felt relaxed with the sounds and everything but soon afterward (10mins) I became very anxious, I didn't want to explore.”

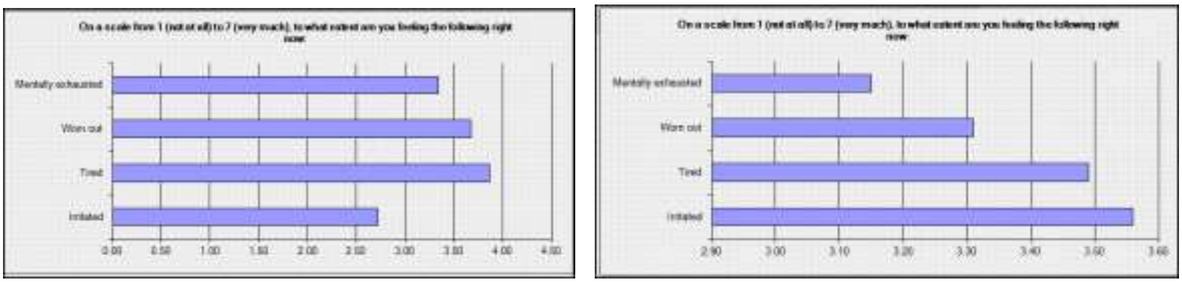

Figure 2: Affective Dimensions Prior to Immersion (Figure 1) and Post- Immersion

The figures give rise to an anomaly: post immersion (Figure 2), the level of reported mental and emotional exhaustion is lower, showing that the experience of immersion had led to a beneficial outcome. However, the reported level of irritation is higher post immersion. Respondents’ written and statistical responses signal that a lack of familiarity with the environment may have been the cause for this.

Conclusions

Immersive natural environments provide a means of restoration for adults and may present benefits for pre-service teachers who are unfamiliar with the natural world. The use of restorative virtual environments could be extended to schools in urban areas in particular, allowing pupils and their teachers to undertake field trips, and to relax in a calming and restorative context. In today’s classrooms where pupils with autism or attention difficulties find the classroom context disturbing, a Second Life retreat may offer a calming and restorative respite. For an immersive experience to be untrammeled by the impact of the unfamiliar, and by the transfer of ‘real world’ anxieties about being alone in a strange place, it is recommended that visitors be accompanied on their first visit, and supported until they become familiar with the navigation and interface of Second Life.

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Implications of the non-traditional student becoming the traditional

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The challenge that the new digital technologies brings to education today is in the shift to online education. Online education, as delivered through Open Universities Australia, is open access, and affords entry into Higher Education for many non-traditional students who are much more diverse in terms of academic skills than traditional-entry students. The aim of this study was to improve academic writing skills, specifically in the correct use of APA formatting for psychology research reports. A 'low-stakes' assessment task worth 5% replaced optional referencing, formatting and report writing exercises. The results found no improvement in student reports (i.e., no increase in assignment grades) in the intervention year compared to three other years where the tasks were optional.

Keywords: non-traditional student, online education, psychology, open-access

Transformation of higher education in Australia

The higher education sector in Australia is currently undergoing a transformation in terms of delivery of undergraduate and, to a lesser extent, postgraduate programs. Driving this change are the new digital technologies which have afforded the shift to online education. An online learning platform constitutes a valuable and necessary addition to an institution's offerings and one considered vital to the sector's long term future. The increasing popularity of online delivery, with the subsequent rise in student numbers, facilitates both an institution's viability as an educational provider in difficult economic times and supports the Australian Federal Government's vision (as outlined in the Review of Higher Education) that by 2020 the proportion of Australian adults who hold bachelor-level qualifications rises from 29% to at least 40% (Bradley, Noonan, Nugent & Scales, 2008).

Student diversity in online education

Accompanying the growth in online delivery of tertiary programs is the increase of students via the non-traditional mode of entry (Cantwell, Archer & Bourke, 2001). An online program offers the opportunity for students who, due to geographical remoteness, restricted program options of nearest educational provider, work or family commitments, have limited opportunities to access on-campus programs of their choice (Ludwig-Hardman & Dunlap, 2003). In addition, rather than students with the traditional educational profile of recent secondary school completion (indicating a homogeneous level of academic competency) found in most oncampus programs, cohorts of online students are often very diverse in terms of their academic skills (ACODE52, 2010; Dearnley, 2003). Therefore, the online student can be an early school leaver or a degree-holder wishing to change careers or complete more studies out of interest, working full- or part-time and living in remote, rural or urban areas. Moreover, diversity is also seen in cultural and family backgrounds with many online students being the first in their family to engage in higher education (Cantwell et al., 2001).
A quantitative growth in student numbers combined with an influx of non-traditional (less homogeneous academic ability levels) students is confronting educators today. Schuetze and Slowley (2002) propose that "the challenge to all universities and other higher education institutions is to meet the educational needs of an ever more diverse group of learners" (p.310).

Open access to a Higher Education Psychology program

Open Universities Australia (OUA) is Australia's largest open-access education provider (Open Universities Australia, 2009), and as such, gives many non-traditional students a pathway into higher education and professional development. As the majority of OUA undergraduate programs have no entry requirements (i.e., ATAR score; previous study or pre-entry examination), student cohorts are very diverse in terms of their literacy, numeracy and computer skills.

One of the strongest areas of student growth is in the discipline of psychology. An estimated 15,000 Australian secondary school students are currently studying psychology (Cranney et al., 2009). There is every indication that many of these students will expect to complete an undergraduate or even postgraduate psychology course (Reece, 2010). Therefore, to meet the projected demand for tertiary level studies, an online program in psychology was developed by Swinburne University of Technology (SUT). Delivered through OUA, SUT's Bachelor of Behavioural Studies (Psychology) is an undergraduate program incorporating an externally accredited major in Psychology.

Given the popularity of the psychology program, and the open-access admission to OUA programs, SUT has experienced very large cohorts in its first year online psychology unit (PSS110 Introduction to Psychology 1 has had up to 1600 students enrolled in one study period). This suggests that many of our students in the introductory psychology unit may not have engaged in study for a considerable amount of time nor have they studied online.

What is happening with Swinburne's OUA Psychology program is no different from what is happening in higher education worldwide, with many governments desiring greater participation in higher education by an increased diversity of student populations (Sambell & Hubbard, 2004). However, the flexibility that open access education affords means that many students are enrolling in tertiary studies lack skills in one or a number of areas (e.g., time management, computer literacy, writing, literature searching) because they have not followed (for whatever reason) the traditional study pathway of completing primary then secondary school before enrolling in higher level studies. Students without a history of previous academic performance will find it harder to succeed with studies in higher education (McKenzie & Schweitzer, 2001). Recent secondary school completers should have a good level of computer skills, be comfortable accessing the internet, and have achieved an adequate level of literacy and numeracy skills (Dearnley, 2003). Regardless of mode of entry, skills deficits in these specific areas are a major obstacle to academic success (Dearnley, Dunn & Watson, 2006) and would appear to compound difficulties in learning more discipline specific skills.

Discipline specific skills

A fundamental skill for any student is the ability to communicate in the language of the discipline, which in psychology is the language of the scientist/practitioner. Written communication takes the form of highly structured research reports which relate, in a logical and clear manner, the results of an investigation into a topic or problem related to psychology. Students learn how to write research reports through a step-by-step process beginning with formatting, referencing, and literature search tasks. The American Psychological Association's (APA) Style is the standard to which psychology reports in Australian universities adhere.

The teaching of discipline specific academic skills is particularly challenging in the online environment. To aid students' learning of APA formatting Hall and McCune (2005) found that including learning objects (e.g., Flash animations) encouraged students to actively participate in learning the formatting rules because it breaks down large and complex chunks of material into smaller more manageable bit-size pieces, and mastering smaller portions of materials sets up learners for success and motivates them to excel in other areas. The authors used flash animations to develop their students' APA formatting skills (e.g., drag-and-drop, sorting, multiple-choice questions, and resource material). Student evaluations were very positive, and student papers showed improvement.

Swinburne's online psychology students are taught by teams of teaching staff using specific tools embedded in the Blackboard Learning Management System, such as, synchronous chat sessions and asynchronous discussion forums. Teaching staff lead online chat sessions and moderate discussion forums to develop students' conceptual and structural understanding of their written assignments (see Fleckhammer & Wise, 2011 for a review of the team teaching method). To alleviate some of the tutors time spent on guiding students in basic but discipline specific activities, students are provided with a series of tasks to complete, such as, referencing or report writing activities.

The referencing and report writing tasks, up to now, have been optional. However, teaching staff observed anecdotally, when grading written assignments, that many students clearly did not take up the opportunity to complete these activities. It was noted that referencing and structuring of reports was quite poorly done and as a consequence students were losing marks that should have been easily attained. Therefore, in the desire to see an improvement in the discipline specific skills of our online students a 'low stakes' assessment was introduced.

The theory behind 'low stakes' assessment

Low-stakes assessments are based on expectancy-value theory which proposes that if a task is perceived as interesting, useful and/or important it is more likely to be attempted. Cole, Bergin and Whittaker (2008) reported that students who perceived tasks as useful and important tried harder, and that trying harder, even on low-stakes tasks, results in better performance. Moreover, motivation theory proposes that the desire to be seen as competent is one of our innate psychological needs. Thus the consequence of students who achieve a high level of competence in specific skills is that they develop an increased level of self-efficacy in their ability to achieve success in other tasks (Ryan & Deci, 2000). Students themselves perceive regular low stakes assessments as helpful for their learning (Sturniolo-Baker & Loiacono, 2012).

The low stakes intervention

In the first study period of 2012, an intervention program was initiated specifically targeting first year, online psychology students' referencing, researching and report formatting skills. In order to gain maximum uptake, it was important that the tasks were brief and promoted as directly related to the written assignments rather than just as skill development (Dearnley, et al., 2006).

The set of six Active Learning Assessments (ALAs) was allocated 5% of the students' overall mark (see Table 1 below). Five marks were allocated to the ALAs for the following reasons:

i) it was approximately the value of marks allocated in each written assignment to the formatting and referencing criterion, and
ii) it would be easily achievable. Students are typically time constrained and out of necessity are very selective in their learning activities and thus the ALAs would immediately be seen as a mark of academic success.

The ALAs were available from Week 1 and students could work through all six at once to achieve the maximum score.

In the first year psychology unit (PSS110 Introduction to Psychology 1), students are required to write two assignments, which when combined, form a complete research report. The first of these assignments introduces students to the practical side of writing in psychology e.g., APA referencing, good/poor research differentiation, library/search skills. The ALAs would directly target these skills.

Assignment 1: An introduction section of a research report. This first assignment is worth between 15-20% of students' overall mark and specific marks are allocated for correct formatting and referencing. Students are given comprehensive feedback by their tutor which informs their second assignment (see Fleckhammer & Wise, 2010).

Assignment 2: A complete research report. This assignment contains an improved version of the first assignment (i.e., the introduction) as students will have taken on-board their tutor's feedback. As for the first assignment, marks are allocated for correct formatting and referencing.

The aim of the two assignments is:

1) to teach students about design, analysis, interpretation, and reporting of experiments in psychology,
2) to teach students how to communicate psychological research in a standardised (i.e., APA) format.

Aim of the study

The aim of this intervention was to determine if the inclusion of a set Active Learning Assessments (ALAs), which were previously optional exercises, now worth 5% of students' overall mark, would result in improvements to students written assignments (i.e., increased overall grades).

The intervention

For Weeks 1 to 6 activities were set which directly targeted both discipline specific skills and more general academic skills. For example, students were required to watch short videos on topics specific to the week's lesson content, answer questions related to the video and then contribute to a discussion forum by commenting on the content of the video. Other tasks required students to conduct a websearch for psychological research literature which met the requirements and for ethical research as per the Australian Psychological Society's Guidelines and report their findings to their tutor (via email) or add comments to a discussion board forum. Still other tasks required students to complete APA formatting activities to develop correct referencing and report structuring skills. Please see Table 1 for the series of ALAs for which students could earn up to 5% of their overall mark.

Table 1: ALAs for Weeks 1 to 6 from Study Period 1, 2012

Week 1	**Aim of ALA**
Watch short video on psychological research	Develop understanding of ethical considerations in psychological research
Conduct a web search to find a 'good' piece of research	Encourage good/poor research differentiation Develop computer literacy skills Develop literature searching skills
Complete referencing activities	Practice formatting references in APA style
Week 2	
Watch video on the brain	Develop understanding of biological basis of behaviour
Conduct a web search to find a piece of 'poor' research	Encourage good/poor research differentiation Develop computer literacy skills Develop literature searching skills
Complete referencing activities	Practice formatting references in APA style
Conduct a literature search two find 2 peer-reviewed journal articles which relate to the topic of the written assignment	Develop literature search skills Develop computer literacy skills
Week 3	
Watch video on the brain	Develop understanding of biological basis of behaviour
Conduct a web search and find out about Phrenology	Encourages critical thinking skills Develop computer literacy skills Develop literature search skills
Complete research report activities	Practice APA formatting conventions
Formulate two hypotheses related to topic of research report	Develop hypothesis formulation skills Develop critical thinking skills Develop writing skills
Week 4	
Watch video on stress management	Develop understanding of impact of stress
Complete report writing activities	Practice formatting reports in APA style
Week 5	
Conduct a web search to find information on repressed memories and hypnosis	Encourages critical thinking skills Develop computer literacy skills Develop literature searching skills
Complete plagiarism activity	Develop understanding of what constitutes plagiarism Develop critical thinking skills Develop writing skills
Week 6	
Complete dream activity	Gain experience in completing dream diaries
Watch short video on sleep	Develop understanding of different perspectives of why we sleep.

Students were allowed to undertake these activities at their own pace, however, they were encouraged to complete the activities in the week that they were set as many of the activities would directly support their first written assignment and consequently inform their second written assignment.

Results and Discussion

The response by students was enthusiastic to say the least. Tutors were swamped with an avalanche of emails, and discussion boards contained many more contributions by students than in previous iterations of the PSS110 Introduction to Psychology 1 unit. However, a true test of this intervention was to be whether there was an improvement in students' work by comparing Assignment 1 and Assignment 2 marks over four consecutive years.

The purpose of this intervention was to determine if the inclusion of the ALAs would result in a transfer of the skills learnt in these tasks to other areas. It was thought that this transfer of skills would be seen in an increase in the grades for two written assignments. It was expected that if a value was attached to a low-stakes task then students would more readily complete the task than if the task remained optional. This appears to be the case, as reported earlier, the response by students was enthusiastic and anecdotally many students reported how much they enjoyed the ALAs.

Comparison of Results Between Cohorts from 2009 to 2012

In terms of actual grade improvement, it was found that when comparing the 2012 results for the two assignments (see Table 5) with the 2011 results (see Table 4) that the results in 2011 (without the intervention) are better than the results in 2012 (with the intervention), in that, a greater percentage of the student cohort in 2011 achieved a grade of Credit and above in both Assignment 1 and Assignment 2 (without the intervention).

Taking into consideration that the 2011 cohort could have been a stronger cohort overall, comparisons among the 2009 (see Table 2), 2010 (see Table 3) and 2012 (see Table 5) cohorts find no real difference in the percentage of students who achieved a grade of Credit or above in both Assignment 1and Assignment 2. It is evident that the intervention is causing little impact on the marks achieved for the written assignments.

2009: The results for PSS110 Introduction to Psychology 1, first and second written assignments for Study Period 1, 2009 are displayed in Table 2. This Study Period had an initial enrolment of 270 students. Withdrawals and attrition resulted in a final active cohort of 130 with 99% of these students achieving a pass grade (only 1 student who completed every assessment failed).

Table 2: Distribution of grades for Assignment 1 and Assignment 2 - Study Period 1, 2009

Assignment 1				**Assignment 2**			
Grade	**No.**	**%**	**Credit & above**	**Grade**	**No.**	**%**	**Credit & above**
HD	6	3.8		HD	10	7.4	
D	24	15.3		D	33	24.4	
C	41	26.1	45.2%	C	38	28.1	60.0%
P	64	40.8		P	44	32.6	
N	22	14.0		N	10	7.4	

2010: The results for PSS110 Introduction to Psychology 1, first and second written assignments for Study Period 1, 2010 are displayed in Table 3. This Study Period had an initial enrolment of 776 students. Withdrawals and attrition resulted in a final active cohort of 338 with 98% of these students achieving a pass grade (6 students who completed every assessment failed).

Table 3: Distribution of grades for Assignment 1 and Assignment 2 - Study Period 1, 2010

Assignment 1				**Assignment 2**			
Grade	**No.**	**%**	**Credit & above**	**Grade**	**No.**	**%**	**Credit & above**
HD	29	6.3		HD	30	8.3	
D	99	21.7		D	97	26.8	
C	121	26.5	54.5%	C	106	29.3	64.4%
P	161	35.2		P	101	27.9	
N	47	10.3		N	28	7.7	

2011: The results for PSS110 Introduction to Psychology 1, first and second written assignments for Study Period 1, 2011 are displayed in Table 4. This Study Period had an initial enrolment of 637 students. Withdrawals and attrition resulted in a final active cohort of 265 with 99% of these students achieving a pass grade (3 students who completed every assessment failed).

Table 4: Distribution of grades for Assignment 1 and Assignment 2 - Study Period 1, 2011

Assignment 1				Assignment 2			
Grade	**No.**	**%**	**Credit & above**	**Grade**	**No.**	**%**	**Credit & above**
HD	23	6.1		HD	31	10.4	
D	79	21.1		D	82	27.4	
C	131	34.9	62.1%	C	104	34.8	72.6%
P	106	28.3		P	56	18.7	
N	36	9.6		N	26	8.7	

2012: The results for PSS110 Introduction to Psychology 1, first and second written assignments for Study Period 1, 2012 are displayed in Table 5. This Study Period had an initial enrolment of 396 students. Withdrawals and attrition resulted in a final active cohort of 141 with 96% of these students achieving a pass grade (5 students who completed every assessment failed).

Table 5: Distribution of grades for Assignment 1 and Assignment 2 - Study Period 1, 2012

Assignment 1				Assignment 2			
Grade	**No.**	**%**	**Credit & above**	**Grade**	**No.**	**%**	**Credit & above**
HD	11	5.7		HD	11	6.5	
D	34	17.5		D	49	29.2	
C	51	26.3	49.5%	C	43	25.6	61.3%
P	79	40.7		P	53	31.5	
N	19	9.8		N	12	7.1	

A comparison of the distributions can be seen in Figure 1. This indicates that the intervention is not facilitating transferability of skills learnt through the ALA tasks to the students' major written assignments.

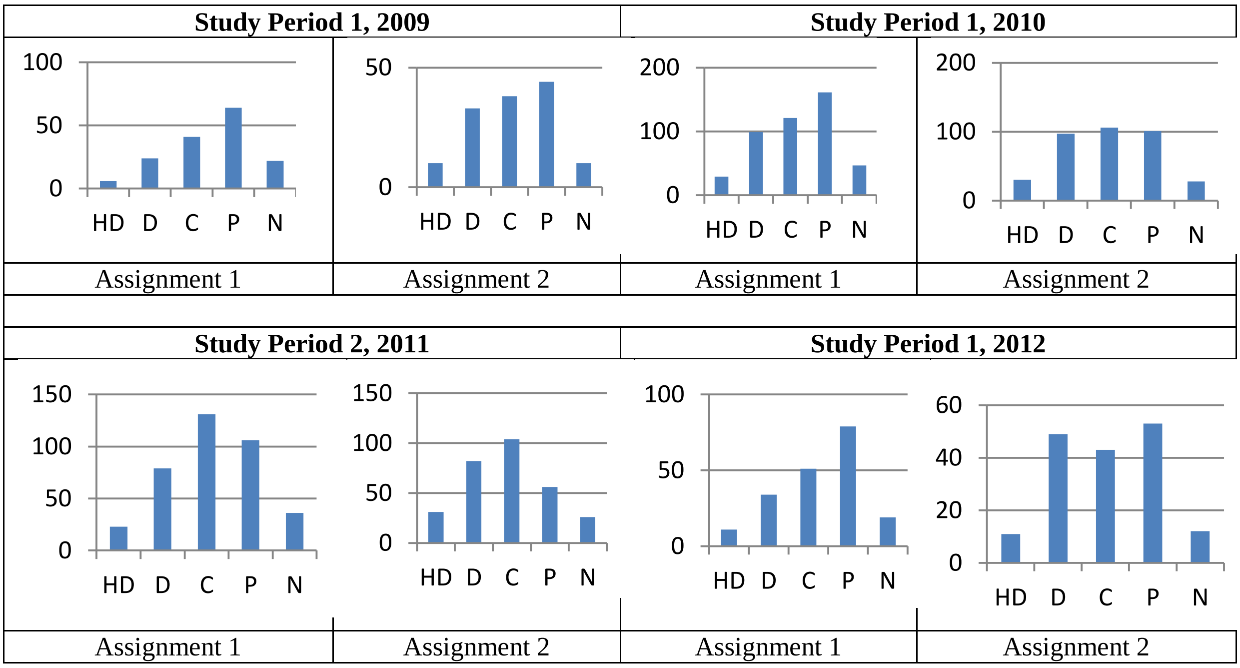

Figure 1: Distribution of Assignment 1 and 2 grades for 4 consecutive years

Concluding comments

The new digital technologies have provided access to higher education for many non-traditional students. As has been noted non-traditional students are very diverse in terms of academic literacies. In addition, non-traditional students are often time poor as they juggle work and family commitments and thus out of necessity are selective in their learning activities (Dearnley et al., 2006). When students, who may be time poor to begin with, are faced with new technologies to learn or learning new ways of using existing technologies, they may become overloaded with all that we expect of them. Cognitive Load Theory proposes that if learners become overwhelmed cognitively when they are expected to acquire complex skills, then they may fail to apply those skills in new situations (Kirschner, 2002). Learning activities which offer an easily achievable mark become the focus of the students' energies, sometimes to the neglect of other, more important but less achievable, elements in their course.

The skills that our students acquired in their ALAs have not readily transferred to their written assignments. Indeed, the inclusion of a further external demand on their time and cognitive capacity could well have interfered with their ability to produce their written assignments. Reducing external cognitive demands will actually lead to more learning (Bannert, 2002).

Rather than trying to increase discipline specific skills the intent is again/now to work on communication skills and to facilitate the development of students' relationships with their tutors and with fellow students. Students are more likely to succeed in their studies if they are socially integrated into the university and the more people they interact with the better chances of success in completion of their studies (Allen, 2006).

As Ludwig-Hardman and Dunlap (2003) observed, the challenge for online education providers is "not in recruitment but in retention" (p.1). Therefore, the sustainability challenge for us as online education providers is yes, to provide technical support for our non-traditional students who are new to Higher Education, but, more importantly to provide students with a sense of engagement and integration. The team teaching model, developed and used by Swinburne University (see Fleckhammer and Wise, 2011), facilitates student engagement in the online environment.

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Feeling the Feed: Migrating from Threaded Discussions to Social Media

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This poster describes the ongoing challenges of using now 'traditional' threaded discussion boards, and details events leading to a simultaneous design experiment conducting an instructional activity in the traditional threaded discussion and a social media platform. It further describes a trial abandoning the legacy threaded discussion application completely in favor of the social media platform.

Keywords: social media, social presence, threaded discussions, online learning & teaching

Short History of Emergent Tools for Online Learning Communities

Threaded discussion boards (DBs) are a proven structure upon which to organise online community conversations along lines of content or learning objectives and are also useful for providing a repository which supports interactions and knowledge sharing. ASCII Bulletin boards predated the Learning Management System (LMS) (Greenlaw & Hepp, 1999). From there the Internet expanded to Web 1.0 including online learning systems,including for higher education (HE). In HE, LMS confined discussion boards became the engine room of online learning engagement. (Horton, 2000; Salmon, 2011). LMS DBs are not universally embraced. Many lecturers complain "they built it and no one came." Making DB participation an assessment item has been integrated by LMS vendors but engagement may be compliant and shallow. Orthodoxy about what instructional/learning design practices instigated within DBs has also emerged (Salmon, 2011; Goodyear and Zenios, 2007). Social presence and teaching presence has also been discussed (Lynch 2002, Schutt, 2008.). Other related themes to have been discussed include teaching team participation (Tseng, Wang, Ku & Sun, 2009) and interaction with students (Novais, Ramos, Nappo & Sigule 2010), modeling of desired academic communication styles and presentation of exemplary curricular artifacts (Morgan, Cameron & Williams, 2009). Not all DB innovations by LMS vendors have improved upon using simple threads which highlight newer posts, although there are improvements such as location of DB within learning paths, and Web 2.0 "rich user experience" (O'Reilly, 2008, p. 34) features. Asynchronous post of audio and video files can also be done. Currently, asynchronicity as provided by DBs may be losing prominence in respect to synchronicity in the context of multi-tasking (Klingberg, 2009). Even real time scheduled learning episodes through virtual meeting are losing to continuous narrative . Structuring of connversations and meaning is no longer the prime requirement as users are simultaneously immersed in multiple continuous feeds in which they have an interest, or at least, are interested, in. Social media is now ubiquitously apparent (Rainey & Wellman, 2012) but has had spottier penetration into the higher education space., As with all technologies introduced to teaching, sparse numbers of early adopters of blog platforms, twitter and Facebook applied to teaching and learning are in evidence (Rutherford, 2010). YouTube is used in face to face lectures. (Bonk, 2008) Universities have employed marketing professionals who have included social within marketing mix (Alkas, 2011).

Simultaneous use Social Media vs. Threaded Discussion Board

In a totally online offering of the Comparative Management Open Universities Australia unit with an enrolment of 240 students at the start, a conventional threaded discussion board strategy was built into the LMS site, with threads for support and queries about assessment, as well as a separate thread envisioned for each of the 6 modules comprising the unit headings where possible. Participation was minimal, as exemplified by the statistics provided in Table 1 for the Exemplar assignment criteria activity in Table 1.

Table 1: Postings and Participants on threaded forum preparing for Written Assessment task

Thread	**Threaded Forum Posts/Participants (non-instructor)**
Exemplar Paper	14/7
Criterion 1 Comparative Technique: Uses both cases to demonstrate knowledge, understanding and analytical skill	0/0
Criterion 2 Command of relevant concepts and facts for each case, including culture	2/2
Criterion 3 Managerial Insights: Reflection and application	3/2
Criterion 4 Written Communication: Language, structure, and scholarship	0/0

This activity was meant to be a high quality interactive experience in preparing for the major written assessment task based on practice in interpreting assessment criteria (Race, 2007) and social constructivist discourse between teachers and students concerning those criteria (Rust, O'Donovan & Price, 2010). An exemplar paper was created and attached to the main thread. Then, each of the four criteria contained for marking were posted as separate threads. Students were encouraged to read the exemplar paper (which by design had some strong and weak performances on different criteria) and post their opinion as to what performance level they thought was achieved and perhaps why they assigned it that mark. Then in keeping up with practice of reality media, there would be a 'big reveal' of the actual mark from the instructor as soon as 50 votes were recorded. In an attempt to garner more participation before the assessment was due, the same activity was run concurrently using Yammer (2012). Figure 1 shows screenshots.

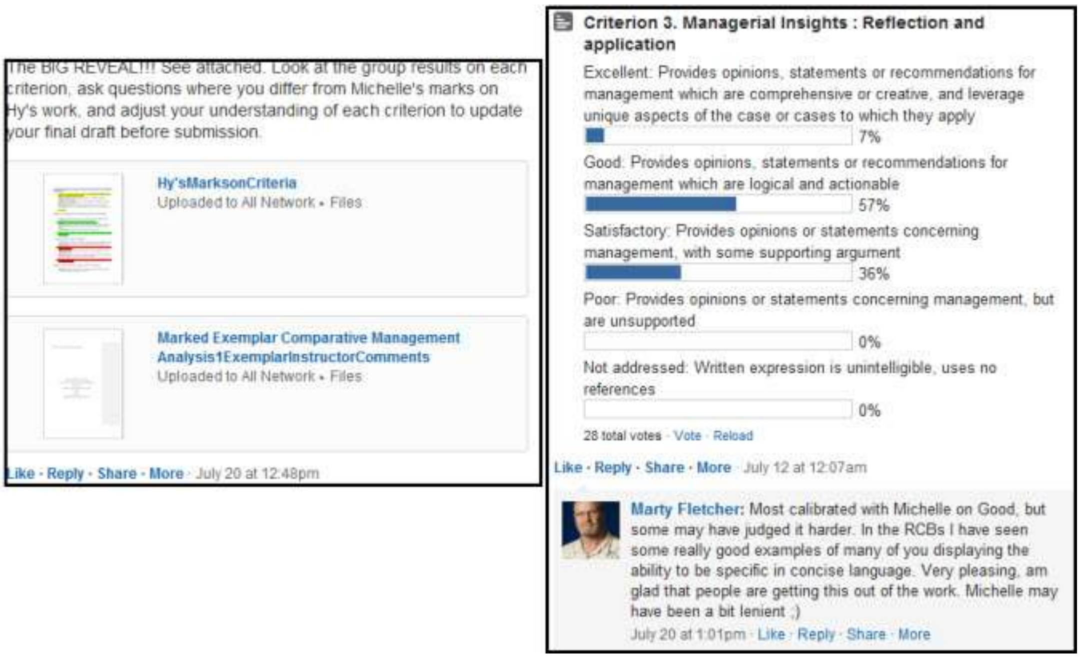

Figure 1: Exemplar Discussion Exercise in Yammer

Results were that, within one week after setting this up, there were additional 28 votes on each of the criteria, and some discourse (Rust et.al) on elaborating on the required qualities of achievement and their rationale. Although 2 students expressed preference for the discussion forum and only addition there were many positive comments about Yammer for instance of preference for its Facebook-like interface over the LMS discussion page set up. A number of students advised that they were already on Yammer in their workplaces. Total number of network members in this short window of time peaked at 101. From an instructor point of view, it was noticed that maintaining awareness and accessing the platform to see the interactions was much more fluid and could be done in much less time than required to monitor the discussion forum. Based upon the experience of using both the discussion forum and Yammer platform side by side, it was decided that in the following study period which is currently underway, Yammer would be used exclusively for discussion activities.

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“It gave me a much more personal connection”: Student-generated podcasting and assessment in teacher education

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This paper reports on a qualitative case study of an online initial teacher education class in New Zealand, exploring the potential of student-generated podcasts as a form of interactive formative assessment. Findings from interviews with teaching staff indicate that podcasting was useful for supporting multimodal learning valuing student voice and reflections. Podcasting enhanced the affective and relational connections in the online class, and empowered students to develop technical skills and confidence relevant in their teaching careers. As such, this study positions educators as future makers and as leaders in a climate of change. We suggest implications for student-generated podcasts in similar contexts.

Keywords: teacher education, podcast, student voice, online learning, tertiary education

Introduction

Web 2.0 tools such as podcasts and wikis provide new ways for students to construct, represent, develop, and report on what they understand. Drawing on a rich range of resources, in multimodal formats, students can manage their learning and express personalized understanding of concepts – using flexible and multiple formats – so that traditional concepts of space and time within the classroom are altered. This paper reports on a case study of student-generated podcasts in the context of an online initial teacher education class.

Student-generated podcasts as an approach to assessment for learning

A podcast is a digital media file that plays sound, is accessed from a website, and can be opened and/or downloaded to play on a computer or portable player (Salmon, Mobbs, Edirisingha & Dennett, 2008). While the use of audio recordings in education is not new, podcasting offers convenience and flexibility due to the relative ease of recording, editing and uploading, as well as accessing and subscribing to podcasts (Harvey, 2008). Podcasting is valuable for supporting learner flexibility and control, motivation and engagement, cognition and learning, and novel opportunities for teaching (Salmon & Nie, 2008).

Current trends in podcasting report on its use for lecture capture or course-casting (King & Gura, 2007), as a supplementary lecturer-initiated course resource, and its evaluation via traditional pencil and paper assessments (Hodges, Stackpole-Hodges & Cox, 2008). Such approaches tend to perpetuate a transmissive mode of teaching where podcasting is used in superficial ways to deliver old content via a new medium (Fischer, 2003). Selwyn (2007) cautions educators against “simply importing informal Web 2.0 applications into classrooms on the presumption of transforming formal education” (p. 7). There is a critical need to examine how educators can more successfully exploit the transformative potential of technology in tertiary teaching to in turn prepare students to learn, teach and lead within technology-enhanced environments.

A recent approach to enhancing class interactivity and maximising the potential of podcasts involves students developing their own podcasts as part of class assignments (Anzai, 2009). This approach increased student engagement with course content and understanding of ideas as opposed to regular text-based assignments (Royer, 2009). There are reports that students initially struggle with the time commitment involved in producing podcasts but eventually grow to be more comfortable with successive attempts (Crow, 2009).

The research context

This research used podcasts to enhance student reflection and to empower students to express and share their emerging understandings as teachers. The process of student-generated podcasts for assessment and learning is consistent with and informed by constructivist and sociocultural views of learning where students are active participants in their learning (Bell, 2011).

Professional Practice and Inquiry is a second year undergraduate course designed to provide students with an overview of educational psychology as a foundation for effective pedagogy. Students engage with key learning theories and themes of motivation, management, and assessment as integral to effective pedagogy. The class was offered online through Moodle and supplemented with two compulsory face-to-face on-campus sessions.

The lecturer hypothesized that podcasting could encourage reflection and articulation of understanding and had trialled the approach in a small ICT option class in 2009. Course participants used the open source programme, Audacity, to produce their podcasts, which they then shared with the class via Moodle. In 2010, the lecturer refined her pedagogical approach in order to implement the podcasting exercise on a larger scale in a core compulsory online class, with 80 students and two tutors, and added a second podcasting task to enhance students' reflective and formative experience. The lecturer had four purposes for the podcasting task: to acknowledge student voice, complement written modes of student learning with an oral presentation, complement traditional summative assessment with a participative approach, and empower students to actively engage in learning and teaching through ICT.

> The power is in the student voice and when students are podcasting. That's why I wanted to do this with our students podcasting, its not very much a leap for them to see that children can podcast too and that Audacity is easily usable by a child and it's the child's voice that can be out there (lecturer).

Each staff member (the lecturer and two tutors) initially generated a podcast in order to model the process for the students, and then guided them to produce two podcast episodes (three minutes each) for the purpose of "podcast-mediated reflective learning" (Ng'ambi, 2008, p. 133). The first episode related to students' observations of assessment approaches during a six-week teaching practicum, and the second episode entailed a synthesis of the students' emergent teaching philosophy.

The student-generated podcasts were compulsory but not graded tasks. Having generated the podcasts, students shared them with the class in Moodle. Students were asked to listen to at least two of their peers' podcasts within their groups, and to respond to their peers' ideas in the Moodle discussion forum. The staff participated likewise.

The staff and students received technical support from the university e-learning staff. Students were provided with detailed instructions and an online help forum within Moodle. This paper reports on the perspectives of the three staff, who co-taught the class. Student perspectives have previously been reported elsewhere (Forbes, 2011).

Research Design

The overall research question guiding the study was "How could student generated podcasting enhance assessment for learning in initial teacher education?" A qualitative, interpretive methodology framed the collection and analysis of the data, gathered from staff interviews. A constant comparison approach to data analysis generated emergent themes from the data (Lincoln & Guba, 1985). The perspectives of the participants in this study represent a convenience sample and although the findings cannot be generalised to a wider population, the data are sufficiently rich to inform similar tertiary teaching contexts. The project received Human Research Ethics approval from the University and all participants contributed on a voluntary basis.

Findings

Three key themes emerged from the data. All participants perceived that the podcasting had afforded a different way of teaching and learning, enhanced affective aspects of online teaching and learning, and increased student confidence with using technology.

Different way of teaching and learning

Participants liked the fact that podcasting offered a different approach in their teaching and supporting multimodal ways of learning:

> Within this online paper students do lot of text based discussion…so when lecturers are podcasting…students say ‘we are feeling a sense of warmth and humanity’, and they respond positively. So when we ask students to share their voices, they have an alternative means of expression, and the literature suggests and some of the students’ comments support the notion that reflection is supported through the verbal as well…. They can listen to the voices and some of the passion in their peers’ voices instead of just reading from a page (lecturer).

Participants also thought the podcasts enhanced student reflection in asynchronous settings:

> While the power of the spoken word is generally seen in synchronous aspects, here [in this paper] reflection is encouraged because it is not synchronous, students can revisit the podcast and can carefully think about and prepare for their podcast. They are not put on the spot… We’ve heard good things back from the students (lecturer).

Enhanced affective aspects in online teaching and learning

Participants thought the podcasting assignment humanized the online learning environment and enhanced students’ relational connectedness to one another.

> They (students) did comment on how hearing the tutors’ voices gave them a clearer sense of who they were and how different each of the tutors had approached their podcast. In an environment where you tend not to get to know people well enough, it gave a much more personal connection. Students liked listening to each other’s voices… I personally found the online environment difficult but found this experience humanises the name on the other end of the keyboard (Tutor 2).

Podcasting also valued student diversity in the course.

> It brings elements of culture to the fore, their [students] ethnic background might create a struggle, whereas when they speak their accents, they can stand proud and there is a diversity of these which come out nicely in podcasting, where it normally doesn’t in texts (lecturer).

Increased student confidence with technology

Participants commented on students’ increasing technical confidence and skill with generating and sharing their podcasts.

> It forced a number of students and even us (tutors) to engage with the technology, tools that we otherwise might not have used (Tutor 2).

The skills involved in podcasting were valuable and relevant to students’ future teaching careers, highlighting the possibilities for teachers as future makers and as leaders in a climate of change:

> They (students) can use podcasting in their own teaching practice. Some have shared their students’ work in their podcasts, which was really good. As the course is online media based, it only makes sense to include podcasting. They become more IT literate and confident as a result (Tutor 1).
>
> This is not just a removed learning activity; there is a life beyond this. These are skills they [students] can use in class (lecturer).

Discussion and implications

This study sought to understand how student-generated podcasts could enhance formative assessment in an online initial teacher education course. The findings indicated that the podcasting episodes were useful in supporting multimodal teaching and learning in ways that value students’ voices and reflections. They also incorporated a humanizing aspect in the online learning environment. Student empowerment and confidence to develop digital literacy required in their future teaching careers was another finding. These challenge conventional uses of podcasting for teacher-to-student transmission of course content. It stands to reason that teachers themselves must be active and competent learners, and in turn that there is a challenge here for teacher educators. Learners, whether they be school aged pupils, tertiary students, teachers, or teacher-educators, need to develop awareness of tools for learning. This includes the ability to locate, download and use software for particular learning purposes.

Three implications for practice follow. Firstly, lecturers need to design online courses so that podcasting is not merely added-on but enhances student reflection and learning. This study illustrates that an alignment of the technology to the course goals, activities, assessment and teaching philosophy was essential to model the transformative value of podcasting. A teaching belief consistent with constructivist and sociocultural tenets recognises the importance of nurturing participation and social connections. As an element of trust is essential in an online class climate where open student sharing and collaboration is valued, student-generated podcasts can contribute by affording "relational connection" (Harms et al, 2010, p. 76). Secondly, teacher educators need to make teaching decisions transparent. As part of the pedagogy of teacher education, "the often tacit knowledge of teaching needs to be made explicit in order to enhance teaching about teaching" (Loughran, 2006, p. 9). By valuing students' voice in the learning process, student teachers are encouraged to unpack teaching by explaining and sharing their own pedagogy. This openness about learning and teaching invites feedback, from peers as well as from teachers, which can lead to deeper thinking through formative assessment (Bell & Cowie, 2001). Finally, by being creative and adopting a problem-solving approach to the use of Web 2.0 technologies for teaching, learning and assessment, teacher educators can move beyond transmissive approaches. We can invigorate our own teaching and inspire students to learn and teach creatively using ICTs as part of their developing identity as teachers of the future, who in turn are preparing their pupils to be leaders of future change. This study has gone some way towards addressing these issues and informing other practitioners interested in adopting student-generated podcasts in similar contexts.

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Patterns of Instruction: Using Screencasts in the Teaching of Textile Design

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Rapid developments in technology over the last decade have enabled new processes for the printing of textiles. This has brought accompanying changes in textile design processes, and new challenges to the teaching of textile print design. Processes that traditionally involved hands-on physical interaction (e.g. screen-printing) have been transformed to become computer-mediated processes. Enabling students to acquire necessary software skills has proved a challenge in a time-constrained teaching environment. This poster illustrates the iterative development of screencasts that have allowed students to work independently on the acquisition of these software skills. Having students work at their own pace, with the ability to revisit material as required, has resulted in more advanced outputs than were obtained using a more traditional teacher-led approach.

Keywords: textile design, screencasts, self-paced learning

Context

In 2006 the Textile Design Lab was established at AUT University, providing access to digital inkjet printing for Art and Design students. In 2008 Digital Textile Design was established as a subject in the new Bachelor of Design Textiles for Fashion, and is now taught across several Design programmes as well as through short courses for industry training.

The "transition from fabric printing to digital textile design has required a significant leap from hand crafted, hands-on printmaking, to working entirely through digital design and print processes" (Fraser, Joseph & Cie, 2010). Adobe Photoshop has become a primary software tool, even though it is not specifically purposed for textile design. It has a number of functions and tools which can be adapted for creating repeating patterns, and for visualising prints, and has the advantage of ready availability both inside and outside class; a recent informal survey of students in a Fashion Elective indicates that a significant proportion of students (50%) had Photoshop available at home, and it is also available in AUT open access computer labs. The survey also showed that while 50% had prior learning with Adobe Photoshop, the remaining students had limited or no prior experience.

Teaching the use of software techniques can be problematic, particularly to groups of design students with varying levels of experience; as Houston and Lin (2012) note, there is the potential in a teacher-led classroom session that "advanced students zone out from boredom while struggling students get lost and often give up"; one-on-one teaching of technical skills had proven to absorb a large proportion of class time. Other research in textile design teaching suggests that student learning should be "active and hands-on, yet requiring time for contemplation and reflection", and that aural transmission is not a preferred delivery modality (Sayer & Studd, 2006).

Screencasts

The development of screencasts was seen as a way of responding to the varying needs of students; screencasts provide a way to present "digitally recorded playback of computer screen output which often contains audio narration" and to visually demonstrate procedural information to students (Sugar, Brown, & Luterbach, 2010). Screencasts (or animated demonstrations) provide "an easy and affordable way of producing multimedia instructional material that is authentic, situated, and motivating and can be exploited in various educational settings (in the classroom, self-paced, collaboratively, etc.) unlike other kinds of multimedia resources" (Palaigeorgiou and Despotakis 2010).

Adobe Captivate software has been used over the last three years to produce a series of screencasts. The initial pilot videos have been revised and refined each semester to improve the content and to encompass new software releases. Additional videos have been developed to cover more advanced topics. The collection is currently being modified and reformatted for delivery as an interactive resource via the iPad.

Outcomes

Digital printing technology has expanded the possibilities for design, allowing use of unlimited colours and fully photographic imagery. The acquisition of more advanced software skills has enabled students to explore visualisation of designs applied to garments or interiors; this allows decisions to be made about scale and print placement, alternative design solutions and colourings.

The shift to using screencasts to develop procedural skills has allowed the lecturer to focus class time on higher level concepts of design development, and on mentoring individual creative processes. This "inverted" classroom approach (Houston & Lin, 2012) has resulted in more advanced outputs than were obtained using a more traditional teacher-led approach. Examples of these outputs are displayed in the Poster.

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Developing medical students’ information skills through online self-paced learning

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StudySmart is an online course designed for second year medical students at the University of Otago. This course was designed to replace a two hour library and information skills lab, and comprises a series of topics, tasks and quizzes. The course was built within the existing learning management system (LMS), Moodle. The content was made up of resources developed in-house as well as appropriate OERs from external sources. The online course was run as a pilot in 2012 and has involved three stages of evaluation: evaluative questions in the topic quizzes; post course reflective evaluation; and a focus group session. This poster presents the findings from the implementation and evaluation of this self-directed online course. The online course was designed to support the development of information skills in order to assist students with a significant summative assessment. The majority of students who completed the course reported a gain in knowledge and understanding about the topics covered, and reported that aspects of the course enhanced their ability to complete their assessment.

Keywords: medical education, medical students, information literacy, online learning, e-learning, library skills, LMS, OER

Background

This online course replaced a series of four, two hour labs run at the start of the second year programme. A variety of reasons lead to this decision including: an increase in student numbers meant there was a lack of rooms big enough to take four labs and the placement of the programme at the start of the year meant that the course was asynchronous with the students’ needs, that is, in preparing for their first significant written assessment. A proposal for an online solution was tabled and passed at the Early Learning in Medicine [ELM] Medical Education Committee [MEC] in September 2011. The course was developed and launched in May 2012 and remained open until 15 August 2012, just prior to the due date of their assessment.

Participation

The course was made available to all students enrolled in second year medicine. The course was voluntary. Students were informed of the course through in class visits and online communication via Moodle.

- A total of 154 students completed at least one topic in the course (54%)
- A total of 111 students completed the course in full (39%)

The entire class (n=287) was surveyed to evaluate the online course. This evaluation included questions aimed at students who did not attempt the course.

- 76% of the class completed the evaluation
- In addition, five students took part in an hour long focus group to further discuss aspects of the course

Findings

The majority of students responded favorably in terms of their perceived gains in knowledge and understanding of the topics covered in the course.

> I thought this was really helpful as I have often struggled to find papers that have been referenced for us to read quickly and easily, which hopefully now shouldn't be a problem. Showing us how to use the databases is a VERY good idea I believe as this is an important skill, especially for the lifelong learning in medicine and being able to access journals readily.

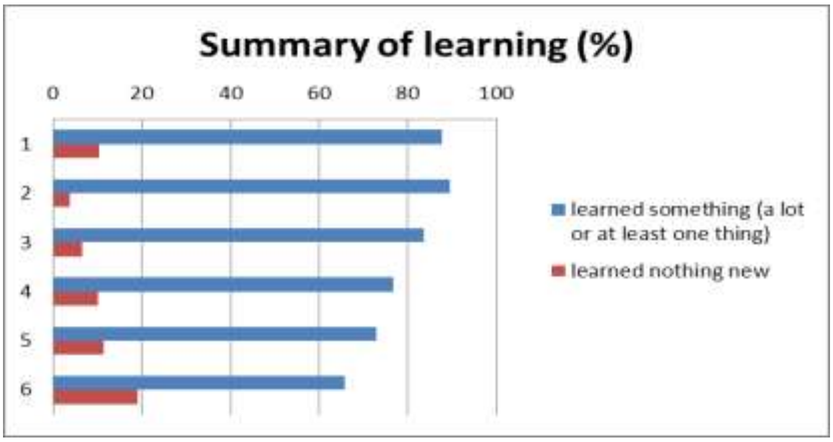

Figure 1: Level of learning reported by students on a three point likert-scale. The blue bars show the collapsed ratings for the top two points on the scale. The red bar indicates the proportion of responses to the lowest rating on the scale. Respondents indicated the level of learning achieved for each of the six topics (y-axis)

Most valuable aspects

Finding out about the databases the library subscribes to, Summon (discovery layer search tool), how to reference, and how to find full text articles using article linker were the most commonly quoted aspects of being of value to the students. The following are drawn from qualitative comments given by students completing the survey:

- "Everything was useful even though I had some knowledge before."
- "Very well laid out programme, easy to use etc. Good work!"

Least valuable aspects

There were fewer comments addressing negative aspects, but in general they included:

- Students commented that they had issues with the length of time it took to do the course. Students were not asked about the length of time taken to do the course but it is evident from Moodle how much time was spent. The course was designed to take no more than two hours. Preliminary data suggests much less time was spent on this course than the two hour lab it replaced.
- Many students found aspects of the first topic too basic, other comments mentioned some tasks had been covered already in prior learning.
- Students who had entered the course with a pre existing degree(s) found some material repetitive.

Conclusions

In the vast majority, students reported a gain in knowledge and understanding of concepts raised in the course. Students appreciated the ability to do the work at a time that suited them. This pilot suggests the course is a worthwhile development in teaching and learning in the medical curriculum at the University of Otago.

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Developing sustainable practice with eportfolios: taking a blended approach?

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The last ten years has seen the introduction of eportfolios in many campus-based tertiary programmes. While the eportfolio literature has indicated the learning potential of eportfolios, the literature also documents technical, psychological and pedagogical concerns for students. The continued presence of these concerns raises questions about the viability or sustainability of eportfolios and their pedagogy within tertiary settings. More thinking is needed to address the issues around learner concerns in order to ensure sustainable practice in this area. This paper addresses the issue of sustainability by proposing that eportfolio learning can be improved by repositioning eportfolios within the concept of blended learning and drawing on existing blended learning research to address some current eportfolio issues. Two ideas for improving curriculum design and the student learning experience are discussed in the paper: (1) viewing the eportfolio and the face-to-face class environment as complementary and drawing on the strengths of both to enhance pedagogy and (2) ensuring that the eportfolio is not regarded as additive or supplemental but fully integrated with face-to-face classes.

Keywords eportfolios, blended learning, eportfolio pedagogy, Mahara, sustainability.

Introduction

The learning benefits of eportfolios are now well documented in the literature (see Stefani, Mason and Pegler, 2007: Butler, 2006). However, the research has also identified many challenges, especially for learners (Gerbic, Lewis &Md Amin, 2011). Eportfolios are still regarded as a disruptive technology (Cambridge, 2102) and this position, combined with ongoing challenges raises issues for the future in developing a sustainable eportfolio pedagogy and practice within tertiary institutions. The notion of sustainability here refers in a general sense to the idea of endurance and existence for a prolonged or extended period of time as opposed to something that is short-lived or ephemeral. A sustainable pedagogy and practice is necessary to ensure that this technology is not marginalised and is able to make a useful contribution to learning.

In campus-based programmes, eportfolios have often been introduced as an ‘add on’ in a learning environment which incorporates both face-to-face and online technologies such as a learning management system and various Web 2.0 tools. The literature indicates that the dominant focus of research and practice has, quite sensibly,been on learning issues for students (Gerbic et al, 2011). Given that eportfolios are often used in blended learning spaces, there has been little consideration of the literature on blended learning. This aspect of eportfolios is therefore unexamined, so the purpose of this paper is to (1) discuss the issue of sustainability with eportfolios at a classroom level and (2) draw from the blended learning literature to make proposals for better integration of eportflios within face-to-face/ blended learning settings.

This paper arises from our introduction of the Mahara eportfolio in 2009 which was accompanied by a research project focused on student perspectives, which included both qualitative and quantitative approaches (Gerbic et al, 2011: Lewis & Gerbic, 2011).   Its focus is on learning rather than evidential or showcasing portfolios and at the classroom level rather than that of the institution.

What are the sustainability issues with eportfolios at a classroom level?

In her research into sustainability of grass-roots elearning initiatives, Gunn (2010) proposed three conditions for sustainability (p. 90) which were (1) a benefit to teaching and learning in a course of study

(2) potential to expand beyond the original site and (3) continuation not being dependent on a few initial enthusiasts. She found that not all elearning initiatives were in fact sustainable and went on to identify key barriers or challenges for teachers and institutions. These included the impact of discipline cultures, where there was little interest from colleagues in elearning pedagogy and discipline-focused research was valued. Other barriers included high workloads, limited access to institutional support and resources and insufficient career rewards.

From a body of research which has investigated student perspectives of eportfolios, challenges for students (and therefore teachers) at the classroom level are now clearly identified. We have discussed these previously (see Gerbic et al, 2011) but they are summarized below in Table 1.

Table 1: Student perspectives of eportfolio challenges

Technical	- Frustration around learning to use the technology. - Insufficient training and support avenues. - Problems with remote access, broadband access. - Time taken to scan and upload documents. - Software issues (Lin, 2008; Singh & Ritzhaupt, 2006, Tosh, Light, Fleming & Haywood, 2005; Kaliban and Khan, 2012)
Psychological/ Affective	- Lack of motivation and 'buyin'. - Confusion and anxiety, especially where assessment is concerned and about purpose and audience. - Difficulty adapting to change, especially if the eportfolio is introduced midway during a course. - Coping with inconsistency across the programme, e.g. assessment, standards, teacher attitudes. (Tosh et al, 2005; Wetzel & Strudler, N, 2006; Singh and Ritzhaupt, 2006; Lin, 2008; Wetzel & Strudler, N, 2006; Pincombe, McKellar, Weise, Grinter, & Beresford, 2009)
Pedagogical	- Lack of understanding about the role and potential value of an eportfolio i.e. the eportfolio is not meaningful. - Not understanding new pedagogies which accompany the introduction of the eportfolio. - Development of reflective skills is difficult in many programmes and forced or overdone in others. - Adapting to new forms of assessment, e.g. linking evidence to course and professional outcomes. - Adapting to new learning activities such as collaboration, giving and receiving feedback. - Being independent learners and acting more autonomously. - Plagiarism. - Accurate representation of professional self. (Woodward & Nonphy, 2004;Tosh et al, 2005; Ayala, 2006; Lin, 2008; Singh & Ritzhaupt, 2006; Carroll, Maukauskaite & Calvo 2007; Kaliban and Khan, 2012)

These student concerns raise challenges for teachers (and institutions). It is worth noting that most of the studies in Table 1 report a single semester implementation where it is reasonable to expect various student concerns, especially regarding use of the technology. However, Thornton, Ferris, Johnson, Kidwai & Ching (2011) found major student frustrations around using the technology still present in an eportfolio programme that had been in existence for six years. The authors viewed these technology issues as a distraction for students and an impediment to achieving the learning values of reflection and personalisation for their students. Student concerns and challenges regarding the technology, the time involved and the place of reflection were also identified in another study of eportfolios in mature practice settings (Wetzel & Strudler, 2006). The persistence of technology and other fundamental issues over time raises questions about the sustainability of eportfolios. While the literature documents the benefit of eportfolios for learning (Gunn's first condition for sustainability), the research indicates that there is little evidence for the second and third conditions i.e. the potential to expand beyond the original site and where continuation is not dependent on a few initial enthusiasts. If eportfolios are to take their place as a valuable and sustainable learning pedagogy, then we need to think of new ways to address the concerns presented to us by students so that more programmes and more teachers take up this pedagogy.

Regarding the technology challenges, much of the research discussed above indicated that programmes were using a variety of Web-based tools as eportfolios and it may be that technical issues will be ameliorated as more institutions introduce dedicated eportfolio platforms such as Mahara. The other factors that may improve perceptions about the technology are the increasing comfort of both students and (younger) teachers when working with Web 2.0 tools and activities, although it is clear now that NetGen students don't necessarily adopt learning technologies with ease.

With regard to the psychological and pedagogical issues described in Table 1, new pedagogic approaches could be beneficial. In many of the published reports above, there is a concentration on the special characteristics of the eportfolio and less on the broader learning environment. However, there is now some recognition of the importance of a wider perspective. Thornton et al (2011) noted student perceptions of a lack of integration where they regarded the eportfolio as an 'add-on'. They also noted that teachers were inconsistent in their use of the eportfolio and wondered whether they also regarded it as an 'add-on'. The authors concluded that a significant issue for future development was integration of the strengths of the eportfolio into the curriculum and that the long term impact of the eportfolio would depend on this. As a relatively new endeavour, eportfolio practice has not developed a curriculum design framework which seeks to fully integrate eportfolios within a blended learning environment where face-to-face is a long experienced component for students. The balance of this paper contributes to this issue of a curriculum design framework by drawing from blended learning experiences to provide a starting point for the framework. This approach of rethinking eportfolio curriculum design has the potential to increase the sustainability of this pedagogy.

Insights from the blended learning literature for developing a sustainable eportfolio pedagogy through curriculum design.

The features of blended learning have been widely discussed by researchers, with most definitions revolving around combinations of temporal and virtual learning spaces (Stacey & Gerbic, 2009). One of the most widely quoted definitions is that of Garrison and Kanuka (2004) where they describe blended learning as both a simple and complex concept involving "the thoughtful integration of classroom face-to-face learning experiences with online learning experiences" (2004, p.96). The definition is useful in the sense that it provides a description that is sufficiently general at a conceptual level but also capable of responding to the wide variation of localised teaching and learning settings. The definition also goes beyond technology and reminds us of the essential role of pedagogy. While they and other writers advocate for the transformational potential of blended learning, there are also accounts which document challenges for learners (Molesworth, 2004) and teachers (Hanson, 2009) , however, it would appear that the widespread existence of blended learning indicates that Gunn's (2010) three conditions of sustainability are likely to be satisfied.

The literature to date has mostly considered blending face-to-face spaces with various online spaces provided through Learning Management Systems or other Internet-based or Web 2.0 tools. Now that eportfolios are becoming part of blended learning spaces, discussion needs to focus on how a pedagogy of blended learning might be developed which includes this new technology. The balance of this paper addresses this issue by drawing on blended learning research in two areas: firstly, working productively with the differences between the two environments and secondly, developing an integrated approach.

Working productively with the differences between the two environments: A complementary approach.

What is important is understanding the differences of the two learning spaces in terms of their strengths and weaknesses and then being able to create learning designs which work to the strengths of the two environments.

Many writers have discussed what the 'e' brings to a portfolio with much of the literature emphasizing its pragmatic strengths. The digital nature of the eportfolio provides a central storage space, which is highly portable and with organisational and searching capacity. It provides 'anytime anywhere' access for its owner but also its readers, and it is capable of storing and presenting a much wider range of media beyond that of paper. The technology offers flexibilities, both in terms of enabling multiple views for different audiences and providing multiple pathways for readers. It also offers opportunities for online interaction and feedback (Abrami and Barrett, 2005: Challis, 2005; Butler, 2006). Arising from the digital nature of the eportfolio, there are also efficiencies in assessment such as saving marking and feedback time and communication advantages by helping teachers and students to remain connected through 24/7 access (Strivens, Baume, Grant, Owns, Ward& Nicol, 2009).

The digital nature (and strengths) of an eportfolio has extended its use beyond that of traditional showcasing and assessment purposes and has enabled the eportfolio to be used in a wide range of learning settings. Some of its strengths here build on the nature of portfolio learning generally and others are now emerging which are more closely connected to the digital character of the technology. Much of the literature on the use and strengths of portfolios is situated within teacher education literature. What lies at the heart of a learning portfolio is supporting the development of professional skills and capacities through reflective processes, especially those which seek to assist new professionals connect theoretical concepts from the university with an emergent practice in a professional field. Zeichner and Wray (2001) also argue that reflection via portfolio construction may lay the foundation for 'habits of reflection and analysis' (p.614) which persist beyond graduation. This construction process can be regarded as a social practice where the role of reflection is to assist the learner's understanding of a professional community, and its norms, values and standards (Darling, 2001). The quality of critical reflection that occurs within portfolios can be problematic and Orland-Barak (2005) observed that it is not the construction of a portfolio that guarantees reflection, although critique is more likely to arise whenever learners collaborate and are exposed to other opinions.

Research into online discussions indicates that digital environments have some strengths which can support reflection. Asynchronous online environments provide time to reflect and a text-based format that may also support the construction of well shaped ideas (Garrison & Anderson, 2003). In their research, Oner and Adadan (2011) found that while the 'anytime anywhere' aspect of the eportfolio made it easy for the teacher and students to provide feedback, what motivated the students to do better work was the fact that others were going to look at their reflections and give them feedback i.e. wider publication than would normally occur with a paper portfolio. The researchers concluded that teachers should be "most concerned with what blend of activities would support reflective thought processes" and the technology was only one aspect (2011, p.489).

The literature is now starting to provide some instances of the ways in which the characteristics of an eportfolio mentioned above might be regarded as strengths for learning (as opposed to assessment or showcasing) . Four areas of identified strength are:

- The ways in which an eportfolio can support a student's learning as a formative process. Because eportfolios are dynamic and living documents, they can assist development over time whereas a paper portfolio operates more as a product (Oner and Adadan, 2011). This role has been widely recognised (e.g. Barrett, 2005; Jafari and Kaufman, 2006; Lin, 2008; Bolliger and Shepherd, 2010) and some authors are now arguing that eportfolios can be used to support the learning process at the same time as evaluating outcomes or standards (Chau and Cheng, 2010).
- There is evidence in some disciplines that eportfolios can support new ways of thinking, especially relational and evidential thinking around the selection and justification of artefacts against end points such as goals. Ring and Foti (2006) found that this was transformational for students because of the need to make numerous connections with their practice and it also helped them to understand the complexity of being a teacher and the interplay of numerous professional issues in teaching. In a small scale study of postgraduate students, Wang (2006) found that students highly valued the synthesis that was required because it enabled them to develop meaning from the whole experience. The ability to support holistic approaches is an important strength of eportfolios.
- Provision of interaction and dialogic support processes means that eportfolios can enable socially focused learning and growth of learning communities. The ability to give and receive feedback amongst peers has the potential to create, not only develop, professional skills, but also to create peer scaffolding opportunities and new zones of proximal development (Vygotsky, 1978) for students. Lin (2008) found that students appreciated this aspect of the eportfolio which has the potential to promote the kind of critique that Orland-Barak (2005) claims is missing from reflection.

- There is now emerging evidence that working with eportfolios is motivational for students because they can make representations of their professional selves in a way that is personal but also highly creative. Woodward and Nonphy (2004) found that, for students, thinking about their representations, and making the most of the flexibility of an eportfolio and its interactive opportunities resulted in a deep level of engagement . Cambridge (2008) has also endorsed the value of eportfolio as a "well integrated and complete representation of the creators sense of themselves" (p.1239) where the key issue is "the negotiation of the tension between the personal and professional" (p.1239). The eportfolio is therefore well placed to respond to a wider trend towards personalisation in technologies and establish a basis for the development of a professional (or otherwise) digital identity.

There is very little direct comment on the weaknesses of eportfolios and the best source is probably the research based on student perspectives which is discussed earlier in the paper. There is also little research on teachers' perspectives on this point. Peacock, Gordon, Murray, Morss and Dunlop (2010) have identified some teacher concerns being the stability and robustness of eportfolio systems, together with teachers' recognition of their limited understanding of the technology and the way in which it might be used to support reflection and development.

The strengths and weakness of the face-to-face classroom are now widely recognised. Some of the key dimensions in overview (Gerbic, 2010) are:

- The richness of the environment visually and aurally means that students and teachers are able to build rich pictures of the class. Being able to see and hear other learners and the teacher provides a sense of authenticity which lays a good foundation for the development of affective elements such as trust, commitment to a community. However, the same proximity can inhibit less confident class members and limit face-to-face critique.
- The synchronous nature of the environment creates rapid flows of information. This supports exchanges of ideas, creativity and developmental energy which can be motivational for learners. However, the time is finite and ideas can be superficial. Students who speak English as a second language may find it difficult to keep up with the conversations.
- The speech-based nature of the environment makes it quick and easy to participate and build a large body of ideas and exchanges. However, the conversation is ephemeral and there is no class record and class members must be sufficiently confident to speak.

Some of the strengths and weaknesses of eportfolio and face-to-face learning spaces have now been discussed. If the two learning spaces are regarded as complementary, then learning designs can build on the strengths of both environments. There is emerging recognition of this in the literature, however eportfolios are often positioned as an 'add on' or are supplemental to the face-to-face class. What is needed is more integration of eportfolios and the last part of this paper makes some proposals on this point.

Purposeful integration of eportfolios with face-to-face classes for more blended learning.

Student perceptions that eportfolios are an "add-on" (Thornton et al, 2011) reflect similar student concerns in blended learning environments (Gerbic, 2010). To address this issue, an eportfolio curriculum framework should build connections between the two environments to create a learning context which communicates the importance of both learning spaces to students. Bluic Goodyear and Ellis (2007) argued that in blended contexts, there is a tension between working with the different parts of the system and the blended environment as a whole and suggest that more holistic approaches be taken which stress coherence and alignment. The blended learning literature provides a number of suggestions and three of the most important are discussed next. The eportfolio literature also refers to 'embedding' eportfolios (e.g. Brett, Brant, & Sutherland, 2007; JISC, 2008; Hallam, Harper, McGowan, Hauville, McAlister, Creagh, 2008). This seems to indicate integration at a higher level than that of a blended class and focuses on the inclusion of eportfolios across entire programmes. To create a pedagogic connection between face-to-face classes and eportfolios (and any other online technologies), three strategies are next discussed.

1. Use a redesign rather than an 'add-on'approach.

The desirability of using a 'clean slate' approach where a course is viewed as a unified whole rather than disparate elements is now widely acknowledged in the blended learning literature (e.g.Garrison &Vaughan , 2007; Kaleta, Skibba, & Joosten, 2006). A foundational issue in a redesign is that of the creation of a portfolio pedagogy, which has been documented especially through the development and use of teaching portfolios in teacher education (Zaichner & Wray, 2001). This portfolio concept is quite elastic and draws on constructivist and experiential approaches to learning and as such, is ideally suited to many contemporary professional programme outcomes. It also provides a framework which enables learners to explore tensions within their development as professionals such as that between theoretical concepts, professional expectations and community practice as well as those arising from reconciling the personal and the professional (Cambridge, 2008). A portfolio pedagogy can also include a community environment for learning and Kaliban and Khan (2012) describe seven learning and assessment activities which might feature in such an environment.

Redesign can also enable better alignment between the learning outcomes and assessment for the course. The benefits of authentic assessment are now recognised within the eportfolio literature (Stefani, Mason and Pegler, 2007) and there is evidence that while students find the task of selecting and justifying artefacts demanding, this kind of assessment is motivational because it creates connection with a professional community and more awareness of its expectations, values and practices (Ring and Foti, 2006). In their research, Kaliban and Khan (2012) found that students liked their eportfolio assessment because it was more practical, transparent and comprehensive than the usual tests and essays and it also contributed to their development as classroom teachers. The authors make a valuable contribution to the establishment of an eportfolio pedagogy in their discussion of what the assessment concepts of validity and reliability might mean in an eportfolio context.

One of the major challenges which students have identified is that of workload. This is also reflected in the blended learning literature where Kaleta et al (2006) talked about the emergence of a 'course and a half syndrome' (p.127) when online technologies are added to face-to-face courses. This means that teachers have to resist the urge of adding the portfolio activity to an existing programme without any commensurate reductions. Kaliban and Khan (2012) suggest that to avoid student overload, face-to-face class time could be reduced and substituted with eportfolio activities.

2. Wrap face-to-face class activities around the eportfolio (and vice versa)

This aspect of redesign focuses on ensuring that the eportfolio is not parallel or supplemental but closely interwoven with class activities. The extent and the way in which this might occur will vary with the course and according to teacher beliefs. Littlejohn and Pegler (2007) provide a three level framework for blended learning spaces which enables teachers to plan for iterative cycles of learning across different spaces and timeframes while using different media. They also make provision for 'strong' and weak' blends (p.29) which would allow teachers to vary the extent of face-to-face and in this case, eportfolio time and activities within the learning programme. Garrison and Vaughan (2008) also provide a variety of scenarios for blending and tend to emphasize the face-to-face class as an anchor for online activities with their framework which focuses on activities before, during and between face-to-face classes.

The way in which the teacher treats the eportfolio in class is significant because, along with assessment, what the teacher gives attention to in class communicates its importance to students. Class time can therefore be used not only to introduce the concept of eportfolios but also to discuss its relevance for student learning and development, special features and how they will be connected to what happens in class. This might include linkages between some of the course topics and eportfolio activities or regular feedback in class on progress and issues (Oner and Adadan, 2011). This could be carried out by the teacher at a general level which could reduce teacher workload, or more specifically, by small groups of students presenting works- in-progress and providing feedback (Oner & Adadan, 2011). If a learning community approach is to be used, then the characteristics of face-to-face classes with their synchronicity and rich aural and visual character can lay the foundations for eportfolio activities such as peer feedback which require openness, trust and disclosure.

Most importantly, face-to-face classes should include activities which develop the students' skills and confidence for the online activities (Gerbic, 2006). Ellis, Goodyear, O'Hara and Prosser (2007) observed that just because students have often participated in class discussions, doesn't mean that they know how discussions contribute to their learning or how to engage in them effectively – online or otherwise. The same point can be made for eportfolio skills. The need for teachers to discuss the role and rationale for eportfolios has been identified above, but attention is also needed to identifying and developing eportfolio skills in class. Three of these that are regularly mentioned in the literature are the ability to:

- reflect (eg Lin, 2008; Abrami and Barrett, 2005) and
- give and receive feedback (Wang, 2006; Vernazza, 2011) and carry out self and peer assessment (Stefani, Mason & Pegler, 2007) and
- set goals, and monitor progress through relating and connecting evidence (Bolliger & Shepherd, 2010; Ring & Foti, 2006).

There are many models of reflection and reflective activities, especially in the teaching and health literature where they are regarded as one of the cornerstones of professional practice and this may be one of the reasons for the widespread adoption of eportfolios in these fields. However, there are still issues about the quality of reflection (Orland-Barak, 2005: Oner and Adadan, 2011) and it may be that this activity needs to be better integrated and addressed within a face-to-face class setting as a preparation for eportfolio work. Where reflection and feedback activities are not normally part of the student learning experience, then there are added stresses for students as they struggle to understand the benefit of these activities and how to carry them out (Vernazza, 2011). More time in class discussing the role of these and practising them might also improve students' eportfolio reflection.

3. The Role of the Teacher

The advent of learning technologies has already indicated new roles for teachers in blended learning spaces and that of course design or redesign has already been identified. Academics have been required to shift their focus from their discipline to new pedagogical approaches and consider constructivist approaches. These may provide an impetus for change with Kaleta et al (2006, p.137) commenting that "teachers need to be prepared to leave behind their previous constructs of what a teacher is, and to anticipate how the new model redefines them, their course and their students". However, equally this may create concerns about the displacement of teachers' authority and their role as knowledge providers (Hanson, 2009).

Cambridge (2012) argues that if eportfolios are to achieve their transformative potential, then changes are needed not only with regard to practice but also with regard to responsibilities. On the role of teachers he comments, that they must move beyond taking responsibility for learning outcomes and embrace broader matters such as life long learning, developing autonomy and self-direction and connecting university discipline learning with broader community and professional contexts. He identifies two areas where teachers might start - reflective practice and using technology to provide a record of their experiences, career and identities. Some teachers may be reflective practitioners already and familiar with this practice. Documenting experience and identity may be rather new for others, and will create challenges for teachers, however it will provide good material and a model for discussion with their learners.

Conclusion

The learning benefits that have been identified for eportfolios make them a promising technology. However, the research on student perspectives indicates that there are challenges with this new technology and its associated pedagogy which raises questions about how Gunn's (2010) second and third conditions of sustainability might be met. In order to move eportfolios beyond their original enthusiast adopters and onto wider programme and teacher adoption, a new approach is needed.

While improvements to the technology itself are beyond the brief of this paper, there are opportunities for developing better eportfolio pedagogy and practice. We have argued in this paper that eportfolios should be repositioned within a blended learning framework. Drawing on the existing research and literature, this would comprise a complementary approach which uses the strengths of the two learning spaces and purposefully integrates eportfolios with face-to-face classes. We suggest three avenues for this - curriculum redesign rather than an additive approach, wrapping face-to-face classes around the eportfolio and vice versa, and reviewing the role of the teacher. Further research is needed to examine the potential of such approaches to create a sustainable eportfolio pedagogy.

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Using Mobile Learning to Facilitate Early Engagement

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Mobile Learning is an emerging learning and teaching field and the strategies for conceptualising, designing, developing and evaluating the mobile learning experience are embryonic and evolving. This paper describes the process of development of a mobile learning experience for use on an iOS device with 'engagement' and 'learning' sitting at the core of the research, design and development of the project.

Background

La Trobe University's attrition for 2009-2010 was 18.2% of its domestic commencing students.[1] Many studies have found that student engagement and a positive first year experience are crucial to student retention.

Reports from 1994-2009 have found that only around 50% of first year students feel like they belong to their university campus."(James, 2010) Pitkethy notes that "Studies of Australian first year students show that initial experiences on campus are important, and influence students' persistence in higher education." (Pitkethly, 2001) We know that students who are engaged, have a sense of belonging, know how to access university resources have a higher possibility of finishing their first year of study at University. (Horstmanshof, 2011).

An increase in student retention of 1% of the 37,000 students studying at La Trobe, at $25,000 per student, translates into $9,250,000, a significant source of university funding and crucial I would say to maintaining and resourcing further research and education programs.

La Trobe University's Melbourne campus is differentiated from most universities by the enormous space that it occupies and the expansive natural surroundings enclosed by a moat, created from the Darebin Creek. Puzzlehunt was developed as a Gamification concept to playfully orient new students to La Trobe's spaces, facilities and resources. A quote from an article written on the project states, *"La Trobe's Melbourne campus spans over 2000 hectares encompassing more than 40 buildings and can be a daunting experience to navigate for new students making Puzzlehunt an ideal activity.[2]"*

Mobile Learning Experience

The mobile learning 'Puzzlehunt' idea was conceptualized at an Apple University Consortium (AUC) workshop in Brisbane. The App was adopted and developed within the Faculty of Humanities and Social Science, at La Trobe University as a mobile "O" week first year experience, designed to playfully familiarise students to key social, resource and learning spaces and to engage students early with peers and staff. Of the five faculties at La Trobe, the Faculty of Humanities and Social Science is the most curriculum diverse faculty, ranging from Shakespeare, Town Planning, Hindi to Photo Jounalism.

The concept of a "Treasure Hunt" or "Great Race" as a University Orientation week activity is not an original concept. It was reported that one Victorian University paid $30,000 to contract an external organisation to run an O week Treasure Hunt style of activity. For a similar level of funding the faculty of Humanities and Social Science developed a mobile learning App to facilitate a 'gamified[3]' student learning experience on an iPad which included a class set of iPads and the cost of developing the App. An additional cost benefit is games or learning experiences can be adapted for other purposes, for example "Future Students" have developed games aimed at providing year 7 & 8 students with a Puzzlehunt appropriate for their age. Also when new students are not using the iPads for Puzzlehunt, they can be utilized for other innovative learning within the faculty.

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[1] (Information retrieved 17th November 2011 http://www.theaustralian.com.au/)
[2] (information retrieved 20th February 2012 http://www.latrobe.edu.au/news/articles/2012/article/students-develop-ipad-app)
[3] (Information retrieved 18th October 2012 http://en.wikipedia.org/wiki/Gamification

Intended Learning Outcomes

The initiative introduces new students to the diversity of faculty subjects through a variety of activities designed game designed to playfully familiarise students to key social, resource and learning spaces and to engage students early with peers and staff (with an element of learning built into each activity.) The intention is to give students a taste of the faculty and to familiarise them to key locations, which might assist them in their new environment (e.g. Careers Office, Library, Sports Centre, First year coordinator.) Games can also be customised to assist students to initiate peer and academic relationships early in the university year.

The underlying objectives of the project were to;

- Engage students with their environment
- Encourage peer relationships
- Get to know University environment
- Develop sense of belonging
- Promote staff/student relationships
- Provide a playful experience

The Game

The Puzzlehunt project has the formative goal in playing a part in building student engagement. The project provides new students with a mobile learning experience, combining smart phone technology with a live scavenger hunt with a learning objective built into each activity.

The game starts with new students receiving a ticket to “Puzzlehunt”. The ticket has a QR code and instructions on how to scan it. The QR code invokes a short introductory movie taking the student into the Puzzlehunt space.

During “O” week, students take their ticket to a central meeting place, where they are lent an iPad loaded with the game and a drop-proof case. The game provides students with choice therefore directing them to varied places of interest at the university. The aim is for participants to work together and unlock clues, undertake challenges and solve puzzles. The activities are designed to use teamwork and creative thinking skills in a fun and collaborative way, while also orienting students to the university. An activity example directs the student to find a QR code near the statue of Charles La Trobe standing on his head. When players arrive they are asked a question through the App which relates to the statue. They are asked to photograph themselves with the statue with extra points for standing on your head.

Development

Why develop an iPad App? In 2010, the iPad's first year of release, Apple enjoyed a market share of 90 per cent in Australia. This has since declined to a not insignificant 75 per cent market share.[4]

To strengthen the student engagement theme Faculty of Humanities and Social Science initiated a cross-faculty App development collaboration with the Faculty of Science Technology and Engineering’s Computer Software staff. Student teams were formed to develop three prototypes as part of a 3rd year Computer Science subject. The winning project was externally mentored with an iOS Developer to polish and test the App to get it ready for the 2012 “O” week trial. As the product was a real world project intended for download from the iTunes App Store the student developers took their roles very seriously and produced a high quality user tested product.

Associate Professor Dr Kay Souter said of the project *‘This has been an impressive collective involvement and it has been rewarding to see the project go from an idea to a realisation. The students who developed the app have gained practical skills and the app will be a useful tool to help incoming students get acquainted with their new learning environment while socialising with fellow students,’*

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[4] (Retrieved October 17 2012 http://www.theage.com.au/digital-life/tablets/why-apple-is-making-an-ipad-mini-20121017-27r4z.html#ixzz29h2d0dDC)

Evaluation

Bateman (2010) states “When this research project began in 2006, neither the iPhone or low cost 3G netbooks existed, the iTunes Store was unavailable in New Zealand, wireless connectivity speeds were limited to first generation 3G (UMTS or CDMA) with limited coverage available, and Wi-Fi was limited to 54 Mb/s...” As the technology evolves so must the methods of evaluating mobile technology.

Mobile learning poses complex challenges when it comes to evaluating the student learning experience. Two issues arise: The experience of the learner occurs at different points in time and at different places. Secondly, the nature of mobile learning ensures the student is moving. This poses the challenge of capturing data for evaluation from a moving student at different times and places.

There are three areas to focus on regarding evaluation. They are usability of the application, effectiveness of the user experience and user satisfaction. Usability testing in a laboratory such as heuristic evaluation (Nielsen, 1994) is well established. Satisfaction levels may be established through surveys such as a Likert scale or by conducting interviews with students. Effectiveness of mobile learning is relative to the context and educational aims of the program being evaluated (Sharples, 2009).

Further to this, any form of evaluation undertaken by a user after a learning experience has occurred, needs to be executed in an innocuous way to reduce the possibility of evaluation interfering with the user experience. Ideally the evaluation occurs within the application and the experience is not dissimilar from the other elements contained in the game.

Within the limited timeframe of the project an evaluation, which fits the above criteria proved difficult to implement within the timeframe. However an opt-in online survey was incorporated into the App so when the game was finished players could, provide feedback. Only a very low percentage of participants opted in to complete the survey. This provided valuable feedback for us in the development of an evaluation strategy for Puzzlehunt Version 2 which includes more innocuous response feedback in a fun interactive way.

Every players experience is different from that of all other participants, therefore to establish a clearer and more accurate feedback, a mechanism to establish a contextual link between the user interactions and the learning experience needs to occur. This objective would be to provide relational data for better analysis of that data and a more accurate evaluation of the user experience against the learning outcomes associated with that experience.

Summary

There are significant learning opportunities which rise from the advances provided within mobile technologies. Puzzlehunt is an example of an iOS App, developed with an intended learning experience to playfully orient new students during “O” week to the university. The student designed and developed project is an example of a highly engaged student learning experience.

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Taking stock of institutional e-learning usage: how is the LMS being used to support blended learning?

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For the last decade, institutions across Australia have heavily invested in learning management systems (LMS) to support learning and teaching activities. UWS, like other institutions have implemented a LMS and embedded support structures around it to ensure effective use by staff and students. Using a UWS developed framework to understand usage of the LMS, periodic analysis is done to determine the level, uptake and quality of LMS usage. At UWS, there is a major institutional focus on blended learning within all schools and a new blended learning professional development model being developed to equip and support teaching staff in effectively using the e-learning system for learning and teaching activities. Taking stock of the LMS usage is useful to identify strengths and gaps in usage and incorporate these into blended learning plans at the University.

Keywords: e-learning, LMS, ICT, professional development

Introduction

The University of Western Sydney (UWS) has a strategic focus on blended learning (UWS Teaching & Learning Plan, 2012-2014). In alignment with this Plan, all schools have developed three-year Blended Learning Plans to redesign their programs to include effective use of the LMS and ICTs in blended learning activities alongside face-to-face on-campus teaching. To inspire and equip teaching staff with the knowledge and skills in blended learning, a targeted support structure is also needed for teaching teams and academic staff. To facilitate this, a new blended learning professional development model is being developed. In forming this model, this LMS analysis project was done as a stocktake to determine the gaps in ICT usage and establish a base-line for measuring growth following the major institutional focus on blended learning to 2014.

In 2008 a benchmarking activity was conducted between Griffith University and UWS (Rankine et al, 2009) using a benchmarking framework to determine the level and quality of the uptake of the e-learning system. For this current project, the framework was reviewed and revamped to include not only the LMS functionality available but also the use of other learning technologies drawn from a literature review. Examples of other learning technologies included the use of marking rubrics to gauge students' performance of understanding (Heinrich, 2009), the use of such social media as Facebook and Twitter (Cochrane, 2010; Bart 2011; Oblinger 2010), cloud technologies such as Google Apps and You Tube (Britto, 2012: Williams, 2012; Johnson et al, 2012; Cochrane, 2010) and access to free open education resources (Atkins, 2007; Goldberg & LaMagna, 2011; Mulder 2011).

Research methodology

To undertake this project a number of activities were conducted:

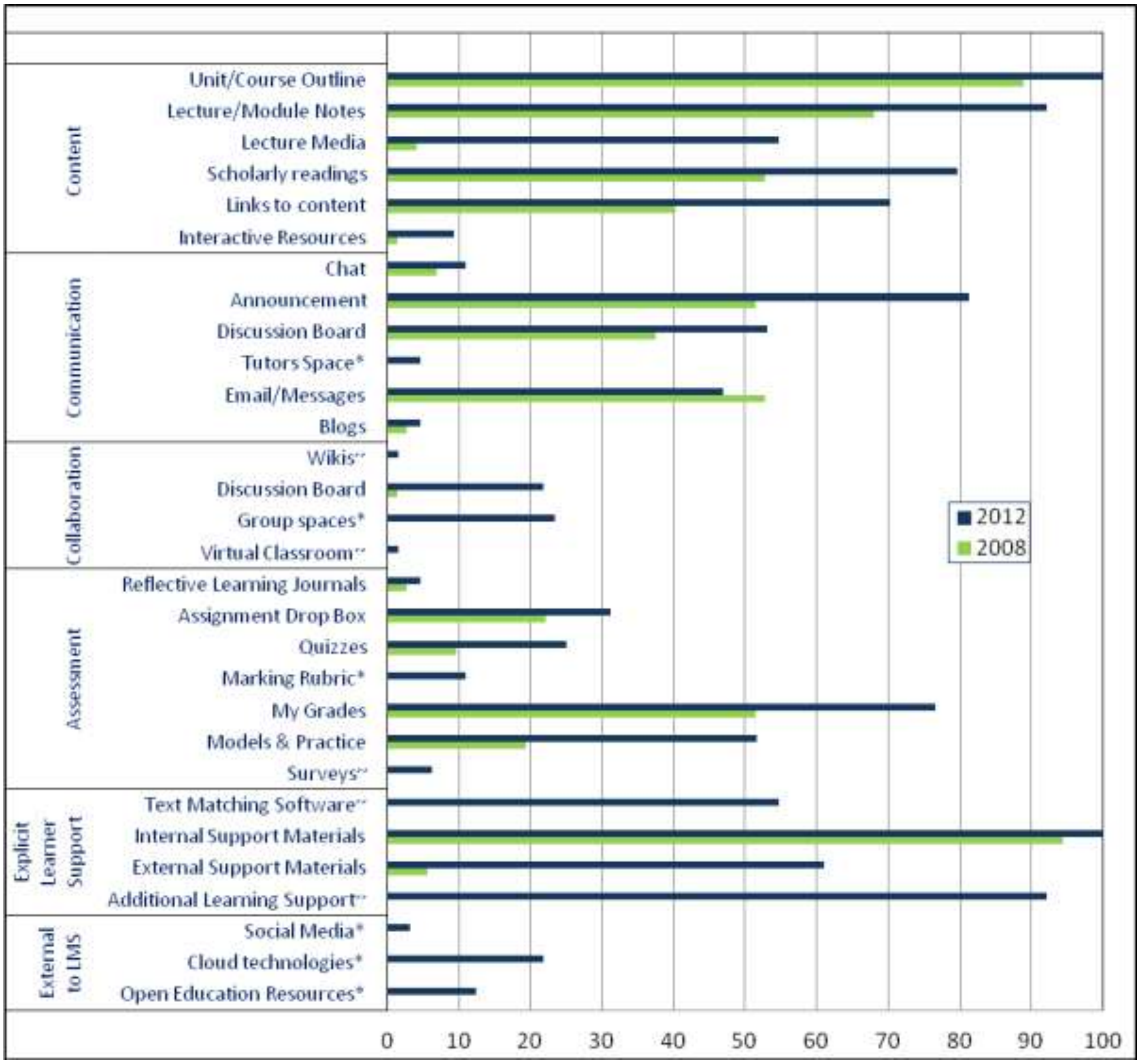
1. Review of the 2008 benchmarking framework for relevance: The framework used in 2008 was refurbished for currency in 2012 taking into consideration additional LMS functionality and other learning technologies.
2. Use the framework to review a 10% random sample of unit sites from Semester 1, 2012 in a similar manner to how it was applied in 2008. The sample was generated by determining all unit sites actively used by

academic staff during Semester 1, 2012. The sample included 10% of school sites with the mix of undergraduate and postgraduate units were maintained. This review of 10% of Semester 1, 2012 e-learning sites took the project team 40 hours.
3. Compare the results of the Semester 1, 2012 review with those from Semester 2, 2008 to understand usage of the LMS

Findings

The new framework provided a picture of the current status of e-learning usage at UWS and when compared with 2008 showed that there has been significant increase in usage since 2008 in all areas but the use of email/messages.

Table 2: LMS and external technology usage results 2012 and 2008



* New learning technologies added to 2012 framework to ensure currency of the framework elements.
~ Results from 2008 were zero for these elements.

Conclusion

The results confirmed increase in e-learning usage since 2008 with significant increases across the large majority of content, communication, collaboration, assessment and explicit learner supports. The results of the review found a number of gaps for inclusion in the new professional development model in the areas of: asynchronous and synchronous communication strategies; strategies to develop learning communities;

management of groups through online group spaces and tools; showcasing learning designs around e-assessment; and strategies to support students in large classes.

Although the 2008 evaluation did not analyse the use of external technologies and purely focused on the LMS tools and functionality, this 2012 review did find that social media is in use, along with freely available cloud technologies and open education resources and therefore this data will be useful for measuring the status of ICT enabled learning conducted in the future.

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Leading the evaluation of institutional online learning environments for quality enhancement in times of change

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This paper reports on findings from a nationally funded project which aims to design and implement a quality management framework for online learning environments (OLEs). Evaluation is a key component of any quality management system and it is this aspect of the framework that is the focus of this paper. In developing the framework initial focus groups were conducted at the five participating institutions. These revealed that, although regarded as important, there did not appear to be a shared understanding of the nature and purpose of evaluation. A second series of focus groups revealed there were multiple perspectives arising from those with a vested interest in online learning. These perspectives will be outlined. Overall, how evaluation was undertaken was highly variable within and across the five institutions reflecting where they were at in relation to the development of their OLE.

Keywords: online learning environments, evaluation, quality enhancement

Introduction

The paper is based on findings from a nationally funded Australian Learning and Teaching Council project being undertaken over 2011-2012. The project addresses the key question of how universities best conceive of and implement, through distributed leadership structures**,** a quality management framework for online learning environments. The project is drawing upon the combined expertise and strengths of five universities using different learning management systems and at different stages of deploying their next generation online learning environment. One of the key aims of the project is to design and implement a quality management framework for online learning environments (OLEs). Evaluation is a key component of any quality management system and it is this aspect of the quality management framework that is the focus of this paper. An overview of the project and the framework that is being developed will be given, followed by an exploration of current practices and issues encountered when evaluating OLEs.

The framework

Two important domains were considered fundamental to the development of the framework namely: the nature and value of distributed/shared leadership in educational settings; and the quality management of teaching and learning in higher education in technology rich environments (Holt, Palmer & Dracup, 2011). Distributed leadership recognises that no single individual possesses the capacity to effectively undertake all possible leadership roles within an organisational setting (Conger & Pearce, 2003). This is particularly applicable to the development and management of online learning environments because to be effective, inputs and expertise from all parties contributing to the educational endeavour are necessary. Distributed leadership captures the scope and depth of involvement through its recognition of both vertical and lateral dimensions of leadership practice. It encompasses both the formal and informal forms of leadership within its framing, analysis and interpretation. Moreover, it is primarily concerned with the co-performance of leadership and the reciprocal interdependencies that shape that leadership practice (Harris, 2009).

Online learning environments can be conceived of as an ecology made up of many interrelated elements, each influencing the other (Ellis & Goodyear, 2010). Building distributed leadership capacity across the various elements was deemed central to the framework with the mechanism for achieving this being the cultivation of individual and collective agency amongst formal and informal leaders who are interacting in and across hierarchies (Holt et al., 2011).

A general message that comes from the literature on quality is that many areas of an organisation have an influence on enhancing the quality of learning and teaching outcomes and experiences, and that effective management of quality requires a comprehensive approach inclusive of the various elements and contributors, their interests and roles (Holt et al., 2011; Fullan &Scott, 2009).

Within this framing, the first phase of the project entailed a review of current approaches to the development and management of OLEs to identify the key elements and contributors for inclusion in the framework. Six key elements emerged - governance, planning, resourcing, organisational support, technologies and evaluation (Holt et al., 2011). Of these, evaluation can be considered to be the cohesive component that combines all the elements in the quest for quality enhancement. It provides the evidence to inform planning processes, alignment of resources with institutional priorities, the work of governing bodies in monitoring performance and outcomes, the choice and subsequent performance of technologies and the effectiveness of organisational support structures in meeting the needs of staff and students. More broadly evaluation plays a pivotal role in managing the risks associated with the online learning environments and ascertaining impact across the institution.

The second phase of the project involved a series of focus groups to explore each of the six elements and their interrelationships in more detail. The first series focussed on the higher level institutional concerns associated with visioning, strategising, planning, managing and evaluating OLEs. Arising from discussions about the importance of evaluation and its effectiveness was universal recognition of its centrality to quality management. Leadership at all levels was seen as fundamental to the development of a coherent approach to evaluation, particularly in regard to articulating and communicating a strategy, engaging staff at all levels, and providing adequate funding. The importance placed on evaluation, combined with the impression that there was not a strong shared understanding amongst participants of what it entailed, highlighted the need for further exploration.

A second series of focus groups, conducted in 2011, explored the notion of evaluation in more depth to gain insights into the nature, scope and effectiveness of current practice. The findings from this series are reported below.

Procedure

Five focus group discussions were held at each of the partner institutions. Participants were chosen by the respective project team members to represent a wide spectrum of seniority in order to capture the distributed leadership focus of the project. The total number of participants was very similar in the first and second series of focus groups (46 cf 47). Twenty eight came from central support offices and 18 from faculties which was similar to the first group (29 and 18 respectively).

Each focus group was of approximately 90 minutes duration. All were face-to-face with one having a single off-shore participant who was involved through video-conferencing. The issues canvassed were determined by the project team, with a single facilitator designing the activities and approach and then conducting the focus groups at each of the universities. Questions posed to the participants covered: the importance of evaluation for the success of OLEs; the effectiveness of current practice; who needs to be involved, what information needs to be collected and for what purpose; the effectiveness of dissemination strategies; and how the findings impact decision making for quality enhancement.

Oral and written data resulted from each focus group; discussions were recorded but not transcribed. The findings from each institution were returned for confirmation of accuracy. Individual reports were then synthesised to gain a richer understanding of issues and the differing interpretations that arose from the operating contexts at each institution. Some of the key issues arising from the synthesised report are presented in this paper. It is important to note however, that they do not represent a comprehensive account of all issues, nor do they represent a consensus of views. Rather, the intention is to highlight the range of different perspectives encountered.

Findings and perspectives

The fundamental importance of evaluation to the development, implementation and management of OLEs was established from the outset. When asked to rate the importance of evaluation (on a five point scale ranging from a very good extent to no extent) of the 46 participants, 43 rated it, to a good /very good extent, 2 to a reasonably moderate extent and 1 did not reply. In answer to the question of the effectiveness of the current evaluation of OLEs, eight rated this as reasonably effective, 18 as moderately effective and 6 as minimally effective.

The higher ratings on both these questions were more likely to come from those charged with responsibility for developing and implementing infrastructure – making decisions on technologies and tracking their uptake and performance. There was general agreement with the proposition that OLE evaluation is often conceived of as a technology project and hence the evaluations being undertaken tended to reflect this perspective. Nevertheless, there was a definite sense that pedagogical matters were increasingly considered as an element of any OLE evaluation which is evident in the following responses.

> ..it didn't take long for the University to realise that, if evaluation were construed as only about the technology; it was a waste of millions of dollars.
>
> People's eyes have been opened to the fact that it's about people, it's about learning and teaching and we're aware of that and we're moving towards supporting it at the moment.

What constitutes effective evaluation?

Emerging from the discussions was an understanding that effective evaluation is cyclical in nature with the focus being on continuous improvement. It is culturally embedded and systematic and while the timing may effect emphasis and focus, the nexus between infrastructure, the technologies and their implementation for learning and teaching is a constant. Moreover, OLE evaluation at the University level ought to be monitored with the process regularly reviewed and refined as necessary. This fuller understanding of what constitutes effective evaluation is encapsulated in the following comment:

> We are coming to grips with the system; we are beginning to understand the place of evaluation in a system that is new to us. That we understand that not having an evaluation strategy and not having a workable evaluation framework and the tools to do that is a big problem – that's progress.

The importance of being systematic and linking evaluation findings to key decisions about OLEs was reinforced by several groups who identified the need for a coherent approach within an overarching strategy and framework. This accords with the four levels of evaluation described by Kirkpatrick (1994) namely: reaction to the innovation; achievement of objectives; transfer of new skills to the job or task; and impact on the organisation. Taking this a stage further, Peat (2000) suggests the resources being developed and the process of co-creation can be evaluated in a number of ways: formative (are the artifacts, actions or policies functional in their context?); summative (are they influencing practice?); illuminative (what is their utility and are there any unexpected outcomes?); and, integrative (how are they best put to use in an organisation?)

What information needs to be collected and for what purpose?

Responses showed differences between the information sought by those from central support units and those for faculties. Faculties tended to be more concerned with the evaluation of online course materials and the quality of the learning experience. Central support units on the other hand were perceived to be more concerned with technical aspects of the OLE gained from server-logs for example, access and usage data. While it was recognised that routinely collected data of this type could provide valuable insights into teaching, learning and course design, there was also recognition that such data only provided a starting point and did not reveal the depth of detail necessary to provide a comprehensive understanding of the effectiveness of the online learning environment. In addition it was noted that the amount of data generated could be 'incredibly overwhelming' and it was doubtful whether staff took the time to analyse and act on it in a timely fashion, if at all.

Student feedback gained through standard course surveys was noted as another source of data. For some there was a sense of progress being made with the inclusion of explicit questions about the OLE. However for most, the extent to which issues related to OLEs were captured in student surveys was low. Even when captured there were doubts expressed about its usefulness. As one participant noted, "One question about a whole environment is just a beginning". Other concerns were expressed about low response rates and also the representativeness of the student cohort.

Some expressed the view that there was insufficient variety in the methods used to collect data. In addition, there was a sense that increased support in analysing data and presenting findings in a more palatable format with follow-up would lead to better outcomes. It was also suggested that faculty staff need to be convinced that evaluation is also their responsibility and their increased participation would lead to more meaningful engagement and hence to local improvements.

There appeared to be less concern about data collection than about its value and how it is being used. As one participant noted:

> Yes, the data comes in. Yes, some people look at it and some individuals might do something with it but [the University] as a whole hasn't made a decision that there are consequences to the data and consequences to it being at different levels. We haven't even decided what's satisfactory, what's acceptable, what's not acceptable and what's the trigger point and the automatic action that will follow. Which goes back to the point, don't ask the question if you're not actually going to do something with the results that come back from it.

It was agreed that 'closing the loop' and using data generated to inform decision making - as distinct from only collecting data – was an important part of an effective evaluation process. If these data were not being used to inform decision making and reports are shelved without their findings being shared with interested parties, the value of such evaluation is severely limited. The impression was that instances of 'closing of the loop' were much stronger in the actual selection of technologies than in their application for learning and teaching.

Dissemination

There was consensus that evaluation findings need to be appropriately disseminated so that decision making about OLEs can be evidenced-based. While instances were given where findings are reported and available electronically, there was less assurance regarding the extent to which the findings were accessed and used to inform practice. This was evident in responses to the question of how effective findings were disseminated so they could have a real impact on decision making. Of the 46 respondents only one felt that dissemination was achieved to a 'good extent', 12 felt it was reasonably effective, 15 moderately effective, 4 minimally effective, and 11 did not see evidence of dissemination.

Discussions revealed that although staff from central units stated "We've been doing a lot of work on the evaluation of the new system", faculty staff in particular, were often unaware of this activity as revealed by comments such as: "What is being evaluated?"; "No idea. I don't know who does it [evaluation] and what they do with it" claiming "They're not communicating with us". These comments suggest that a greater emphasis on communication, both lateral and vertical, within the institution is needed.

Nevertheless there were examples where dissemination was effective. One good practice cited was where committees and reference groups had been discussing student feedback on learning technologies with both central and faculty staff to increase their understanding of what was happening as various technologies were implemented, so shaping thinking and actions. Another instance was cited where central staff working with individuals and small groups disseminated information and findings that was useful for shaping improvements to learning and teaching.

Conclusion

Evaluating OLEs needs to be undertaken from multiple perspectives. Multiple perspectives though come from multiple parties with a variety of evaluation purposes in mind. It is not necessarily easy to clearly identify and constructively reconcile these differences for advancing the quality of OLEs as evidenced by this round of focus group discussions. Better aligning of various leadership roles across, up and down the organisation is a vehicle for drawing out different stakeholders' informational and decision- making needs. The focus group findings reaffirm evaluation as being seen by most as an imperative and at each institution examples were provided to evidence that both formal and informal evaluation were occurring. 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.

How evaluation was undertaken was highly variable within and across the five institutions reflecting where they were at in relation to the development of their OLE continuum. Those where choices of key elements are still being made, or have very recently been made, are likely to express different evaluation concerns and objectives from those who have had core elements in place for more extended periods. Evaluation demands will only intensify, along with need for distributed leadership structures, as we see the continued proliferation of social media/networking/cloud-based services growing up in and around organisations enabling more devolved, and less controllable, environments for socialisation and academic learning.

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What's the Big Idea 2012? The Flipped Lecture

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> New digital technology is enabling new models of teaching and learning. Will the currently trending "Flipped lecture" provide an approach that will impact positively on learning, or is it more "back to the future?' Simply, will flip flop?
>
> Or…
>
> I should like to know about risks, out-of-pocket expenses, time required and remuneration, and so forth" - by which he meant: What am I going to get out of it? and am I going to come back alive.
> - J.R.R. Tolkien, *The Hobbit*, Ch. 1

Outline of focus area and summary of ideas to be explored

The Flipped lecture (or classroom) is an emerging description of a pedagogical model where the typical lecture activities and the work students traditionally do at home or out of class are reversed. For an overview - http://www.youtube.com/watch?v=26pxh_qMppE&feature=youtu.be
Students view prerecorded lectures (or listen to podcasts) and complete interactive activities in advance of class. Then when in class they engage in collaborative activities, enquiry based learning or test their skills in applying knowledge. (Educause, 7 Things you should know about Flipped Classrooms 2011). The Flip models are as numerous as the variations on the name, and span the school sector and now increasingly the tertiary education sector. Requiring careful planning and considered use of educational technologies the approach can lead to greater engagement, student centred learning and increased understanding. However there are pitfuls; including student resistance and time and technology demands. With the rise of open educational resources the concept of lecture repositories is now commonplace, with sites such as http://ed.ted.com/ including "Flips" and educational design for use in a variety of educational settings. The convergence of Open Education Resources (OER),

lecture capture technologies and mobile learning place the Flip pedagogy at the forefront of approaches for new ways of learning. Through exploration of examples, case studies and participant experiences, this symposium will seek to explore the participants' views on the approach and relate this to the conference themes. Is the approach contributing to learning for the future and importantly, is it sustainable?

Range of views that panel members will represent

The panel members are engaged in a variety of roles; facilitating and evaluating innovation, supporting academics in adopting new approaches and developing strategies to foster change, academic capacity and sustainability. The focus will be on audience discussion, and the panel will act largely as facilitators.

Describe the intended audience

Any conference attendees interested in contributing ideas and challenging their thinking and those tasked with creating, delivering and managing change in learning and teaching in new spaces and utilising new educational technologies.

Outline of the symposium format, including strategies that will be used to engage the audience

This session aims to be interactive and audience led. Audience members will be able to engage in brainstorming and polling activities via their mobile devices; using GoSoapBox, (http://www.els.qut.edu.au/innovation/emerging/gosoapbox/index.jsp) a web-based student response system which blends the physical space with a virtual learning environment. The format will be lively, provocative and engaging. The flipped lecture concept will be introduced with a multimedia overview that will also capture student and academic opinions about its use in learning and teaching. It will also show examples of the approach in practice. The Chair will then seek those with flip experience from the audience to explain, in small groups, their practice. The panel will present assumptions and misconceptions as a provocation and the Chair will lead a plenary discussion and polling exercise to consider the audience perception of the question that the Flip concept will positively impact on learning for the future. This session ideally would be programmed toward the end of the day's sessions, when topics introduced in earlier sessions can be discussed under the banner of this forum. The chair and panel facilitators will strive to create a flipped experience by demonstrating an effective format and use of technology that engages the audience and stimulates thinking and discussion.

Sustaining the future through virtual worlds

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Virtual worlds (VWs) continue to be used extensively in Australia and New Zealand higher education institutions although the tendency towards making unrealistic claims of efficacy and popularity appears to be over. Some educators at higher education institutions continue to use VWs in the same way as they have done in the past; others are exploring a range of different VWs or using them in new ways; whilst some are opting out altogether. This paper presents an overview of how 46 educators from some 26 institutions see VWs as an opportunity to sustain higher education. The positives and negatives of using VWs are discussed.

Keywords: virtual worlds, Virtual Worlds Working Group, VWWG, Second Life, SL, OpenSim

Introduction and background

As we race through the 21st century, the demand to make education globally accessible and always available is increasing exponentially. This demand for increased accessibility exacerbates the deficiencies already experienced in higher education with educational resources being stretched by increasing numbers of students, fewer staff and less support. Given traditional delivery models, under these circumstances the provision of quality education is unsustainable (Gregory & Gregory, 2011). The pressures on staff are enormous and the workplaces that our graduates are likely to enter are becoming more complex with increasing reliance on advanced technologies and associated processes. Finding new ways for students to engage with and link to a learning community is crucial. As the fidelity of 3D virtual worlds (VWs) increases and more students opt to learn online, VWs are increasingly providing rich experiences for learners as places where students and staff can interact with each other and the wider community (Brenner, 2009). The social immersion engendered by a sense of community provides the potential to reduce dropout rates so that more students will persevere with their studies (Karsenti & Collin, 2012). Access to learning that may be too costly or too dangerous in the physical world can be made possible through VWs (Thackray, Good and Howland, 2010; Savin-Baden, 2011). VWs enable activities that make life and learning meaningful, such as getting together, sharing information, collaborating and celebrating (Gregory & Tynan, 2009). Herewith, members of the Australian and New Zealand (NZ) Virtual Worlds Working Group (VWWG) demonstrate how VWs can be used to sustain the future of education.

In 2010, 21 members of the VWWG outlined ways in which they were transforming the future through VWs (see Gregory et al., 2010) and by 2011 69 members reflected on how Australian and NZ higher education institutions are sustaining the future through the use of VWs (see Gregory et al., 2011, and Hearns et al., 2011). There have been dramatic changes in the ways in which institutions are using VWs and these changes are reflected in the brief overview of the use of VWs in teaching and learning by the 26 institutions represented in this paper. The focus of their combined comments is sustainability and learning for the future.

Virtual worlds and sustainability

VWs are 3D online environments populated by multiple users through their avatars (Girvan & Savage, 2010). Across the world, many universities have a VW presence (Thackray, Good & Howland, 2010). The ability to be "immersed in a synthetic, constructivist environment" as suggested by Dede (1995, p. 46) is a major factor in educators persevering with VWs to provide complex learning experiences that promote higher order cognitive skills in their students. The popularity of VWs in higher education remains undiminished in defiance of a range of barriers including technical, identity-based, cultural, collaborative, economic and creative issues (Warburton, 2009) and accessibility (Wood & Willems, 2012). Although these barriers remain today, educators' perseverance, as demonstrated in this paper and in the literature (Savin-Baden, 2011), reveals their belief that VWs can deliver positive student outcomes. Although we propose that VWs have the potential to address issues of sustainability in higher education, there is currently scant reference in the literature. As Dede (2005, p. 226) reminds us, "The evolution of higher education is shaped by changes in the characteristics of entering students, by development of new methods of teaching and learning, and by shifts in the knowledge that society values". We believe that VWs have a part to play in this evolution, as suggested by Ondrejka (2008, p. 229), who states that the "mix of fantastic possibilities and social educational opportunities has VWs poised to transform basic approaches to learning and communication, as well as innovation and entrepreneurship."

Method

A survey was circulated to VWWG members seeking their thoughts and opinions on how trends in VWs were affecting their institution. They were also asked what "sustaining the future through VWs", meant to them and their institution. Forty-six authors from 26 institutions participated, consisting of experts, champions or regular users of VWs with in-depth knowledge of the challenges facing the longer term viability of VWs in education.

Analysis and discussion

The following information is a collation of the survey data. VWWG members indicated that they use VWs across a wide range of disciplines for a myriad of purposes including education, early childhood learning, physiotherapy, pharmacy, social work, occupational therapy, health, nursing, community service, aged care, nutrition, sports and soft tissue therapies, OH&S, arts, medicine, biotechnology, criminology, languages, ICT, multimedia, business, law, project management, journalism, construction, communications, employability skills development and research. Educators reported on a diverse range of activities including games, interviews, lectures, literacy activities, discussions, reflections, simulations, building, scripting and role-playing. Educators work with school students, collaborate with other universities, conduct careers days, conferences, workshops, public relations activities and create machinima (in-world video) as a teaching resource. Table 1 provides a summary of the findings indicating how 26 institutions are using VWs in teaching, learning and research.

Table 1: Institutional opt in year, discipline(s) and how virtual worlds are being used

Year	***Institution,*** *Discipline(s)***,** How the virtual world is being used
1997	***Charles Sturt University***, *social work, policing and chemistry, information studies* - social networking and preservation, online conferencing, student presentations, group discussions, meetings, socialising.
1998	***University of Western Sydney***, *digital humanities, cultural studies, health care, computing, engineering, mathematics* - research, human-machine interaction, games, simulation, social informatics, cyber-physical systems.
2005	***University of Southern Queensland***, *counselling, public relations, language, law, education* - meetings, conversation, courtroom trials, attentional restoration, trial bots, the Encke Virtual University Collaboration.
2006	***Victoria University***, *White Card certification, biotechnology* - construction training game, simulations
2006	***Nelson Marlborough Institute of Technology***, *midwifery, interviewing, IT, English as a Second* Language - build, script, events, machinima, staff workshops.
2007	***University of New England***, *education, pharmacy* - tours, role-plays, guests, experimentation, discussions, reflection, web quests, machinima
2007	***Queensland University of Technology***, *law, business, nursing* - community plaza and auditorium, machinima, field trips, games, AI, simulations, learning design.
2007	***University of South Australia***, *career services* - communication, teamwork, problem solving, interviews, meetings.
2007	***Monash University***, *languages, behavioral studies, pharmacy* - simulations, bots, identity, privacy, communication, teamwork, commerce and community, problem based learning.
2008	***Deakin University***, *crime, arts education, medical discipline, health sciences* - tutorials, scenario based learning, Physical TV Company production "Thursdays Fictions", case studies, scenarios.
2008	***The University of Queensland***, *languages, educational technology, pharmacy, assessment* - orientation, field trips
2008	***Curtin University of Technology***, *physical and multi-disciplinary, health sciences and information systems* - oil, gas and mining industry, modelling, 3D graphics, social interaction, collaboration, learning, simulations.
2008	***University of Technology Sydney***, *retail, administration, international studies* - language teaching, course design, delivery modes, learning strategies.
2008	***Canberra Institute of Technology*** and ***University of Canberra***, *health* - communication, inter-disciplinary learning, skill development.
2008	***University of Newcastle***, *architecture* - design learning, collaboration, creative possibilities.
2009	***Manukau Institute of Technology***, *interviewing, language studies, nursing, policing, teaching* - holodeck (scene changer), discussions, interview and media room, advertisements, literacy enhancement, presentations.
2009	***University of Ballarat***, *Emergency room, stuttering support, art, variety of subject areas* - simulations
2009	***University of Western Australia***, *art, teaching, visualisation research, architecture marketing, business, teaching and learnin*g - amphitheatre for large numbers, machinima.
2009	***Southern Cross University***, *commerce, management, law, justice, hospitality, tourism, education* - role-play, maths, science, sustainability.
2009	***Victoria University of Wellington, NZ***, *language* - oral presentations, research, meetings, speakers, developers, PD, contacts, learning, field trips, interviews with native speakers
2010	***Macquarie University***, *education* – learning, teaching, site visits, geometric problem, accessibility, interaction.
2010	***Flinders University***, *mental health* - machinima, otherwise have discontinued using VWs.
2010	***University of Tasmania***, *designing virtual worlds, sociology, social work, education* - creation of stand-alone structures, themed 3D environments, view lectures, role-play, chat, machinima.
2012	***Canberra Institute of Technology, University of Canberra with Oztron***, *OH&S, health* - create spaces for higher education institutions including skill development e.g. IV medication scenario
2012	***James Cook University,*** *public health, Information Technology - posters, bots* - screen casting to share computer screen, interaction.

Sustainability in virtual worlds – an Australian and New Zealand perspective

VWs offer engaging learning opportunities for students, particularly those at institutions that have a strong focus on distance learning. VWs can help to meet the need for more flexible learning through practical procedural based activities that can be delivered online and at a distance and can be accessed remotely from anywhere at any time. Traditional expensive physical settings are under pressure from both increasing student demand for flexibility and restraints on resources. VWs provide a proving ground for prototyping new methods of learning and teaching, especially constructivist, problem-based approaches. They also offer a way of meeting current demands for widening participation as we look for more flexible ways to accommodate an increasingly diverse audience.

In preparing students for a knowledge-based society, educators need to shift their focus to enquiry-based education, facilitating the development of creative problem solving skills and increasing opportunities for students to undertake practice-based and service learning. Without the use of technologies such as VWs, educators are limiting options for expanding their range of educational activities and resultant positive outcomes for students. VWs enable student work to be showcased nationally and internationally, providing them with an expanded network of opportunities. Educators can connect globally in ways that remove barriers to the creation of networks and communities. The following outlines a number of themes in relation to the sustainability of higher education provision via the use of VWs that emerged from the analysis of survey responses.

Innovative teaching methods

VWs can facilitate an expansive range of innovative teaching and learning methods (see Table 1), which include simulations, role-plays, virtual tours, building, scripting, and the inclusion of geographically distant experts within courses. All these methods can utilise VWs to teach and learn in ways that are not possible or viable by traditional face-to-face teaching or distance learning using Learning Management Systems. VWs allows for the synchronous provision of the same experiences for students irrespective of study mode or location.

Multimedia production

VWs enable the development of engaging and challenging learning materials including 3D models, data visualisation and machinima, contextualising otherwise abstract principles and making difficult areas of curriculum accessible. Such materials suit modern day learners who are surrounded by ubiquitous information and merged technology and who deal with competing time commitments. Machinima is also cost-effective as it is cheaper to make than traditional video productions. It is also flexible, since specific content can be created far more easily than in real world environments, and accessible, since professional cinematic expertise is not required.

Blended learning

VW technology offers a bridge to future educational environments where the real and the virtual can coexist seamlessly and where on-campus and distance education cohorts can be bought together. VWs provide a place to learn, engage, experience and experiment and are fundamentally about experiencing global connection in a 3D environment in real time. This can include working in virtual teams or attending conferences, but their real value is in allowing educators to grasp some of the issues and challenges that they will face in the new real/virtual integrated world, and to giving them opportunities to experiment with how they, as individuals as well as educators and students, might start to approach these challenges.

Economic constraints

It is inevitable that there will be more economic constraints on higher education institutions in the future and while it can be argued that VW technology is expensive to establish, the continuing costs are minimal in comparison. The costs of establishing virtual facilities are many times less than building similarly innovative physical spaces on-campus. VW simulations, particularly of complex, dangerous or rarely encountered situations are also cost-effective when compared to running simulated events on campus. Experiments can be conducted cost-effectively without harm to others and at minimal costs compared to real life experiments. The costs and time associated with transport and accommodation related to conferences, field trips and off-campus students attending residential schools could be minimised or eliminated. Virtual excursions can provide authentic learning; virtual conferences allow distant colleagues to gather easily, and off-campus students can come together for a virtual residential school that can offer many of the affordances of face-to-face sessions. Unfortunately, academics are sometimes not aware of existing virtual spaces and may embark on large projects costing substantial amounts of money. With a little planning and savvy, VWs can enable the cost-effective provision of a range of services and student learning, particularly if the free resources that have already been created in VWs are utilised. However, VWs have not always been adopted at an institutional level. Rather, projects have been implemented and driven at an individual, unit, program or faculty level, therefore there is greater need for coordination, particularly within institutions, to realise improved cost savings.

Careers

There is an increasing trend for employers to use VWs as part of their recruitment practice and service delivery (Andersohn, 2009; Klingshrin, 2010; Sullivan 2010), as evidenced by the appearance of virtual careers fairs. The more learning institutions utilise and thereby expose students to this environment, the better graduates will be positioned for the work world of tomorrow.

Collaboration

VWs make the increasing focus on national and international educational collaboration easier to accomplish, with the ability to bring geographically distributed staff and students together in one virtual space. For example, VWWG meetings are unique in the Australasian context, allowing a diverse group of academic staff from many universities to meet regularly. These meetings have enabled the VWWG to retain its membership and activities over three years. The VWWG began in November 2009 with ten members from four institutions. The current membership is now over 190. The first meeting began by teleconferencing. Skype was then used. By the third meeting, the VWWG decided to only meet in the VW with communication via in-world audio and/or chat. The ability to create and store resources on an extremely limited budget will be of benefit to all providers particularly as the body of knowledge in all disciplines continues to grow in leaps and bounds. Given the need to make sense of this explosion in the availability of information, we need to educate new students in how to learn and how to work together in a community of practice so that ideas can be shared and knowledge built collaboratively. It has been demonstrated that VWs are a suitable environment for the development of these communities and the sharing of knowledge and resources (Molka-Danielsen, Mundy, Hadjistassou, & Stefanelli, 2012).

Professional Development (PD)
If we consider the sustained use of VWs in Australian and NZ education, it is necessary to reflect on the PD of current and future educators if adoption beyond special projects is to take place. The IT and pedagogical support units in institutions will need to gear up to support academic's use of VWs. This could be achieved by the creation of ready-made environments, shareable examples and the offering of PD courses, which will help stimulate interest and develop a critical mass of knowledge about VWs in the academic community. Teacher education programs would need to familiarise pre-service teachers with VWs by providing them with opportunities that will challenge their ideas on pedagogy.

Future of learning using virtual worlds (sustainability)

In the pursuit of better educational outcomes, many members of the VWWG in Australia and NZ, believe that the future will see VWs playing a greater role in teaching and learning. Those proposing an increase in VW use see the development of more user-friendly input devices, browser based access and an increase in bandwidth reducing any impediments and encouraging the creation of configurable worlds that that were not previously possible. In some universities, VWs, 3D virtual environments and simulations are now embedded in a number of formal curricula and, while still not widely used throughout all disciplinary areas of the university, they are driven by individuals rather than at an institutional level. The need to demonstrate levels of innovation in both teaching practice and teaching spaces has helped to sustain the presence of VWs in many universities. Examples such as language learning offer new possibilities in speaking, writing and listening through the development of innovative visual and interactive learning activities.

An important issue that demonstrates the sustainability of VWs is the emergent use of different VW platforms. In 2010, when the first VWWGs paper was published, approximately 90% of institutions were using Second Life (SL). Now two years later, many are using OpenSim and other platforms, even though the majority has retained a SL presence. As staff become more sophisticated in their skills in building and scripting, the opportunity to develop closed VWs where students can self explore scenarios as many times as they like is increasing the possible uses for academics. One reason for the movement away from SL is the growing movement towards more manageable simulation environments and intranet versions of VW servers for easy development of internal secure grids and mobile VW clients. This will facilitate ad hoc and ubiquitous usages of VWs in educational scenarios to contribute to a greater uptake of VWs. Some of the barriers to using VWs continue to be the usability due to bandwidth and hardware quality, but these are generally felt to be less of an issue than in previous years and likely to be resolved with future developments in networks such as the Australian National Broadband Network (NBN). To increase the use of VWs, especially SL, the costs and time needed to develop skills is still mentioned as a barrier. A general sense of optimism in the uptake in VWs is expressed through the survey responses.

Two VWWG members who are not as optimistic about the future growth of VWs reported that they cannot accommodate the time requirements of working in VWs where more teaching responsibilities are falling to sessional staff, some of whom may not be familiar with many current pedagogical initiatives including the utilisation of VWs. A growing emphasis on educational technologies such as social media and mobile computing technology such as smartphones and tablets appear to be currently receiving a greater focus than that of VWs. Even though these devices limit the possibilities of using VW viewers, they do amplify the possibilities of augmented reality and we are beginning to see projects that tap into these affordances. What seems to be evident is a reapplication of the basic principles of immersion and engagement and repurposing them into other contexts that are more sustainable under prevailing conditions within the university. The more sophisticated VWs will see future application in those areas where their affordances more closely meet pedagogical requirements than do other, less demanding, competing technologies.

The findings reported in this paper represent a limited number of academics from a self-selecting group of virtual world advocates (members of the VWWG), and so care must be taken to avoid generalising the implications beyond this population. Furthermore, limitations on space do not provide scope for a more detailed critical analysis of the data. Despite these limitations, the snap shot of the use of VWs by members of the VWWG suggest a few interesting trends and the implications for the long-term sustainability of these environments for teaching and learning in higher education.

While VWs are gradually becoming a feature of tertiary education, key influencing factors for sustainability include: ongoing improvement in the network and computer technology needed to access and develop these environments; greater functionality of VW platforms combined with a commensurate improvement in user-friendliness and accessibility features; ongoing empirically based research into models of learning that incorporate VWs leading to improved pedagogical design of learning activities and demonstrated relevance of these activities to the main curricula; changes in broadly held perceptions of VWs from being associated with leisure-based gaming activities to that of useful tools which can provide learning opportunities not readily available in real world settings; an increase in PD of educators towards improving technical skills and literacy of educators as to the affordances of VWs; and a general increase in online interaction in all aspects of everyday life.

Further research should extend studies such as this to a wider, more representative population, including academics that are not currently using VWs in higher education to begin to build a more comprehensive picture of the future sustainability of these environments. Such a study should be conducted longitudinally to track changes in technology, pedagogical approaches as well as changing teacher and student attitudes toward the use of VWs in the curriculum.

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Meeting the Challenges of Sustainable Learning Support

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Michael has been using blogging technology since 2005 to enhance his teaching of literature. He has a PhD (Sydney 1981) in Australian Poetry and a Certificate of Higher Education from ACU (2011). His research topic for the Cert. in Higher Ed was "Blogging in the University Literature Classroom: A Case Study". Michael has given academic papers on the use of technology in Higher Education at Blackboard Conferences in Chicago and Cairns. He has published widely in the field of Australian Literature and Spirituality and has recently begun publishing in the area of teaching with technology.

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Diana Simmons gained a Masters Degree in Applied Linguistics in 1991 from Macquarie University, majoring in systemic functional linguistics and literacy development. She has lectured in both these areas at Macquarie University, the University of Technology, Sydney, the University of Western Sydney and the University of Wollongong. Since 1999, on joining the Academic Skills Unit at Australian Catholic University, her work has focused primarily on tertiary literacy. The affordances offered by recent advances in technology are of particular interest to her, as they allow for literacy development through peer-to-peer as well as teacher-to-student interaction.

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Simon is currently employed as an eLearning Designer at The University of Adelaide. In addition to his current role Simon has worked in the tertiary education sector in South Australia, New South Wales, and Jiangsu Province China in the roles of Online Applications Specialist, Systems Administrator, and Lecturer. Simon's research interests include intercultural issues in education, large class and diversity issues, and electronic assessment within the tertiary education environment. Simon has a particular interest in semi-automated quality feedback and the design of media to increase perceived quality of feedback content.

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Wai-Leng has been collaborating with Michael in the use of technology for engaging students since 2004. She has worked in a wide range of roles including five years in the elearning area: provided support to lecturers in the use of LMS (for face-to-face and online units) and use of Web 2.0 tools, research support and copyright. Her interests are in learning design, pattern language and the use computer-supported collaborative learning.

Outline of focus area and summary of ideas to be explored

Universities and staff are under pressure to demonstrate improved performance and often with declining resourcing (Ellis & Goodyear, 2010). Currently the authors are involved in the design of a pilot "study" that will comprise students from two different faculties to use blogging technology as a way of enhancing their writing skills and their engagement with learning. Blogging was the technology of choice as there has been positive anecdotal feedback from students in a literature course. While the feedback has been positive, there have been a number of challenges with managing blogging and managing students' expectations in relation to timely feedback. This project will also explore the role of peers in the community of bloggers, use of semi-automated quality feedback and informal support provided by academics and academic skills advisers. This cross-faculty model involves voluntary participation of students from a literature cohort and students from a health science cohort.

Range of views that panel members will represent

- Michael - using blogging - literary/creative aspects; assessment
- Diana - academic skills perspective; leverage blogging to improve students writing in particular academic writing
- Simon - semi-automated quality feedback with blogs - design, etc
- Paula – expertise in elearning and perspectives from a faculty that support large class sizes
- Wai-Leng computer-supported collaborative learning to support and enhance learning using Web 2.0 tools and technologies

Describe the intended audience

Staff in higher education institutions, colleges and schools looking at use of blogging as a strategy to engage students and improve students writing especially within context of large class sizes

The 5 C’s of Literacy and Literary Skills Development: Conversations, Community, Collaboration, Creativity, and Connection

Michael Griffith
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The use of blogging has been explored on how it can enhance and extend support for student participation and learning: as collaborative learning spaces, for increased participation and interaction amongst students, as a valuable asset to the learning schedules of large cohort university teaching, for promoting writing skills. The limitations and lack of perceived benefits have also been acknowledged in some studies. At our university, blogging has been applied in a course to enhance the engagement of students in the study of literature, to extend community with peers, and to build skills for future employability. It is precisely because of the less formal nature of the blog, one more in harmony with students' own social networking practice, that this Web 2.0 tool segues so effectively from students' native skills into the academic arena. The increasing use of social media in academic contexts has however, raised the question of whether the largely informal nature of Web 2.0 can act as a pathway to develop students' writing or if this could hinder the development of competence in academic discourse.

Keywords: Blogging, Affordance, Literacy, Literary, Digital

Introduction

The authors present preliminary findings into which aspects of blogging support students' development in literacy and literary competence. However, the authors also affirm the *affordances* of this social software in its capacity to facilitate a ‘‘participatory culture’’ amongst students and provide ‘‘low barriers to artistic expression and civic engagement, [strong] support for creating and sharing one’s digital productions’’ (Jenkins 2006, p. 3).

5Cs: Conversations, Creativity, Community, Collaboration and Connections

This preliminary analysis has been derived from the blogs of a selected group of first year (literature) students. Students have been required to complete a weekly blog entry of around 120 words responding to a series of questions (both creative and critical: http://michaelgriffith.livejournal.com). They are also asked to write at least one peer review each week of around 150 words. At the end of semester, students then have to shape their blogs into an e-Portfolio (created within WordPress/ currently Mahara). This e-Portfolio gives them an opportunity to showcase their best work and to write a critical, summative report on their experience over the semester.

The **conversations** that are enabled through these contexts are equally extensive: educational, social and creative. Students converse with each other in ways that are not possible within the busy lifestyle of a modern university and they are able to engage with their teachers in ways that break down barriers and create new opportunities for learning. One of the most powerful conversations that is realized through this technology is that which opens students to the world beyond their own unit of study and beyond their own campus. Tomes (2001) argues that technologies create new opportunities by "capturing the collaboration and communication between groups of learners and teachers in a form which allows that collaboration to become an educational resource for other students" (p. 222). There have been cases of students whose creative work has been noticed by professors in other parts of the world. Here are the beginnings of real global synergy.

Creativity is one of the strongest features that this technology gives access to. Students who have never had an audience before, suddenly find a space where creativity is released and responded to. Typical responses include: "I never knew I could write poetry before" and "It is wonderful to have a ready-made readership of my writing".

In writing critical and creative blogs on authors and topics students are collaboratively engaged in a **community** creating a digital context which supports their individual work on literature. This is a powerful agent for meaningful engagement. No longer is the student studying an author or idea in relative isolation, now they are sharing their enthusiasms and questions; they have a real sense of how their peers as a whole are engaging with the content. It is not necessary for them to wait till class to hear what others think. There is a living continuum of engagement with vitally meaningful content available at the click of the button on their iPad.

Collaborative learning is strongly sustained by the peer review process that is part of our teaching/ learning strategy. Peer review is an essential component of enhancing and developing a student's capacity in the areas of both literary and literacy development. Typically students are asked to peer review each other's work at least once each week (i.e. one student per week). While encouraged to be supportive in their comments they are also asked to make constructive criticism where appropriate. This allows the cohort to support collaborative learning as well as the development of editing skills, some of which are subject specific.

The interactive contexts for students using this technology are extensive **connections** are created. These engage students with a whole range of resources, human and technological: their peers, their teachers, the academic skills support sector outside their discipline, the array of digital contexts that offer themselves as an ever-growing cornucopia of expressive tools.

Impact on Literary Development

A student's literary development is deeply enhanced by expressing their understanding in written form in a forum where they can be heard by their peers and by their teacher. In the best cases it acts like an extension to face-to-face class time where ideas are expressed and critiqued both by peers and teachers. Some students who are less willing to share ideas in a face-to-face forum find their voice in this context. Because of the nature of the language requirement for blogs, students are also less inhibited to express what they really feel and often link their observations about literary texts with aspects of their own experience. This is something that can be well illustrated by student examples.

The word "literary" here refers to both a student's grasp of the specialised language of literary criticism, but also to their capacity to find their own creative voice through the imitation of an author's style (across all genres) or through being stimulated into writing their own original poem or short prose piece based on their own experience. In a blogging context, the word "literary" is expanded even further by virtue of the fact that students are no longer writing in a two dimensional media, but in fact have the full resources of the multimedia environment at their disposal. "Literary" now means not simply finding the *mot juste*, but also finding the capacity to embed creative or critical words in a context of well selected visual and/or aural elements -including all aspects of visual style enhancement- and through bringing a higher order of creative ability to their expression.

Impact on Literacy Development

The development of a student's literacy is a central concern for all users of this technology within a higher education setting. While the creative, literary developments that blogging can enhance are a central driving force to the use of this technology, the enhancement of a student's literacy, their ability to master the distinctive discourse of their subject specialisations, is of major concern to academic institutions always keen to enhance their academic credibility. It is for this reason that this study has this twin agenda: to explore the literary and also the literacy development of students' writing capacities, through the agency of blogging.

In the context of the Systemic Functional Linguistics school of thinking (SFL), Colombi (2006) argues that "the fundamental interconnectedness of language use, and the social context..." (p. 149) informs the basis of a course for developing academic literacy. This provides a strong argument for the underlying components of "educational blogging" as a powerful creative underpinning for what is required in the academic arena.

This also accords with what Starfield (2007) says about not "devaluing the multiple discourses students bring with them to university ... " (p. 878). The embedding of academic skills into this process indeed builds on such language capacities that they already have and further brings to the students' attention the conventions of academic literacy and an awareness of how register changes according to the audience and purpose.

Literacy Development within this context has of course one further connotation and that is the development of a student's digital literacy. This is something that many students already grasp well, being, as we know, "digital natives"; however the implementation of blogging as part of their academic discipline creates a new demand for them to develop their capacity in this area of literacy to a new level of competence. This is in fact what we have discovered, namely that some students have developed and mastered areas of their digital expressive powers- their digital literacy - in ways that they could not themselves have foreseen.

Pegrum has tellingly predicted:

> ... education must also prepare students for a social future where they have the technological and personal literacies to build their own digital identities and author their own individual narratives. It must prepare them for a sociopolitical future where they have the participatory and remix literacies to intervene in societal narratives. It must prepare them for a global future where they have the cultural and intercultural literacies to contribute to world narratives. The future of our individual liberties, our democratic political systems and our planet demand it. (Pegrum, 2009, p. 54).

Discussion

Students are tempted into writing informally on topics of great personal significance (issues of personal identity they encounter in reading literature along with the triumphs and tragedies of the authors and their characters) and then find themselves deeply engaged with their own lives and with other lives (both those of their peers and those of the authors they are studying) (Pegrum, 2009).

Such engagement inevitably leads to a discovery that writing is a tool that liberates students' understanding and it is upon this basis that further engagement with academic skills is supported. At our university we have underpinned this organic process by embedding the work of our Academic Skills unit directly into Arts and Education degree literature units. Students find that work on their blogs can lead to an enhanced understanding of what is needed to improve their writing skills both as a medium of creative expression and as the central part of their academic equipment. Moreover there is a wonderful synergy created between the following key elements of a student's experience at University: their academic work, their fellow students, their lecturers, their academic skills support unit and finally with the technology that is the most powerful and ever advancing component in their armoury of equipment (Pegrum 2009).

An educator of some real standing in the American community, Parker Palmer, writing well before the onslaught of the digital age, has expressed powerfully a profound justification for the ways in which Web 2.0, in particular blogging, can achieve the highest educational aims:

> … to teach is to create a space in which the community of truth is practiced…. I need to spend less time filling the space with data and my own thoughts and more time opening a space where students can have a conversation with the subject and with each other… (Palmer, 1998, p. 120).

While students demonstrated a remarkable capacity in their blogs to engage both critically and creatively with the literature being studied, an initial discourse analysis of the responses to critical tasks revealed that many of the first year students had not yet achieved full control of the conventions of formal academic writing. In order for them to be able to display their work in the e-Portfolios to its best advantage to possible future employers, it was proposed to embed the development of academic literacy into their literature course.

Challenges of Managing Large Classes

The use of digital technologies like blogging, brings with it a plethora of challenges especially for large classes:

- Managing students' feedback in a timely manner,
- Managing students' expectations,
- Load issues for staff and students.

Some of the strategies that we are currently exploring include:

a) Use of peer review to provide feedback (Tomes, 2001)
b) A network of informal support comprising other staff, for example embedding academic skills support
c) Use of semi-automated quality feedback (Burrows & Shortis, 2011)

Conclusion

The work that is proceeding in this paper, will extend the current research to a wider group using design-based research; it will continue to look at literary and literacy skills development and implications for sustainable practices; it will comment on the use of semi-automated quality feedback, cross-faculty model of blogging; it will further explore the involvement of academics and especially the embedded involvement of academic skills. It is the authors' intentions to study closely the impact of these technologies on a cohort of students over the next three years. This then is an ongoing study which, it is hoped, will fine-tune the strategies for effectively implementing Web 2.0 technologies as part of the deep learning process in Higher Education across the curriculum. It is anticipated that a further discourse analysis of the students' work will be conducted during the second semester concentrating on systemic functional linguistics (interpersonal; logical) with a focus on what students are actually learning through the agency of blogging.

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Facilitating motivation through support for autonomy

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With the increasing ubiquity of new technologies, many claims are being made about their potential to transform tertiary education. But in order for this transformation to be realised a range of issues need to be addressed. Research suggests that student motivation in technology-rich learning environments is one such challenge. This paper reports on one aspect of a larger study that investigates the nature of motivation to learn in online environments. Using self-determination theory (SDT) as an analytical framework, the focus here is on the underlying concept of autonomy. Ways in which certain social and contextual factors can foster perceptions of autonomy, and in turn motivation, are explored. These factors can have a supportive effect on learner motivation. Most prominent among these are the relevance of the learning activity, promotion of interest and active learning opportunities.

Keywords: motivation, e-learning, autonomy, self-determination theory

Introduction

The rapidly changing nature of technology is having a dramatic impact on how, where and when we choose to learn (Harasim, 2012). Educational institutions including universities are no less affected (Haythornthwaite & Andrews, 2011). In such a rapid time of change, it is critical that we are cognisant of factors that contribute to learning success in technology-mediated environments. Motivation is one such factor (Bekele, 2010). Perceptions regarding the motivation of online learners have developed out of earlier distance education models (Moore, 1993) and adult learning theories (Knowles, 1984) that consider such learners as independent, self-efficacious and having high motivation to learn (Bates, 2005; McCombs & Vakili, 2005). But as the student population becomes increasingly diverse, the boundaries between traditional and informal learning environments blur and new forms of online learning such as massive open online courses (MOOCS) experience high dropout rates (Mackness, Mak, & Williams, 2010), these underlying assumptions are being questioned (Haythornthwaite & Andrews, 2011). A growing body of research highlights motivation as an issue requiring further investigation in online contexts (Artino, 2008; Bekele, 2010; Hartnett, St. George, & Dron, 2011).

Literature review

"To be motivated means *to be moved* to do something." (Ryan & Deci, 2000a, p. 55) Motivation involves goals that provide the impetus for purposeful action with an intended direction. Inherent in this definition is the notion that motivation is a process rather than an end result. As such, it must be inferred from actions such as choice of tasks, persistence, effort and achievement, or from what individuals say about themselves (Schunk, Pintrich, & Meece, 2008).

Understanding the complexity of motivation is important because it has practical implications for online instructors and instructional designers as well as learners. For example, motivation to learn has been shown to play an important role in determining whether learners persist in a course of study, the level of engagement, the quality of work produced, and the level of achievement (Schunk, et al., 2008).

Contemporary views of motivation emphasise the situated, interactive relationship between the learner and the learning environment (Turner & Patrick, 2008). Just as motivation is a key factor in learning and achievement in face-to-face educational settings (Brophy, 2010), so it is in online learning environments (Bekele, 2010). Despite this, existing research in online contexts are limited both in number and scope, as others have noted (Artino, 2008; Yukselturk & Bulut, 2007).

Motivation to learn online

Various frameworks have been used in studies of motivation in online contexts. These include: Keller's (2008) ARCS (attention, relevance, confidence and satisfaction) model (Huett, Kalinowski, Moller, & Huett, 2008), self-efficacy (Moos & Azevedo, 2009), goal orientation (Dawson, Macfadyen, & Lockyer, 2009), interest (Moos & Azevedo, 2008), intrinsic–extrinsic motivation (Xie, DeBacker, & Ferguson, 2006) as well as various combinations of these constructs (Lin, Lin, & Laffey, 2008; Yukselturk & Bulut, 2007).

One theory used to investigate learner motivation in online environments is intrinsic and extrinsic motivation. “Intrinsic motivation is defined as the doing of an activity for its inherent satisfactions rather than for some separable consequence” (Ryan & Deci, 2000a, p. 56). Intrinsic motivation often results from the challenge, interest or fun an individual derives from an activity. In contrast, “extrinsic motivation is a construct that pertains whenever an activity is done in order to attain some separable outcome” (Ryan & Deci, 2000a, p. 60). Extrinsic motivation is associated with a source outside the activity itself, such as undertaking a course of study to improve future career prospects. Research suggests that individuals who are intrinsically motivated are more likely to undertake challenging activities; be actively engaged and enjoy learning; adopt a deep approach to learning; and exhibit enhanced performance, persistence, and creativity (Brophy, 2010; Ryan & Deci, 2000b).

Self-determination theory (SDT) (Ryan & Deci, 2000a) is a contemporary theory of intrinsic-extrinsic motivation that is built on the fundamental premise of learner autonomy. SDT argues that all humans have an intrinsic need to be self-determining or autonomous (i.e., experience a sense of agency and control), as well as competent and connected, in relation to their environment. When autonomous, students attribute their actions to an internal locus of causality; and experience a sense of freedom and choice over their actions. SDT states that if the environmental conditions are such that they support an individual’s autonomy (as well as competence and relatedness), then more self-determined motivation will be promoted with intrinsic motivation being the most self-determined (Ryan & Deci, 2000a).

A number of studies have used SDT to explore students’ reasons for engagement in online environments. Comparative studies are common (Shroff & Vogel, 2009; Wighting, Liu, & Rovai, 2008) and findings have indicated that online students were more intrinsically motivated than their on-campus counterparts. Other research has suggested that learners’ perceptions of autonomy were predictive of both intrinsic and extrinsic motivation (Huang & Liaw, 2007); intrinsic motivation was associated with greater exploration of the learning environment (Martens, Gulikers, & Bastiaens, 2004); and intrinsic goal orientation was significantly positively correlated with online success (Yukselturk & Bulut, 2007). Together these studies have suggested that learners’ perceptions of autonomy are important in fostering online students’ intrinsic motivation.

SDT has also been utilised to identify contextual factors that support intrinsic motivation (Harper, 2009; Rovai, Ponton, Wighting, & Baker, 2007; Shroff, Vogel, Coombes, & Lee, 2007; Shroff, Vogel, & Coombes, 2008; Xie, et al., 2006). Collectively, these studies have demonstrated that feedback, well-designed discussion topics, the instructor’s role in online discussions, clearly stated guidelines, choice, competence, challenge, interest, relevance and collaboration all influenced student intrinsic motivation to learn in the various online learning contexts. However, the study by Xie et al. (2006) was the only one to draw on multiple perspectives by incorporating instructors’ points of view on the purpose of online discussions. Furthermore, none of the above studies clarified which of the different psychological needs of SDT were supported by the identified contextual factors influences. It can be argued, for example, that clearly stated guidelines and well-designed discussion topics guide, clarify and facilitate the learning process thereby supporting a learner’s need to feel effective and competent. In other words, it is the support for learners’ competence needs rather than their autonomy needs that fostered the observed intrinsic motivation in these studies.

The current research sought to go beyond existing research by using the underlying concepts of SDT (i.e. autonomy, competence and relatedness) as critical lenses to untangle the multiple influences on motivation that combine in complex ways in different online contexts. By doing this, it is possible to shed light on the ways in which the different psychological needs of learners are affected by a range of social and contextual influences.

Method

This paper presents findings of one aspect of a wider study (Hartnett, 2010) that explored the motivation of pre-service teachers situated within ‘real-life’ online learning contexts. While the main study explored and identified a broad range of influences that supported or undermined learners’ autonomy, competence and relatedness needs, results presented here focus on those factors that fostered perceptions of autonomy among learners.

Case studies

This study was exploratory in nature and sought to identify, explore and understand pre-service teachers’ online learning experiences as they related to their motivation to learn in specific online contexts. Therefore, the methodology adopted was case study because such an approach can be of value where the research aims to investigate a complex phenomenon embedded in the real world, where the scope is difficult to define and can only be understood within context (Gillham, 2000; Yin, 2009). Purposive sampling methods (Patton, 2002) were used to select two information-rich cases. Although the broader institutional context was beyond the scope of the wider study, the effect such influences can have at the situational level have been noted previously (Vallerand & Ratelle, 2002). Potential cases were therefore identified from the same programme within the same institution in order to reduce differential contextual influences at the institutional level. Cases were chosen based on predetermined criteria of importance to ensure relevance to the research question. In particular: (a) courses were required to be predominantly web-based, with only limited resources provided by alternative methods such as print; and (b) students were required to participate in the online learning community as an integral part of their assessed coursework.

Procedures

Ethical consent to undertake the study was gained prior to the collection of data. Data collection procedures comprised online questionnaires, interviews, online asynchronous discussion transcripts and course resources. Findings presented here draw on interview and open-ended questionnaire responses in addition to online discussion transcript data and were collected after the relevant learning activities had been undertaken.

Both inductive and deductive analysis occurred within this research investigation. While self-determination theory (Ryan & Deci, 2000a), provided sensitising concepts with which to explore the qualitative data (Blumer, 2006), an inductive approach geared to allowing additional patterns, themes and categories to emerge from the data, occurred concurrently (Bogdan & Biklen, 2007).

This process involved reading and re-reading all qualitative data to get a sense of the breadth of responses and the possible range of codes needed to identify themes. Each theme was assigned a code and each coded piece of text was placed at a “node” named in such a way that it described the essence of the idea identified. In this way, chunks of text with similar ideas were able to be stored together. These pieces of text varied in length and were coded at all relevant nodes depending on whether single or multiple themes were identified.

Context and participants

The two courses that provided the context for the case studies were situated within the larger context of a pre-service teacher education programme within a New Zealand tertiary institution. Students in this programme were preparing to teach in New Zealand primary (i.e. elementary) schools. These courses were considered Internet-based rather than fully online because students received some print material (study guide) and digital resources (CD-ROM – Case Study One) at the beginning of their course. The online learning platform used for online communication and most content delivery was the WebCT Learning Management System. The boundary for each case study centred on one assignment and its associated online activities. In both case studies, all participants had similar prior experience of online learning and group assignments.

While both cases were chosen from courses within the same programme, the instructional design of each was different. Case Study One was situated within a compulsory integrated science and technology course. Teaching staff consisted of a course coordinator with science expertise and a tutor with technology expertise. The tutor was responsible for most of the online teaching and management of the course and focused on use of online resources and facilitating related asynchronous discussions. Students usually took this course in the third and final year of their degree. The case study itself focused on a Problem Based Learning (PBL) assignment worth 60% of the final mark. This was undertaken over a six-week period in which students were required to work collaboratively in small groups. PBL is an instructional approach built around authentic, ill-structured problems which are complex in nature (Schmidt & Moust, 2000).

Case Study Two was positioned within an introductory social studies curriculum course that formed a compulsory component of the same programme. Students usually took this course in the second year of their degree. An individual micro-teaching and reflection assignment (with associated online activities), which required students to plan and teach two consecutive lessons in a school of their choice and then reflect on their experience, formed the boundary for Case Study Two. Students completed this assignment over a four week period and it was worth 40% of the final mark. The course coordinator was responsible for all online teaching throughout the semester.

A total of 21 student participants took part in the two case studies (12 in Case Study One and 9 in Case Study Two) and three lecturers (2 in Case Study One and 1 in Case Study Two) and were recruited from the semester one (February – June) 2008 online offering of each course. Participants were located throughout New Zealand

and undertook their courses at a distance from the main campus. The respondent group comprised two males and 19 females (one male in each case study). Participants' ages ranged from 18 to 55 with 90% in the over 24 age group.

Findings

As mentioned previously, self-determination theory is used as an analytical framework. The fundamental premise of SDT is that perceptions of autonomy, competence and relatedness (Ryan & Deci, 2000a) contribute to self-determined forms of motivation (Hartnett, et al., 2011). Only the situational influences that provided support for the autonomy needs of learners are reported here.

A range of important social and contextual influences were found within each case study that served to support learners' autonomy needs, thereby facilitating the expression of more self-determined motivation. Themes common to both case studies and others unique to one case are summarised in Table 1.

Table 1: Autonomy supportive influences that support high quality motivation

Autonomy Supportive themes	Case Study 1		Case Study 2	
	Frequency count	Students identifying theme (n=12)	Frequency count	Students identifying theme (n=9)
1. Task relevance & meaning ▪ professional ▪ personal	68	8	55	9
2. Interest ▪ situational ▪ personal	50	7	52	9
3. Actively use knowledge in practice	29	6	32	9
4. Significant role in group decisions & tasks	25	7	-	-
5. Autonomy supportive lecturers	18	5	20	6
6. Provision of choice	17	6	19	9

The *relevance and meaning* of the activities emerged as the most salient theme that supported the autonomy of participants in both case studies. Within this major theme, two key sub-themes emerged: *professional relevance* and *personal relevance*. Comments such as 'this assignment was exactly what the course is about and indeed what we are studying to be is all about – teaching' (Student2, CS2, questionnaire) and 'an authentic problem that was happening in our community that was … meaningful … that was motivating' (Student11, CS1, interview) were indicative of comments from participants across the two cases.

The autonomy needs of learners were further supported through the promotion of *interest* in two distinct ways. Online discussions that were considered 'quite hot topics … [and] got us talking … I got the impression that people were participating quite regularly because it's just interesting' (Student1, CS2, interview) and the use of authentic learning approaches such as problem based learning that emphasised 'the fun of actually trying to create some experiments' (Student7, CS1, interview) were some of the ways in which *situational interest* (i.e. features of the learning activity itself that participants found interesting) was promoted. Moreover, activities that provided opportunities to pursue *personal interests* were key mechanisms that supported autonomy as revealed by the following comments 'I decided to take it into the fact or opinion kind of evaluation or you know inquiry aspect of that, that intrigues me. I mean anything to do with getting kids to think about why they are thinking, fascinates me' (Student7, CS2, interview); and 'science and technology are my favourite things' (Student8, CS1, interview).

Being able to *actively use knowledge in practice* was also seen as important and valuable and was next most prominent theme highlighted by learners across both cases. The following remarks indicate what this meant to learners: 'it was a very hands on/practical assignment which not only put the theory into practice but it also replicated exactly what would happen within the classroom situation' (Student9, CS1, questionnaire); and 'I think it was probably the best thing that you could do … you know, you learn all about social studies … and then you are faced with the problem well, how am I going to teach that? You know, it's like, oh wow okay, I've just read all about it, so now I have to actually work out for myself how that's going to go' (Student2, CS2, interview).

Perceptions of having played a *significant role in group decisions and ta*sks also contributed towards learners' autonomy in Case Study One (a collaborative task) but not Case Study Two (an individual task). This occurred in groups where learners were supported by their peers to contribute to group decisions and tasks by having 'your say on everything' (Student8, CS1, interview) to ensure 'we all know that this is what we're doing now and summarise what we'd been talking about and that we're all on the same page' (Student4, CS1, interview). In contrast, the individual nature of the assignment in Case Study Two, that afforded learners a clear sense of autonomy, meant that fellow students were not perceived as central to influencing learners' sense of agency as the following comment indicates: 'it was really valuable … to have the experience of making your own choices and making your own mistakes or your own successes' (Student1, CS2, interview).

A further theme to emerge was the autonomy-supportive approaches adopted by the lecturers. Statements like 'I think it's healthy when they decide because the ownership is on them and they're not being pushed' (Lecturer1, CS1, interview); 'students identifying their own opportunities so they get that sense of … ownership right from the start, it's not imposed upon them' (Lecturer2, CS1, interview) and 'for me it's a sharing of power' (Lecturer, CS2, interview) indicate that support for learners' autonomy was a consideration for lecturers in both case studies. This translated to learners' perceptions of autonomy most consistently in Case Study Two (see Table 1) as the following comments indicate 'we weren't told this is the way I want your groups to be. Or this is the way that I want you to do it but we were given options' (Student3, CS1, interview); 'I loved how she brought it across because she wasn't serious and this is how it is and this is how it's going to be and she gave us the freedom to explore' (Student3, CS2, interview) and 'Isn't it lovely to feel worthwhile & capable & valued' (Student9, CS2, online transcript).

A final significant theme to emerge that supported participant autonomy was the perception of many choices being available to them. The *provision of choice* was seen as freeing and having no limits, as the following remarks attest: 'choice is very important to me in a motivational sense' (Student7, CS2, questionnaire) because it allowed learners to 'choose what was of personal importance to me, to my life' (Student10, CS1, questionnaire).

Discussion

In the discussion that follows, it is important to note that no one factor supported all the autonomy needs of learners on its own. Rather, learners' *perceptions* of the extent to which their needs were met were formed from multiple influences that combined in complex ways that were dependent on the learning environment in which they were situated.

Relevance and meaning

Across the two case studies, the importance of the learning activity in terms of its relevance and meaning emerged as a central theme that fostered perceptions of autonomy resulting in the expression of more self-determined motivation among learners. Within this, two clear sub-themes were identified in terms of what participants found relevant and meaningful about their respective assignments. First, participants who saw a clear link between their own experience during the activity and its relevance to their future teaching practice expressed feelings of autonomy. Expressions of autonomy were reported by participants across both cases but most consistently in Case Study Two. For these learners, the usefulness or utility value of the activity (i.e. a means to achieving a future goal) they were undertaking was clear and something they identified with. Highlighting the relevance and applicability of an activity (to future goals) has been identified previously in the literature as an important strategy for supporting the autonomy needs of learners that results in more self-determined motivation (Brophy, 2010; Reeve, Ryan, Deci, & Jang, 2008).

In addition to professional relevance, the second sub-theme was the personal relevance and meaning the activity engendered for participants. Being able to make connections from the course content to their everyday lives, in terms of existing interests and prior experiences, enhanced the meaningfulness of the task and encouraged personal involvement for the majority of participants. Support for personal relevance and task value being important sources of motivation to learn in online contexts can be found in a number of previous studies (Artino, 2007; Xie, et al., 2006; Yukselturk & Bulut, 2007). Beyond affirming existing research, this finding has further significance because it demonstrates that the relevance and meaning of an activity is not just important for learner engagement online but that it influences the quality of learners' motivation, by providing support for autonomy needs.

Interest

The primary way in which learners' interest was supported in both case studies was through the promotion of situational interest – interest generated by certain conditions in the learning environment (Hidi & Renninger, 2006). Interest is always content specific (Krapp, 2002). Situational interest was promoted and sustained in Case Study One through the use of problem based learning as an instructional strategy which encouraged participants to engage with science and technology content. Participants expressed interest in at least one aspect of the PBL process – a new learning approach for the students and one that had direct relevance to pre-service teachers as a model of practices that might be used in their own teaching. Examples included the collaborative nature of the activity and the potential for various approaches to solving the chosen problem. This interest was further supported by the lecturers who encouraged students to pick a topic that piqued their interest and/or had personal relevance.

Similar to Case Study One, participants in Case Study Two were also encouraged to focus on a topic that was personally meaningful. Additionally, the lecturer created on-going situational interest by the inclusion of regular online activities and resources that were topical, relevant and meaningful, both personally and professionally. The promotion of situational interest is an important finding. This is because it demonstrates that while the potential for interest lies within the individual (Hidi & Renninger, 2006), the situation – in this case the teaching approach – also has an important bearing on its development and, in turn, the motivation experienced by learners.

In addition to participants finding aspects of the learning environment interesting, personal interest – an individual's preference to return to a particular area of content over time (Hidi & Renninger, 2006) –also emerged as an important theme. When the choices available were perceived as appealing, this allowed learners to align learning activities with their individual interests. Participants identified the opportunity to choose the topic of the assignment, in particular, as key to this alignment process. The main difference between the two cases was that the majority of students from Case Study Two (see Table 1) expressed a strong, well-developed, pre-existing individual interest in social studies content which was further enhanced by the autonomy supportive context of the micro-teaching task. Opportunities to link learning activities to areas of personal interest have been shown previously to support autonomy thereby promoting more self-determined motivation (Hidi & Renninger, 2006; Reeve, et al., 2008).

Actively use subject knowledge in practice

Students liked being active and being able to put into practice what they were learning in an authentic way. Participants from both case studies highlighted having opportunities for action as a key feature that helped them to understand the importance, relevance and value of their respective tasks, particularly to their future teaching practice. Tasks that involve a high degree of participation and activity have been shown to promote motivation (Reeve, Deci, & Ryan, 2004), learner engagement and encourage deeper understanding (Brophy, 2010).

Significant role in group decisions and tasks

Learners in Case Study One who played a significant role in their group's decision-making processes and completion of tasks, perceived their peers as having contributed to supporting their autonomy needs. In other words, they believed their contributions were not only endorsed by their peers but also influenced the overall action taken by the group. Whether this took the form of collective decision-making processes or the role of leader, participants perceived their peers as supporting their need to be self-determining.

Support by peers for the autonomy needs of their fellow learners did not feature in Case Study Two. This was due to the independent nature of the activity. While participants did consult with their peers before making decisions about choice of topic, teaching approach and possible resources, decisions were not dependent on the suggestions made by other students.

Autonomy supportive lecturers

The ways in which lecturers communicated expectations and feedback was important to learners. The provision of clear expectations and feedback using informational, non-controlling written language was identified by students as a feature of the lecturer's communication style that they considered autonomy supportive (as well as supportive of competence needs). This informational style revolved around information-rich messages that identified what was required, written in a way that conveyed flexibility and personal responsibility to the learner rather than seeking compliance through control or coercion. The use of explicit, detailed information that clarifies what is required without seeking to control behaviour has been identified previously as an important characteristic of autonomy supportive teachers (Reeve, 2009).

Provision of choice

The provision of choice emerged as a final prominent theme that learners identified as supportive of their autonomy needs. Across the cases, participants who perceived themselves as having choice identified several areas where they were given opportunities to choose. These included: the topic they focused on, how they went about it, and the presentation of their work. Case Study One learners also identified the opportunity to choose their peers as a further key area where they could make their own decisions. However, this tended to occur only for those students who approached other learners early on in the process and therefore had more potential group members from which to choose.

Being given opportunities to choose how and when to act, in ways evident in these case studies, promoted perceptions of choice, a sense of control and greater volition similar to previous research results (Van Etten, Pressley, McInerney, & Liem, 2008). Here, the provision of choice was autonomy supportive because it provided opportunities to pursue topics and activities in ways that were interesting, relevant and meaningful. In other words, the choices offered were not seen by these participants as trivial or superficial as can sometimes be the case with, for example, option choices (Reeve, Nix, & Hamm, 2003).

In summary, six important themes emerged as facilitating perceptions of autonomy across the two case studies. The different ways in which the psychological autonomy needs of learners were supported were, in turn, influential in fostering the expression of more self-determined motivation. It is interesting to note though, that some factors were identified as supportive or undermining of learners' autonomy needs depending on an individual's perception. This highlights the complex and interactive relationships between the learner and learning environment that influence motivation (Turner & Patrick, 2008).

Implications

This study has demonstrated that perceptions of autonomy by learners (which contributes towards how self-determined they feel) were influenced by online teaching practices, the design of learning activities and the social aspects of the tasks in which they were engaged. This is hardly new or surprising given our current understanding of the situated nature of learning in traditional (Lave & Wenger, 1991) and online (Wegerif, 1998) contexts. What is new is the consideration of these influences from a motivation perspective (through the analytical lens of autonomy from SDT) and the findings that, similar to learning, motivation is also situated in particular contexts. The implication is that differing circumstances of students within the learning context need to be considered and, where possible, accommodated in order to support the learner's psychological need for autonomy and the expression of high quality (i.e. more self-determined) motivation among learners.

Limitations

As with all research, there are a number of limitations with this study. The use of case study methodology meant that research findings are associated with particular chosen contexts, namely two courses that formed part of a pre-service teacher education programme within a single New Zealand university. This limits the transferability or usefulness of findings to other online practitioners in diverse settings. However, the primary intention was to explore environmental influences on learners' motivation, not to generalise to the wider population of online learners.

Conclusion

Using self-determination theory and the underlying concept of autonomy, this study has uncovered a range of social and contextual factors that facilitated perceptions of autonomy among learners. Importantly, learners' autonomy, and therefore motivation to learn, was shown to be facilitated by specific online teaching practices, design aspects of learning activities and the social aspects of tasks in the contexts described here.

The identification of a range factors that support learner agency offers practical assistance in supporting our understanding of the dynamic interplay of influences that can support student motivation in online contexts. While this is by no means a definitive list, the factors identified may help in the creation of useful guidelines for teachers and instructional designers when considering the development of and teaching within online educational contexts. The interplay of factors will vary within any given context and be different for individual participants but unless this complexity is recognised and understood, we run the risk of not being fully prepared to face the challenge of developing practices that support the motivation of learners in the future.

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Moving down Stream: Using e-technology to enhance social work field education

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In 2009, Massey University introduced Moodle (aka Stream) as an institutional innovation to support and enhance teaching and learning. The social work field education (practicum) programme has embraced Stream as an opportunity to creatively advance current educative practices. The development of a meta-site for field education provides academics, students and field educators[1] a forum in which field education can be advanced. This paper will outline the rationale for a research project that examines the perspectives of field educators and academic staff on the opportunities and challenges associated with on-line teaching and learning in the field education area. The research will assess the value of the Stream environment and consider ways in which the current innovation can be further developed.

Keywords: online environment, Moodle, field education, community of practice

Background

Massey University, a multi-campus and dual mode university in New Zealand, aims to provide higher education of a quality and kind that will enhance the capabilities, potential and intellectual independence of its students, on a life-long basis (Brown, Argyle, Kendall & Sandbrook, 2011; Massey University, 2009). The introduction of Moodle (known as Stream) in 2009 sought to provide students with an engaging, rich-media environment (Brown et al., 2011). As an online environment it is intended to be connected, innovative, flexible and relevant to learners (Bates, 2010; Kehrwald, 2011).

In the Bachelor of Social Work and Masters of Applied Social Work programmes at Massey University students are required to undertake two 60-day practicum in social service agencies. Students may study either internally or by distance and the practicum may be located throughout New Zealand. Students are, in the main, supervised and supported by a registered social worker in the practicum agency. These field educators commit to educating and assessing a student throughout the practicum period, however, they may have had no or minimal training for this role. Field educators may lack confidence, specialised knowledge or pedagogical skills required to ensure student learning (Chilvers, 2011). Voluntary face to face training for field educators supervising Massey University students is restricted to two or three regions each year and may not be attended due to, for example, workload commitments, geographical location, health or interest.

Field educators communicate directly with academic staff during the planning stage of the practicum, they are visited approximately mid-way through the practicum by an academic staff member, and they may choose to phone or email staff if any concerns arise. Aside from this contact the field educator is largely isolated from the University.

From our experience positive relationships between the University and agencies as well as clear expectations and understanding of the field educator role are more likely to ensure quality practicum. Given the time and resource constraints on both academic and agency staff we question whether online technologies, and specifically Stream, can be used more effectively for the benefit of field educators. In 2011 we began to re-develop the Field Education Stream site that had initially been established for practicum students so that it was more relevant and accessible to field educators. Access is offered to all field educators although acceptance of this invitation is required. At present asynchronous modes of communication are utilised; primarily a news forum, text and audio resources, as well as relevant university documentation.

Stream also has the potential to be used as a forum in which academic staff can provide feedback and encouragement to field educators as student's progress through the practicum. It may also be a place where field educators can connect with one another thus developing a community of practice where ideas and strategies may be shared. Academic staff could also use Stream to facilitate and guide field educators in their often challenging roles as educator, coach, mentor, supervisor and assessor. Stream might also offer a quality

[1] Field educator refers to the person in a social service organisation that is supervising and supporting a student throughout a 60-day practicum. This person is usually a registered social worker.

learning environment which may be of particular value to field educators who are new to the role or who have not been able to attend face to face training with the University (Garrison and Vaughan, 2008).

The Stream site then may offer a new opportunity to support the ongoing learning of field educators. This is important as part of our professional commitment to supporting and strengthening the social work profession and to benefit our students as learners in the practicum environment. Through building positive relationships and offering valuable resources to the field educators they in turn may better support students, the university and the wider social work profession. In the current competitive environment the provision of appropriate incentives to field educators, such as relevant resources, may also assist in retaining quality practicum opportunities.

Evaluating the Stream site

The potential functions of the Stream site may include enhancing relationships; developing a community of practice; augmenting professional knowledge and practice; and ultimately improving student learning. There is however no compulsion for field educators to be active in the Stream setting and so a learning environment that is relevant, flexible, convenient and accessible is necessary (Cleveland-Innes, 2010). We are particularly interested in exploring how the Stream site can be connected, innovative, flexible and relevant to field educators as learners. At this point it is unknown whether the field educators are interested in such a learning forum or what type of digital environment they might prefer to enhance their professional development as field educators.

A formative evaluation of the Field Education Stream site will gather information to guide future decisions as to the shape and function of the site so as to enhance its quality and effectiveness (Reeves and Reeves, 2012). The research involves a literature review and semi-structured interviews that will collect the perspectives of field educators who have accessed the site, field education staff who have used but not developed the site, and a teaching and learning consultant.

Stream as connected

The Stream site is currently accessed by only a few field educators. These people primarily view the assessment documentation and resources related to supervision. Access is only occurring during the period that students are on the practicum. This raises questions as to how best to connect with field educators when students are only on practicum for a three month period once during each year. Field educators may also choose not to take students every year.

It is important that assumptions are not made as to engagement, connecting or collaboration. While academic staff may prefer to increase interactions between themselves and field educators during and outside of the practicum period this may not be a shared goal. Elements of collaboration already exist between the university and field educators as they both endeavour to ensure a successful practicum (Zepke and Leach, 2010). However, field educators may differ in their preference to develop stronger relationships with the university, particularly through an online environment. At this point field educators have not indicated a desire to develop or participate in a field education learning community that may ‘collaboratively engage in purposeful critical discourse and reflection to construct learning that is personally meaningful’ (Reeves and Reeves, 2012, p.120). Building a community of practice takes considerable time and requires strong leadership. Furthermore it will only be successful if there is sufficient interest and commitment (Hay, 2011).

Developing the Stream site then needs to be purposeful to ensure that there is responsiveness to the needs and preferences of the field educators (Garrison and Vaughan, 2008). A series of questions may be asked: Do field educators want engagement and connection through Stream? What type of connections do they want? How can this be delivered? When do they want to be connected? Who do they want to connect with?

Stream as innovation

Learning technologies such as Stream may involve tools for information delivery, tools to provide active learning, and tools to provide knowledge. These tools may have value for field educators who are working as professional social workers as well as educating students on practicum. No monetary resources are transferred from the university to social service agencies for practicum students. While there is an implicit expectation of reciprocity with the student expected to positively contribute to the work of the agency during the practicum the reality is that the benefits for the agency are often less than for the university (Shardlow, Scholar, Munro &

McLaughlin, 2012). Offering digital resources and an opportunity to become more connected with the university and other field educators may be seen as a benefit for field educators. As a digital environment Stream offers an innovative means of interaction that may be immediate despite geographical distance. It may also become an online training environment that can be accessed by field educators when convenient. The inclusion of a range of resources, whether text, video or audio, may also support field educators to continue their own professional learning and development. While the Stream site is innovative in the sense that it is accessible for field educators rather than only students it is important that consideration is given to how the site can be 'a learning environment that encourages learners to seek, find, analyse and apply information appropriately' (Bates, 2010, p.23). Questions to be posed include: What tools are of most relevance and value to the field educators? What resources do the field educators want to access? What will motivate the field educators to access this online environment?

Stream as flexible

Designing a flexible as well as relevant and accessible online environment is likely to be of greater benefit to field educators. Field educators will come to the site with various understanding and knowledge about digital resources. To be of value then the site may need to include a range of strategies and tools so that diverse needs are met. At present, the site is largely a repository of print resources and contains links to relevant professional websites and podcasts. Resources have been categorised to enable easier searching. A news forum is used to convey messages from academic staff. Curriculum resources, for example assessment documentation, are also available. There is potential for a broader use of tools, for example, discussion forums or chat. Audio messages from university staff could also be used as a means of support, teaching and encouragement. Questions however remain as to the value, purpose and likely use of these by field educators especially given the voluntary access to the site, the workloads of the field educators and their perceptions of the accessibility of the Stream site.

Stream as relevant

Field educators are both educators and learners whilst they support students on practicum. They are teachers of students with a responsibility to the university to support the student to meet the required learning outcomes. Further they are learners in their professional roles as social work practitioners as well as field educators. As life-long learners the Stream site could provide field educators with another learning environment. It is well-known that motivation is increased if tools and resources are seen as having value and being relevant (Bates, 2010). Achieving this is one challenge for offering digital resources to field educators. There is considerable diversity in field educators, not only in terms of their social work positions but also in respect of the time they have to engage, interest in using technology, interest in ongoing interaction with the university, perceived relevance of university-provided resources, and availability of technology. Incorporating authentic tasks may assist with increasing the perception of relevance (Reeves and Reeves, 2012). Questions in this domain include: How can the Stream site be of value to field educators? How can issues of diversity be addressed? What tools and resources are most of use to field educators in their dual role as educators and learners?

Conclusion

The Field Education Stream site at Massey University is currently designed for both students and field educators. Over the past two years academic staff have begun to shape the site so that it offers more relevant resources to field educators with the intention of better supporting them as both educators and learners. All field educators need to both understand and continue to develop in their critical roles. Receiving adequate training, feedback, encouragement and support is important to ensure the success of practicum (Chilvers, 2011). The Stream environment potentially offers a mode for creating better connections with field educators in an innovative, flexible and relevant way. The potential of the Field Education Stream site has at this point not been examined and thus provides the rationale for this research. The project therefore will seek the perspectives of field educators as well as draw on the expertise of key university staff so that informed decisions can be made as to any future developments. Field education is at the interface of academia and practice and university staff must ensure that all developments, including within digital environments, are responsive and of sufficient value to those whom they are intended (Chilvers and Hay, 2011).

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Leading by Example: The start of a journey towards transformation of teaching practice in the online space

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This paper outlines the design of a study to investigate how a collection of example units was used as part of a wider training and support strategy during the transition between learning management systems. Example units can be thought of as a type of learning object or template from which innovative uses of learning technologies can be shared and used for professional development purposes in the design of online teaching spaces. Using a Developmental Evaluation approach, questions were asked about the authenticity and reusability of the example units to enhance their design in the next round of iterative planning. This paper will be of interest to Educational Developers and Academic staff interested in course design with technologies as well as co-ordinators of professional development strategies.

Keywords: Teacher professional development, technology, learning objects, evaluation

Introduction

Students' expectation of online learning, the approaches they take, their profile, and prior experiences with online learning have been documented in studies concerned with driving institutional change (Canole, de Laat, Darby, & Dillon, 2006; Collis, & Moonen, 2008). Students now expect materials that are rich, interactive, engaging, accessible, and that enable communication to cater for learning anytime, anywhere (Conole et al., 2006; Garrison & Vaughan, 2008; Oblinger, 2003). The latest releases of popular Learning Management Systems can act as a conduit to such demands but are they being used to their full advantage? The importance of the teacher role in the successful integration of technology in education is widely known and accepted. The role of adequate teacher support and teacher professional development (TPD) is seen as key to ensuring teacher engagement with and application of technology in their teaching (Collis, & Moonen, 2008; Lofstrom, 2007; McNeill, Gosper & Hedberg, 2011). There are a number of attributes (of TPD) that work well to support teachers in this regard. Studies identify constructivist learning, situated learning, collaboration, collegial networking, and access and support among others as conducive to teacher learning (Handal & Huber, 2011; Taylor, 2003). How can we design TPD to take advantage of such findings and lead to transformation of current teaching practice in the online space? What resources are needed to support and sustain this change? By providing templates, along with pedagogical and technical support to scaffold the adoption of technologies, can we bridge the gap between what the student expects and what the teacher is capable of delivering? What format must these templates take on if they are to be effective and sustainable?

Learning objects are any digital, reproducible and addressable resource used to perform learning activities, made available for others to use (Koper, 2003). Example units (or courses) are frequently used as a learning resource in technology training for their pedagogical affordances, and can also be viewed as patterns or templates for teachers. Each pattern addresses a problem and provides a solution. Example units showcase technology within an authentic setting that would enable teachers to draw links to their own classrooms and teaching (Taylor, 2003; Wells, 2007). Known qualities of an effective learning object are reusability (Koper, 2003; Watson, 2010), and the ability to be repurposed (Gunn, Woodgate, & O'Grady, 2005). Gunn, Woodgate, and O'Grady (2005) offer a sustainable approach to reusability involving teachers in a participative design process that results in a sense of ownership, acceptance and ability to realize the potential of technology in different contexts. This study aims to investigate the use of example units as an effective tool for facilitating teacher professional development in technology by evaluating their reusability, sustainability and authenticity.

Background

A major Metropolitan University recently transitioned from one Learning Management System (LMS), Blackboard, to another, Moodle as part of a larger technology enhancement project. The project followed a system development lifecycle (i.e. analysis, design and development, implementation, support and training, and evaluation). In a recent survey of students' expectations of technologies in learning at this university, students indicated that they wanted more flexible access to content, more opportunities for communication with teachers and peers and the convenience of online assignment submission (McNeil, Diao & Gosper, 2011). As part of the support and training strategy for staff, thirty-four example units were developed by the Educational Development group in collaboration with convenors from Faculties across the University with the aim of showcasing features of the Moodle platform across a variety of curriculum models and teaching scenarios. Some of the convenors had previously used the LMS for their online delivery and others were new to the field of online and blended learning.

A large-scale summative evaluation of this project is currently underway and this study reports on a work-in-progress project, a subset of the support and training evaluation. Focusing on the role of the example units, this part of the study aims to investigate their effectiveness in facilitating TPD in the area of technology integration, by asking how academics used the resource and looking at how they repurposed the designs.

Method

This study uses pragmatism as the theoretical paradigm in which to underpin the design. Pragmatism provides the opportunity to use multiple methods of data collection and is oriented towards "what works" and practice. (Creswell and Plano-Clarke, 2011, p.41). A Mixed Methods approach, with a Convergent Design (Creswell and Plano-Clarke, 2011, p.77) was used, enabling the collection of both quantitative and qualitative data to develop a complete picture of the use of example units and their effectiveness in the professional development in online learning design.

Two data sources were identified for this study. The first data set is quantitative in nature and involves collection of system-generated transactional logs to explore the patterns of use. Moodle has built-in reporting capability that provides a digital vestige i.e. a trace of events and actions. This is achieved using a Reports interface for access to logs and options for visualising this information (Hamuy, & Galaz, 2010). The second data set provides a pedagogical focus and involves an online survey to collect a mix of quantitative and qualitative data.

Evaluation Design

Since the aim of this study is to find out how example units were used as part of TPD, and improve their design for better reuse in the next iteration, a cyclical design framework known as developmental evaluation (Patton, 1994) is used. Developmental evaluation 'aspires to continuous progress, ongoing adaption and rapid responsiveness' (Patton, 1994, p. 313). The framework aligns with this study since these resources are available (online) for ongoing access and their currency is important. The analysis of the transactional logs inform answers to the questions 'What tools were of interest to the target group?' and 'What was the pattern of access of this set of resources?' Analysis of the findings from the user survey contribute towards finding how the example units (and their supporting resources) were accessed; the level of authenticity of the content (Taylor, 2003; Wells, 2007); the level of influence they had on the design of the user's own online unit (Gunn, Woodgate, & O'Grady, 2005); and the level in which the user's understanding of the new LMS was improved.

The transactional logs were analysed 6 months after the example units were made available as a resource for TPD. All teaching staff that had accessed the example units in this time period were invited to take part in an online survey (n= 314). The response rate was approximately 10% and participants were of mixed gender, and of mixed ethnicity, generally busy (time-poor), and varied in the level of ability and/or desire to use technology in their teaching. The survey was developed using a mix of criteria for TPD using technology and for learning resources (reusability) based on the literature of McDougall (2008) and Lawless and Pellegrino (2007). The survey comprised of 14 questions; 4 tick-box, 8 five-point, Likert scale (e.g. agree to disagree), and 2 open-ended questions (see Appendix A for a sample of the questions).

Initial Findings

The transactional logs have been analysed to investigate what tools were of interest to the target group and the access patterns to this set of resources. The most viewed tool in the example units was the Discussion Forum (31% of total tools viewed across all example units) and Database (27%). The least viewed tools were the Choice (online Poll) tool (3%) and the Workshop (peer review) tool (1.5%). Of the total view count of the example units (5620), there were twice as many views of the resources (3732) in these units than the tools (1888).

The survey results showed Quiz, Discussion Forum, Blocks and Lesson tools consistently rated highly in authenticity (Appendix A, Q.1), influence (Q.2) and impact to understanding (Q.3). Conversely, Chat, Workshop and Wiki tools scored the lowest. There were a number of questions in the survey which were designed to inform future design of the website from which these Example units are accessed. Findings showed that 56% of users preferred to browse the example units rather than search using keywords, they also preferred a listing by faculty rather than alphabetically and only 24% of respondents actually viewed the supporting videos (which accompanied the actual example units and consisted of 8-10 minutes where the convenor explained what functionality they had designed in.) Another administrative-type question asked whether there was an inclination to revisit the example units in the future (Q4.), only 35% of respondents said they would. When asked about the collaboration aspects of these resources (Q.6), only 42% of respondents were in agreement.

Discussion

The number of views per tool aligned with some findings in the literature. It is widely accepted that discussion forums are one of the most used tools in online learning for communication and for engaging with the course content (Garrison & Vaughn, 2008), therefore it stands to reason that the majority of our users would be interested to see how the Discussion Forum looked in the new LMS. The Database is a new tool to the LMS (i.e. not available in the previous LMS) so this high view count may be due to users wishing to explore the different scenarios of how this tool could be used. Conversely however, the Choice (Poll) and Workshop tools are also new additions in comparison to the previous LMS and were not viewed nearly as often. It could be the name of these tools that contributes to this finding, as one cannot immediately infer their functionality. In respect to the viewing of resources, particularly the videos, results will influence the next round of development since these were quite time consuming to produce. Additional probing questions will be included in the next phase of the study to explore the reasons for this.

The survey data corroborated the findings from the transactional logs. In agreement with Taylor, (2003) and Wells, (2007) it was found that content rich (authentic) tools generally performed better as measured by the number of views, influence rating and impact on understanding. Wiki and Workshop tools were an exception to this pattern. Both scored moderately for authenticity and impact on understanding but performed low for influence on future design. One explanation may be that both are LMS features that staff would not have encountered prior to the Moodle installation and may not yet feel ready to include them in their unit design. The number of responses stating they would revisit the example units was lower than expected, indicating that staff may have gleaned the necessary information on the first visit and felt no need to return. This will be developed into an interview question for the next phase. If new example units (showcasing new features) are developed then this may encourage staff to return to the site. Another reason for low access levels and responses may be due to the fact that there was no student content at the time these units were created. A more content-rich view of tools would be more beneficial, however you then have the issue of privacy of student data to consider. Moodle does have the ability to de-identify students so this could be an option for the next round of example units. The collaborative aspect of using learning objects to contribute to TPD (Handal & Huber, 2011; Taylor, 2003) needs to be further investigated before we can agree with these authors since numbers of respondents who agreed on this aspect were low. In fact 35% actually disagreed that the example units offered opportunities for collaboration.

The open ended question asking what the example units had enabled staff to do that may not have been possible otherwise, produced various comments predominantly around presentation of content and new ideas for use of tools. It will be of interest in the wider study to compare the example units to other supporting resources such as training sessions and self-help guides that were made available during the project implementation.

In line with the developmental evaluative approach to this study, the next phase will include interviews with the unit convenors who designed and then delivered these example units. Questions will be asked about what worked from the original designs and what perhaps didn’t quite go according to plan as they taught these units. What did the students say about the units? A further source of evidence that will be collected is feedback from the educational developers and designers who worked on these example units. For the majority of them, it was also their first interaction with the new LMS and they were trialling ideas around its functionality. Now that their knowledge of the system has developed, their reflections on example unit design will contribute to the next round of development.

Conclusion

Traditionally, professional development in using new technologies for teaching incorporated supporting resources consisting of ‘how-to’ guides and pedagogical reasons ‘why-to’ alongside hands-on face-to-face workshops. Is this adequate for our time-poor academics or is there a more effective and sustainable way to provide such professional development in the future? Improved use of multimedia and functionality of online delivery platforms has contributed to a reconceptualisation of how these supporting resources can be designed and delivered. Since time to invest in TPD is limited with competing workload requirements, teachers require more authentic and proven examples, which can be used as templates in their own design. This study has begun to investigate the affordances of using example units as models of authentic learning design and results to date show positive links to achieving sustainable future teacher professional development.

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Appendix A – Sample of questions used in the survey

Likert-scale

1. The content in the example units was authentic.
2. The example units influenced the design of my online unit.
3. My level of understanding (of Moodle) improved by using the example units.
4. I would be inclined to re-visit the example units in future.
5. The supporting resources were adequate when using the example units? (E.g. video, design brief)
6. Example units provide opportunities for collaboration with my peers and/or other staff in using the LMS

Open–ended

1. Comment on the ways in which the example units could better support your learning of Moodle:
2. What have the example units enabled you to do with teaching your course that you wouldn't otherwise have been able to do?

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Course Team Symposia: A useful launch pad for exploring course leadership?

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Course Team Symposia are a funding opportunity provided by Charles Sturt University's Flexible Learning Institute to help course leaders engage their teams in blended and flexible learning design. Initial findings from this preliminary study suggest that course leaders and their educational designers have used the symposium process to 'try out' leadership practices on the job by clarifying and developing a shared vision of blended and flexible learning, supporting collaborative planning, helping their teams reflect on their own practice and forming strategies to improve that practice. In doing so, they are building a repertoire of leadership strategies to use with their teams in the future. Further research involving more symposium recipients will shed additional light on how leadership is being supported through this initiative, and any implications for student outcomes.

Keywords: leadership, course, blended learning, course design

Introduction

> We can only learn about leadership through practising leadership, just as we can only learn how to ride a bicycle by riding a bicycle…This 'learning by doing' within a well-thought-through framework is the only way we can turn the leadership development key and unlock the organization's leadership potential (Peters & Smith, 1998, p.285).

Leadership in higher education is traditionally defined as the 'everyday process of supporting, managing, developing and inspiring academic colleagues' (Ramsden, 1998, p.4). More recently, it's been aligned with managing change (Parrish, 2011), and motivating diverse groups of people to work together to achieve shared outcomes (Fullan & Scott, 2009). Arguably, strong university leadership has never been more important than it is today, with significant global and national changes in the sector forcing universities to rethink their purpose while, at the same time, deal with a leadership succession challenge prompted by the impending retirement of its baby boomer senior managers. Such challenges have understandably prompted an increase in research on academic leadership in recent years (Scott, Coates & Anderson, 2008; Fullan & Scott, 2009; Parrish, 2011) as universities struggle to ensure they are well equipped to re-vision their place in the community in this climate of change.

One leadership role that remains surprisingly under-researched given its significance in terms of course quality and learning outcomes is that of the course leader. Indeed, course leaders are a core asset to universities (Balogun, 2003, in Vilkinas & Ladyshewsky, 2012), directly influencing curriculum change and ensuring that courses remain effective and relevant to a broader and more discriminating student cohort used to a world of ubiquitous knowledge and open educational resources.

Yet despite such key responsibilities, the role of the Australian course leader is often ill-defined, involving an eclectic mix of curriculum design, managing complex academic and professional teams, staff mentoring, marketing, quality assurance, pastoral care and administration (Krause, Scott, Campbell, Spencer, Lizzio, Bath, Fyffe & Clark, 2010). Individual leaders show little similarity in the significance they place on each responsibility, and universities typically do little to support the development of those taking on these roles, instead leaving this to *ad hoc*, on-the-job training and generic leadership programs (Inman, 2009). It's hardly surprising then, that many course leaders see their work as being like 'a small fish in a largely cloudy pond' or like 'rowing without an oar' (Scott et al., 2008, p.50).

Scott et al. (2008) suggest that current approaches to leadership development need to be 'radically reconceptualised' (p. xvii) and mirror established approaches for engaging students. Burgoyne, Mackness & Wiliams (2009) found that development approaches are most effective when conducted in a contextually appropriate way that involves authentic learning activities and opportunities for leaders to 'try out' leadership practices on the job. Similarly, Burgoyne et al. (2009) found that emerging leaders find coaching and mentoring to be particularly effective in supporting their development as leaders. These points are echoed by Scott et al.

(2008), who add that conversations about work with people in similar roles, participating in peer networks both within and beyond the university, and studying real-life workplace problems all have a medium level of influence on effective leadership development.

Course Team Symposia – a conceptual framework

Course Team Symposia are a funding opportunity provided by Charles Sturt University's Flexible Learning Institute (FLI) to help Course Directors engage their teams in Blended and Flexible Learning (BFL) design. The symposia were conceptualised in 2010 as a response to two key drivers. Firstly, the Faculty Deans requested that FLI's current approach to supporting staff through individual Teaching Fellowships (Keppell, O'Dwyer, Lyon & Childs, 2010) be expanded to engage a broader base of staff in BFL design. Secondly, in 2011 the University began its implementation of the CSUDegree (CSU, 2012), which moved curriculum renewal away from an autonomous, subject-based focus to one that was more collaborative, holistic and future-orientated, focused at the course level. Through the CSUDegree, the University made a series of commitments to its undergraduate students to provide opportunities for them to develop in-depth discipline, professional and personal skills, including learning effectively in online environments.

The CSUDegree presented challenging demands for course teams, many of whom had not worked collaboratively on course design in the past. Course leadership was also being reconceptualised, moving away from Course Coordinators who focused on administrative tasks, to Course Directors who would focus on strategic leadership, planning and curriculum development (CSU, 2010). By 2011, most Course Directors were still feeling their way in their new roles, some adjusting quickly supported by strong backgrounds in curriculum development, others finding the right vision but being limited by overwhelming administrative responsibilities, with a small number locked into a less collaborative model of curriculum design. Similarly, some educational designers were taking on informal leadership roles, while others sat outside the renewal process.

The FLI saw the symposia as a way to respond to these drivers. A total of 21 course teams in 12 symposia were supported during the 2010-2012 period (FLI, 2012) through a small financial grant as well as planning, resource and strategic support before, during and after the symposium. The financial grant allowed the Course Directors to bring their multi-campus teams together to collaboratively engage in course design through a focus on BFL. Through forming a draft course strategy, they also provided an opportunity for Course Directors to build leadership experience in their own, authentic context, supported by mentoring from a FLI staff member.

This preliminary case study formed part of a larger research project between Charles Sturt University and Massey University designed to explore learning leadership (Childs, Brown, Keppell, Nicholas, Hunter & Hard, in press). It aimed to explore how course leaders were thinking about and refining their leadership role through the symposium process.

Method

The study used mixed methodology, including analysis of websites and documents emerging from the symposia, as well as a questionnaire and focus groups involving course leaders and educational designers from the initial round of offers. This was important, given the very limited number of symposia (n=4) available to be analysed at the time of writing. All participants (n=8) taking on a leadership role in the first four course team symposia were informed of and invited to participate in the study. The chosen data collection methods included:

- analysis of documents emerging from the symposia, as well as relevant and publicly available websites,
- a questionnaire (n=4) completed by course leaders (n=2) and educational designers (n=2) involved in the first four symposia undertaken as part of the initiative, and
- a focus group comprising questionnaire respondents was conducted to probe, clarify or extend responses from the participants. It was held via teleconference and utilised semi-structured questions to guide the facilitated discussion. The recording was transcribed and analysed for emerging themes. Participants were assigned a code based on their role in the symposium (e.g. CD1, ED1) to ensure anonymity in reporting.

As a preliminary study, this method is limited by the small number of participants, the exclusion of symposium recipients other than course leaders and educational designers (resulting in perceptions of leadership coming only from the leaders themselves), and limited time between the symposium and the focus group, making it difficult to make any longer term assessments of whether each symposium assisted in leadership development. A more extensive longitudinal study is currently in progress.

Findings and discussion

Perception of selves as learning leaders

Each participant expressed an individual leadership style, ranging from being the principle leader (CD1), to leading ‘from behind’ (CD3), collaborating with others in the team who had specific learning expertise (CD2), and a more facilitative role, ensuring that things ‘get done’ (ED1). These reflect depictions of leader roles in the literature, and show a balance between the empathetic management of ‘people’ and the more developmental side of leadership and managing change.

The participants saw leadership as a natural part of their designated role, and felt particularly comfortable with models of leadership that inspire others toward a shared course vision, and which involve creating a comfortable environment in which to identify opportunities for, and facilitate, change. Three of the four questionnaire respondents deliberately set out to inspire or influence others through the symposium, and this seems to have had some initial success, with each respondent impacting on the teaching of between 1 and 4 other academics.

The participants agreed that the symposium had clarified their role rather than changed it. Responses suggest that they were using it to ‘listen’ to others and ‘link’ (Fullan & Scott, 2009) strategies employed to how they might lead curriculum change in other courses:

> It enhanced my role as a leader but I consider it more of a learning experience...What the symposium has empowered me with is the right approach...I didn't have the capacity to, I didn't have the right words if you want, to help these people in the course meeting before the FLI symposium. I wouldn't have known how to approach them without, sort of, hurting a few feelings. I'm more comfortable now having live examples of what we could do...it doesn't have to be dramatic changes it can be incremental changes. It's much better to look at where we want to get as a course, and slowly work towards that. That's been a great experience for me. (CD2)

All questionnaire respondents felt that the perception of themselves as learning leaders had strengthened as a result of the symposium, with perhaps the strongest response coming from the educational designer:

> I feel that my role was strengthened purely through actually having a path to follow. I feel like before we did the symposium there was a lot of talk about incorporating the CSUDI into courses ...but it always got stuck for me as to the how, the when and why we are doing it...the symposium clarified for the course what we wanted to do, why we wanted to do it and when we wanted to have it done by...before we'd done the symposium someone might come to speak to me about BFL but they wouldn't really have a holistic concept of what it was so it made it really difficult for me to suggest the kind of things that they wanted (ED1).

Misconceptions about BFL

A particularly strong theme emerging from the focus group was the benefit of the symposium in providing clarity and addressing misconceptions about their own understanding of blended and flexible learning.

> For a long time I thought that BFL was synonymous with more electronics in teaching...It was when we got together...that a switch went on and (I realised that) this BFL is actually a learning strategy...(CD2)

The leaders felt that the Symposium had helped them develop a clearer vision and engagement in BFL design with their teams, indicated by Fullan & Scott (2009) as critical factors in successful turnaround leadership. Some participants also commented that they had helped them reverse a feeling of disempowerment amongst their colleagues by affirming that many of their current strategies reflected good practice, and were a solid platform from which to build a more consistent and integrated course approach.

Opportunities to develop teams

For half of the questionnaire respondents, this was the first course-level planning meeting that they had attended at CSU. The symposium offered a ‘launch pad’ from which they could establish strong course team relationships and processes, which were later built on as each course leader worked independently with their teams. Here, a Course Director comments on how the symposium helped him move from ineffective processes:

> We have a regular monthly discipline meeting...and sometimes we just don't get anything achieved...One of the consequences of the BFL symposium was that I've come up with a structure for four course teams potentially five course teams within our discipline group...one of the things I wanted to do was to test it out and it worked well I think ... I was impressed. (CD1)

Similarly, other course leaders spoke of the symposium as enabling academics to feel more comfortable in being transparent as individual lecturers and looking at each other's subjects. Each agreed that this was an incremental process, and a learning curve for all involved.

The course symposia, by nature, encouraged academics to reflect as a team on their current practice, particular challenges that were being faced, and possible design solutions to those challenges. The importance of this 'space' for reflection is demonstrated through the following comment:

> We are pulled into a cycle of activities that does not allow for reflective practice. We used the BFL symposium as a reflective period of time, otherwise we just wouldn't dedicate that time to it … I had the opportunity to reflect on it further because I had to put the document together. That was very good … I was forced to have a period of reflective practice, which I wouldn't normally have. (CD2)

Conclusion

Given the significance of the course leadership role, especially in our current climate of rapid change, institutions need to explore a range of approaches to supporting course leaders' personal learning about their role. Although one-off course team symposia can never provide all that course team leaders require to lead innovative course design, nevertheless they do provide valuable and much needed launch pads for trying out a range of leadership strategies 'on the job' that can then be refined and transferred for use with other course teams.

The initial findings from this study suggest that participants have used the symposium process to clarify their conceptions of blended and flexible learning, develop a shared vision, find ways to support collaborative planning within their teams, and reflect on their own practice and changes that need to be made to improve that practice. In doing so, the participants seem to be building on their repertoire of leadership strategies that they can take forward to use with their teams in the future.

Course team symposia are thus a valuable addition to the personal learning opportunities offered by institutions to those undertaking this important role. Used in conjunction with other contextually appropriate, authentic strategies, they may be able to help reverse Inman's (2009) finding that universities do little to support the development of our course leaders.

Further research currently in progress involving additional symposium recipients will shed more light on how leadership is being supported through the symposia process, and any implications for student outcomes arising from this initiative.

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Unsupervised Online Constructed-Response Tests: Maximising Student Learning and Results Integrity

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This paper reports a case study in which the Blackboard essay test tool was used to evaluate e-student learning. To promote student learning as well as maintain the integrity of test results, constructed-response items were randomly selected from a large pool of study questions and the time available to complete the tests was limited. The e-lecturer maintained a reflective journal and the e-students were invited, via email, to provide feedback on their perception of the value of the testing approach used in their e-class. Overall, students evaluated the use of the online tests positively, although issues of technology difficulties presented challenges for some students. The e-lecturer was particularly positive about the benefits of such as approach to online assessment citing ease of test management including student test submission, provision of feedback and grading. Unsupervised online constructed-response tests have the potential to enhance student learning while providing valid test scores.

Keywords: Online testing; online examinations; internet tests; unsupervised tests; e-assessment

Assessment in Undergraduate Education

In educational contexts, *assessment* refers to any processes that appraise a student's knowledge, understanding, abilities or skills (Marriott, 2009). Commonly, assessment is dichotomized as formative (i.e., informs the processes of teaching and learning) or summative (i.e., provides a summary of extent or degree of student learning; Bennett, 2011). In undergraduate university education, summative assessment includes, most typically, student performance on examinations (Barhi, 2011). Traditionally and currently, university examinations are tightly controlled to ensure that students' final grades accurately reflect their level of knowledge and skills. Such control is characteristically associated with proctoring or supervision during student completion of examinations.

Summative assessment may include test items in which students select a response from alternatives provided (e.g., multiple-choice, true-false and matching terms with definitions) and/or constructed-response test items which require written responses (e.g., fill-in-the-blank, short-answer and essay questions; Kuechler & Simkin, 2010). Both selected-response and constructed-response test items have advantages and disadvantages. Selected-response test items are easily marked but may not fully assess complex skills such as analysis, synthesis, evaluation and application of knowledge (Yonker 2011). In contrast, marking constructed-response tests is time consuming and scores may vary across markers. However, well-crafted test items and detailed scoring criteria improve the validly and reliability of constructed-response test scores (Livingston, 2009).

E-learning is a fundamental aspect of university education (Allen & Seaman, 2011) and essential to many forms of professional training (Nerguizian, Mhiri, & Saad, 2011). Learning online requires summative assessment which may include tests and examinations (Marriott, 2009). One challenge in e-assessment is the maintenance of academic integrity. The possibility of cheating is the most common reason that professionals hesitate to implement online testing (Chapman & Webster, 2003; Tippins, 2009). However, several studies have concluded that cheating on unsupervised online tests may not be as pervasive as assumed (Arthur, Glaze,Villado, &Taylor, 2009; Nye, Do, Drasgow, & Fine, 2008). Having controlled for student grade point average, Hollister and Berenson (2009) found no significant differences in average performance when online examinations were administered in a proctored environment (i.e., in class) versus an unproctored environment (i.e., offsite). In defense of e-tests, Drasgow, Nye, Jing and Tay (2009) argued that cheating also occurs during supervised examinations and that multiple forms of tests are particularly useful in minimizing student dishonesty in both online and traditional learning environments.

E-assessment research is increasingly common due to the changing nature of higher education and expectations for e-assessment practice (Nicol 2007). According to Oblinger (2006), contemporary university students reflect a broad background of technology use both at home and school. Students expect interaction, a visual experience and rapid feedback from their learning activities. Wilkinson and Rai (2009) noted that many universities use computers for online formative assessment, but “application of computers to the summative assessment arena are much more limited” (p. 368). When summative e-testing is used, it is typically restricted to selected-response items, perhaps due to the benefits of automatic marking (Lin & Dwyer, 2006). Whitelock (2009) argued for fairness in online tests and the need for systematic investigation of e-assessment and student e-learning. For example, in comparing the effects of a variety of e-test formats, Johnson (2006) reported that “short answer and true-false online quiz items were differentially associated with measures of academic achievement, suggesting that cognitive processing differed across item format” (p. 105). Marriott (2009) concluded that “e-assessment offers opportunities for creating innovative assessment practices that help engage students and increase their motivation for learning” (p. 237).

Applied Research Focus

Blackboard testing options may be applied to maintain student academic integrity while promoting student learning outcomes. The Blackboard test tool allows for random selection of test questions from a large pool of potential items. As well, enforcing time limits, easily implemented in Blackboard, may encourage students to develop effective learning strategies. This paper reports a case study in which the Blackboard essay test tool was the only sources of summative assessment in a fully-online course.

An E-Learning Case Study

Via Blackboard, all students enrolled (n=23) in a fully-online first year educational psychology course were required to complete three unsupervised constructed-response tests using the Blackboard LMS. The course was organized into weekly learning modules. Each module included an *Elluminate Live* session, required readings, online discussion and learning activities. Each module contained several study questions which helped students focused their learning efforts. Students were informed that all tests items would be taken directly from the study questions. Figure 1 provides a screenshot of the study question organized in learning modules in Blackboard.

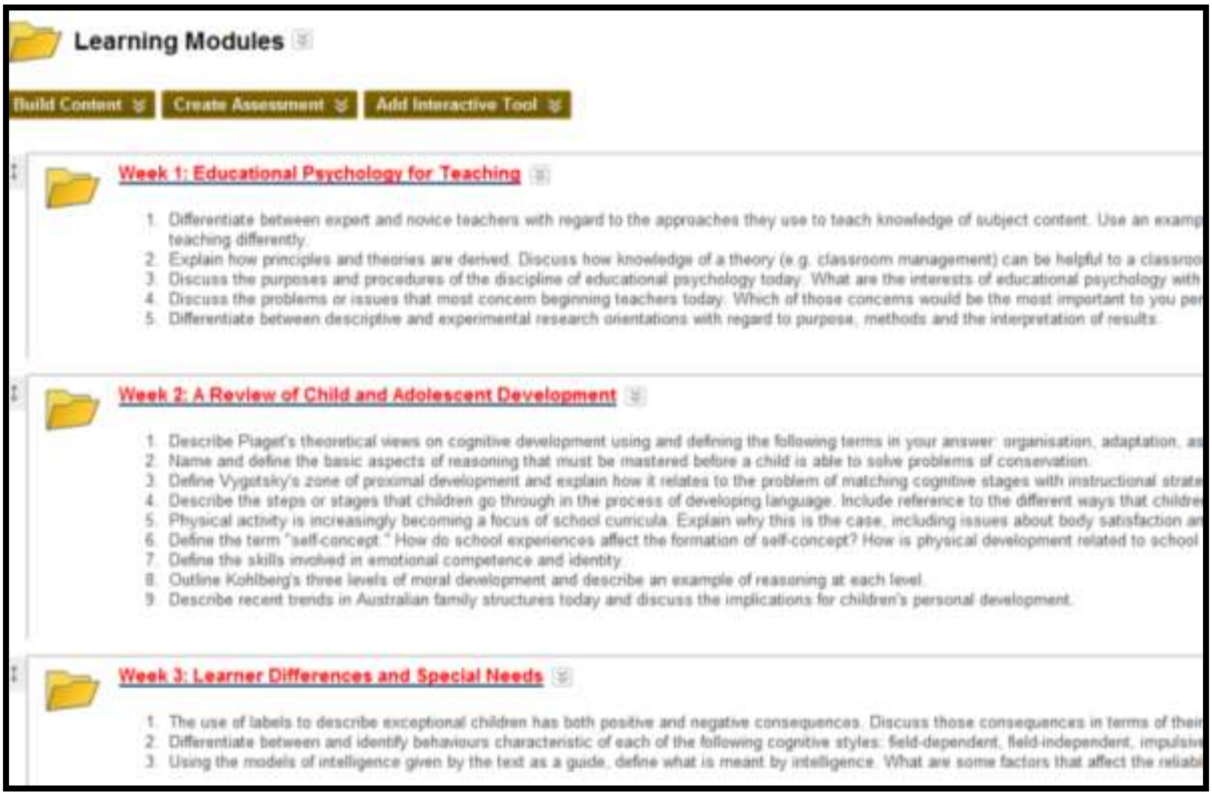

Figure 1: Weekly Study Questions Organized in Blackboard Learning Modules

Students completed the three unsupervised constructed-response tests via the Blackboard test tool. Test items were randomly drawn for a subset of study questions corresponding with the learning content covered during specified instructional weeks. The amount of time that students had to complete the online tests was reduced across the three assessments. Such reduction allowed for determination of student response to time limits in e-testing. Students were not required but simply informed that preparing written responses to all study questions would facilitate their timely completion of each online test. That is, regardless of the specific items randomly generated by the Blackboard test tool or the number of days students had to complete the test, students would be able to simply copy and paste their completed responses into the response space provided in Blackboard. Research findings suggest the student learning is maximized by careful and thorough written response to study questions (Papadopoulos, Demetriadis, Stamelos, & Tsoukalas, 2010). Figure 2 provides a screen shot of the Blackboard essay test interface.

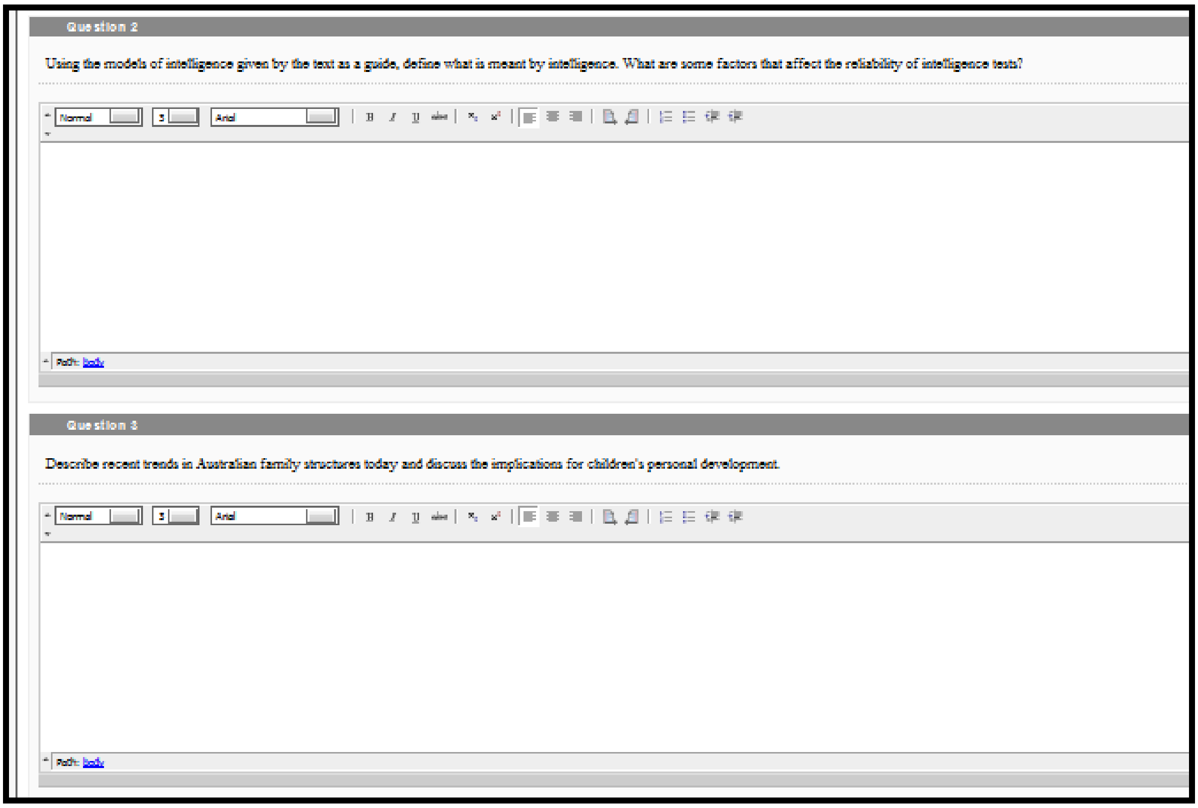

Figure 2: Blackboard Essay Test Interface

The following information summarized instructions to students with respect to each of the three required constructed-response e-tests and appeared on the course outline and in Blackboard:

> Each Learning Module (i.e., weekly Elluminate Session, Blackboard learning events and corresponding textbook chapter/s) includes study questions that are posted in Blackboard in LEARNING MODULES. On the dates specified below, a subset of study questions will be available via the Blackboard link STUDY QUESTIONS ASSESSMENTS. You will have the opportunity to answer these selected questions for a limited amount of time. There is a practice set of study questions so that you can ensure that you feel comfortable with the submission processes and that your technology is functioning. Scoring criteria is available in Blackboard and will be discussed in detail during the Elluminate sessions.
> *Study Questions # 1* (value = 30%) assess your understanding of material presented during the first four weeks of class (Learning Modules 1 through 4 which includes textbook chapters 1 through 5). The STUDY QUESTIONS ASSESSMENT will be available from August 9th until August 15th. Students have exactly seven days to complete and submit their responses to the randomly generated five questions drawn from all the study questions associated with the specified learning modules.

Study Questions # 2 (value = 30%) assess your understanding of material presented during the fifth, sixth and seventh weeks of class (Learning Modules 5 through 7 which includes textbook chapters 6 through 9). The STUDY QUESTIONS ASSESSMENT will be available from September 2nd until September 5th. Students have exactly four days to complete and submit their responses to the randomly generated five questions drawn from all the study questions associated with the specified learning modules.
Study Questions # 3 (value = 40%) assess your understanding of all material presented during all weeks of class (Learning Modules 1 through 12 which includes textbook chapters 1 through 14). The STUDY QUESTIONS ASSESSMENT will be available from October 9th until October 10th. Students have exactly two days to complete and submit their responses to the randomly generated eight questions drawn from all the study questions associated with the specified learning modules.

Students submitted their written test responses via the Blackboard test tool which were then marked by the e-lecturer. Marking criteria, posted in Blackboard and discusses in detail during the weekly *Elluminate Live* sessions, evaluated each constructed response in terms of 1) concise statements (every word necessary), language usage (spelling, grammar, sentence structure), paraphrase (avoid copying from the textbook), terminology usage (appropriate vocabulary), analysis (explore the topic in depth) and proper referencing (adherence to APA format). Figure 3 provides a screenshot of the Blackboard essay test feedback interface. Marks automatically populated *Blackboard My Grades*.

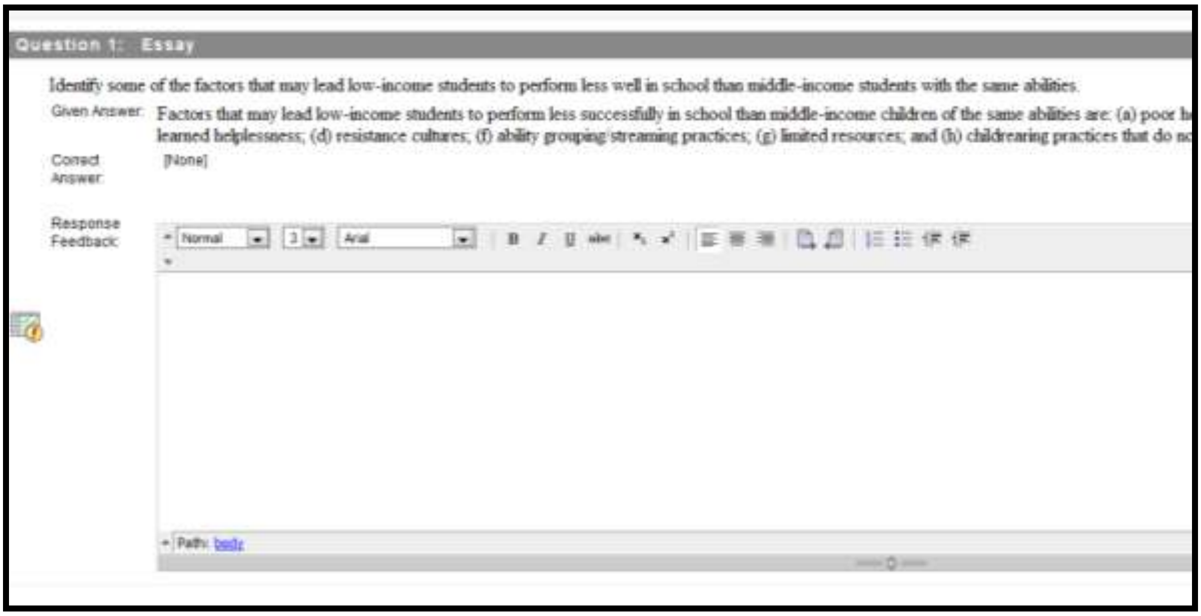

Figure 3: Blackboard Essay Test Marking Interface

E-Learning Case Study Evaluation

Throughout the academic semester, the e-lecturer engaged in professional reflective journaling with respect to experiences with students, the technology and marking the constructed-response test items in Blackboard. During the 15 week semester and until all final marks were submitted, the e-lecturer made ten journal entries. Entries varied from several words (e.g., marking is the worst part of teaching) to several sentences which made reference to email conversations with students and student comments and queries during weekly *Elluminate Live* sessions. Professional reflective journal entries were organized and analysed in terms of themes. Some journal entries included multiple statements and sentiments and, thus, multiple themes.

Following marking of all online tests and the posting of the final grades in *Blackboard*, all students who remained enrolled in the educational psychology e-class (n = 21) were invited, via email, to provide feedback on their experiences with the essay online tests. As required by research ethics, students were reminded that their response to the questions was entirely voluntary and that, if they chose to respond, the confidentially of their identity was guaranteed. Students gave permission for their responses to be directly quoted for research purposes and without connection to any identifying information. All students who responded to the email survey indicated that their message could be used for research. The questions in the email included:

1. How did you feel about the Blackboard essay test format?
2. Did you encounter any technical problems with the Blackboard essay test tool?
3. Where there any advantages to you using the Blackboard essay test tool to complete your assessments?
4. For the first assessment, the test tool was available for one week. For the second assessment, the test tool was available for four days. For the final assessment, the test tool was available for two days. How did this affect your approach to the assessments? Where there differences in how your approached each assessment because of the allocated time differences?
5. Can you suggest any improvements in using the Blackboard essay test tool in the future?

E-Student and E-Lecturer Feedback on the Online Essay Tests

Approximately half of the students invited to provide feedback on their experiences with the essay online tests responded to the email, although some students did not answer all five questions and some students simply wrote general comments all of which reflected satisfaction with the online tests and the course in general. Several students did provided detailed and considered written response to the email survey questions. Representational student comments are presented in Table 1. As can be seen, students varied in their perceptions and interpretations of the value of the Blackboard essay test tool. Approximately half of students who responded to email survey item #2 claimed that they experienced technical difficulties while approximately half reported that the technology worked well. Although home-based internet access is virtually universal among Australian first-year university students (Johnson & Broadley, 2011), the quality of connectivity and hardware and student comfort and ease of computer use may vary. Additionally, there was a high level of student satisfaction with the course and the e-lecturer and, perhaps, positive evaluation may have generalized to the use of the Blackboard essay test tool. Approximately 40% of the students who responded to email survey item #4 stated that they had answered all the study questions. Two students expressed the perception that the Blackboard essay test tool was more useful for the teacher than for the students. Such students expressed preference for simply submitting a text document via email, although such an approach would not have allowed for random generation of constructed-response items from specified study questions.

The e-lecturer reflective journal entries were extremely positive with respect to the students, the technology and marking the constructed-response test items in Blackboard. The e-lecturer was particularly positive about the benefits of online assessment citing ease of test management including test submission, provision of feedback and grading. Table 2 provides summative analysis of e-lecturer journal entries organized into themes. Four themes were evident from the ten professional reflective journal entries including issues related to: 1) managing students, materials and learning events online; 2) marking the constructed-response online tests; 3) professional satisfaction with specific aspects of teaching online and 4) frustration which focused primarily of marking and email from students which suggested lack of effort (e.g., failing to reading information available in Blackboard).

Integrity of student tests results was not an issue. E-student responses to the email survey and the e-lecturer reflective journal entries did not provide evidence that constructed- responses were copied or were not the work of the student who logged on to Blackboard and submitted the completed test. This may be the consequence of the testing protocol used. That is, while students did not know the specific items that would appear on each of the three online essay tests, they knew that the items would be drawn from the learning module study questions posted in Blackboard. Additionally, participating students did not need to cheat since, with sufficient preparation, they could simply copy and paste constructed-responses from previously answered study questions. Alternatively, although time was restricted, the number of items in each online test was sufficient to generate constructed-responses because students had access to their learning materials. The approach to e-learning and e-assessment reflected in the case study investigation did not require students to memorize course content. Requiring students to memorize large amount of information may spawn academic dishonesty.

Table 1: Representational Student Feedback on the Online Essay Tests

Question	Representational Student Response to Question
How did you feel about the Blackboard Essay test format?	It was a little cumbersome as it was not as easy to use as Microsoft Word, so cut and paste was required to transfer answers from Word to Blackboard. Proof reading and editing was much simpler using Word and at times while researching information for the answers, I would start editing in Blackboard, then realise I should have done it in Word, or make some changes in Word and some in Blackboard, becoming totally confused. My results showed that I did very well responding to the questions, however I found the number of questions asked was very small, in comparison to the 81 or so questions that required preparation. (Only approx 21% of content was actually tested - is this normal?) I did enjoy using this format, and the limited word count for the questions really allowed me to study and condense my knowledge, by getting to the point, rather than writing a lot of superfluous information.
Did you encounter any technical problems with the Blackboard Essay test tool?	No, the technology worked well and no problems were experienced. I had MANY instances of technical difficulties loading the questions...I found this nerve wrecking...Also, the fact I did not know how long I had to load the questions - before the system timed out, caused anxiousness.
Where there any advantages to you using the Blackboard Essay test tool to complete your assessments?	I can't think of any advantages from a student's perspective, however from a lecturer's perspective the timed aspect may have been useful. This, however could also be achieved through issuing questions with a specific time limit for submission. Using the blackboard essay test tool allowed me to plan my study, work, family and personal commitments around the scheduled testing periods. There was ample time available to load the questions.
For the first assessment, the test tool was available for one week. For the second assessment … How did this affect your approach to the assessments? Where there differences in how your approached each assessment because of the allocated time …?	This did not affect my approach to the assessments, as once started, the assessment had to be completed. Thus the amount of time available was irrelevant, apart from coordinating a specific time within the timeframe to complete the assessment. If we were able to access the questions for the whole period of time the assessment was available, I may have approached the assessment differently each time. For example, I would have been tempted to wait until the assessment was available before completing the questions for the longer timeframes, rather than completing the questions on a weekly basis The three different timetable schedules worked for me. If I was doing this unit on-campus, exams would be on a certain date at a certain time, therefore this unit's format had ample flexibility. I had all my questions pre-prepared on a word document so it only required a few minutes to load the questions – except for the 'saving' technical difficulties I experienced. Ultimately, it's all about organisation and preparation – and this unit supported this opportunity by providing a workable schedule in the beginning of the unit.
Can you suggest any improvements in using the Blackboard Essay test tool in the future?	I am unsure of Blackboard's suitability for essay writing. It is much more cumbersome than using Word. The window for writing is quite small and copying and pasting from Word leaves a margin for error, for example, in one question I accidentally left out references. I have found Blackboard very good for quizzes, but submission of essays using Microsoft Word only is a much simpler process. All aspects of this unit were exemplary and I thoroughly enjoyed the format. I especially felt supported by the materials used, and thought the textbook was great and easy to understand. I particularly enjoyed Elluminate, and felt all these learning tools provided me with the best opportunity to provide 'deep' answers to the questions asked in the Blackboard essay testing tool.

Table 2: Thematic Analysis of E-Lecturer Reflective Journal Entries

Theme	Representational E-Lecturer Reflective Journal Entry
Management	I remember the old days of submissions apparently disappearing into cyberspace. This is better. Even though BB is a bit of a dinosaur, it is nice to have all aspects of the course organized and assessable in one central location.
Marking	I just love the essay interface. I made some cut-&- pastes so was able to reuse some comments. Gosh it is nice to save a branch or two. Paper is the devil.
Satisfaction	I like teaching online. The students seem more appreciative and motivated, not like my f2f classes, grrr
Frustration	Not sure what's up but several students claim their PC hiccupped and they could not get back into the test. I give them a choice, I can reset and they start again, I can email a random set of questions which they can return. Not good. What if I had a huge class??

Implications for E-Assessment and Future Research

Assessment is an essential component of learning processes. It is, therefore, not surprising that virtually all learning management systems offer assessment tools, particularly for the creation, execution and evaluation of selected-response or multiple-choice tests (Amelung, Krieger, & Rosner, 2011). Yate and Beaudrie (2009) concluded "that evaluating students through the exclusive use of online assessment is a reasonable approach that results in grades that do not differ from measuring student progress with exams that are given under proctored conditions" (p. 69). Results of the current case study investigation, although limited in scope and application, provide support for the viability and utility of exclusive use of unsupervised online constructed-response tests in fully-online learning environments. Most e-students and the e-lecturer strongly supported use of the Blackboard essay test tool as the only mechanism of assessment. No e-student objected to online constructed-response tests, although not all saw advantages over simply emailing documents to the e-lecturer. From the e-lecturer's perspective, however, large numbers of students negate the possibility of such a submission strategy. As well, email does not necessarily provide evidence of student submission or the basic timing functionality of online test programs.

One of the potential advantages of e-assessment is automation of marking (Lin & Dwyer, 2006). This is particularly true with selected-response items (Amelung et al., 2011; Johnson, 2006), although exclusive use of selected-response may not maximize student mastery of required learning and skills such as written composition. Increasingly, programs are emerging that automatically mark constructed-response test items. For example, Jordon and Mitchell (2009) implemented a natural language system to mark short-answer test items. Students were automatically given tailored and detailed feedback on incorrect and incomplete responses. Reportedly, "a small number of the questions are now in low-stakes summative use, alongside other e-assessment tasks and tutor-marked assignments, to give students instantaneous feedback on constructed response items, to help them to monitor their progress and to encourage dialogue with their tutor" (p. 371). As natural language software continues to improve, applications to marking constructed-response e-assessment will correspondingly continue to improve. Students' interpretation and perception of machined-marked written composition requires further investigation.

Some, but not all, students in the current case study investigation prepared responses to all study questions associated with each weekly learning module in Blackboard. Reported benefits associated with written responses to questions include increased levels of student reading comprehension, retention of information, use of cognitive strategies, motivation, satisfaction, communication, interaction and problem-solving (Abramovich & Cho, 2006; Barlow & Cates, 2006; Yu & Liu, 2009). Menary (2007) concluded that "creating and manipulating written sentences are not merely outputs from neural processes but, just as crucially, they shape the cycle of processing that constitutes a mental act" (p. 622). The actual process of writing can be used effectively as a tool for supporting students in developing critical thinking and increasing their analysis, inference and evaluation skills (Quitadamo & Kurtz 2007). Strategies directed at ensuring that all students construct responses to all study questions might be developed, implemented and evaluated. Although systematic investigation is required, one possibility is extreme restriction of online essay test availability.

E-assessment has stimulated change in assessment practices in higher education and is likely to play an increasingly important role in the future (Whitelock & Watt 2008). Stödberga (2011) conducted a comprehensive review of current e-assessment research and concluded “that the body of knowledge in the field is extensive enough to provide a sound basis for general guidelines” (p. 12). In considering the relationship between human cognition and the evolution of tools, the need for rote memorization may be decreasing as digital technology allows for easy storage of large amounts of information and mechanisms to quickly retrieve that information as needed to solve immediate and specific problems (Johnson, 2008). Movement away from rote memorization in university education will likely increased student academic integrity. Manipulating time-constraints, easily achieved with learning management systems, may encourage student learning (e.g., answering all study questions in advance) thereby reducing incidences of dishonesty during testing. Whitelock (2010) argued for a new focus on e-assessment driven by pedagogy rather than technology.

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Online learning in ACSEducation: Using online learning tools in professional education

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Following the theme of "Learning for the Future", this paper investigates the use of a number of online tools that enhance learning within the Professional Year Program offered by ACSEducation. Supported by the literature on the use of these tools for learning and assessment, the use of online tools has provided engaging and relevant learning for students undertaking ACS programs. This paper explains the choice of tools and how they are applied to ensure the best outcome for the learners. Current research being undertaken to investigate the perceptions of students toward the use of these tools is discussed. Future research into the improvement in the use and efficacy of the tools into the future, and the methods planned for this research is also detailed along with relevant supporting literature.

Keywords: ACS, Moodle, Mahara, e-Portfolio, online learning, online assessment, professional education

Introduction and background

This paper details and discusses the use of online learning tools within the Professional Year Program at ACSEducation, a subsidiary of the Australian Computer Society (ACS). ACSEducation uses a number of online, open source tools to deliver educational programs for ICT professionals. Using a variety of well-researched online learning tools has enabled the ACS to engage and advance the skills of ICT professionals in programs across the industry association. This paper will discuss several of the online tools used within one program and plans to formally evaluate the efficacy of such tools as the ACS plans and expands its educational program into the future. Following the theme of "Learning for the Future", this paper will highlight the advantages of the use of such tools within ACS programs into the future.

Australian Computer Society, ACSEducation & the Professional Year program

Underpinned by an Outcomes Based Education (OBE) model that promotes a constructivist approach to reflective learning, ACSEducation provides several on-line, open source e-learning environments within which IT practitioners at all levels may study to enhance their own particular skill sets with a view to seeking professional certification.

In a report commissioned by the Federal Government, three factors were identified as contributing to only one third of Australian trained, overseas born graduates obtaining employment within the Australian workplace: lack of specific occupational work experience; a viable Australian labour market bridging program; and weak English skills (Birrell, Hawthorne and Richardson, 2006). The development of the ACS Professional Year Program was recommended as a way in which to equip migrant workers with a variety of predetermined work readiness skills. Previous research had shown that the poor English language and communications skills were key areas of deficiency (Bretag, 2007; Watty, 2007). Professional Year Programs were designed to equip language challenged graduates with the generic skills required to work effectively within the Australian workplace (Birrell, et al., 2006). The PY 44 week work readiness program developed by the ACS offers a twelve week component whereby the PY student is enrolled simultaneously in an ICT internship and an online tutorial and it is this element of the program on which this paper concentrates.

A review of relevant literature conducted for this paper identifies previous work that supports the use of the online learning tools employed by ACS Education as well as informs the methods used in current and planned research in this area. The literature review selection criteria concentrates on an analysis of the efficacy of online learning delivery, the pedagogical underpinning for such educational delivery as well as the types of methodologies used to support on-line, open source learning environments within varying levels of educational delivery. A second objective was to identify the types of gaps evident within the literature review conducted. A brief review of the most relevant literature is presented here.

Increasingly, universities are incorporating online technologies into teaching and learning strategies with the aim of creating more flexible learning activities (Taylor and Eustis, 2002). Advancements in information and communication technologies (ICT), as well as the changing needs and demands of students, are profoundly influencing instructional formats and delivery modes of tertiary educational institutions worldwide. Some acknowledged benefits of online learning delivery in this field include: enhancement of marketability; maximization of students' choice of learning styles; location; time; place of learning; reduction in instruction time; enhancement of effectiveness and mastery of learning; potential improvements in retention; increases in student motivation; satisfaction; and enjoyment of the learning experience (Farrell and McGrath, 2001; Kenny, 2002).

Recent studies have established that the provision of access to teaching materials alone is unlikely to engage students who respond better to more multi-modal forms of learning and is less likely to result in deeper levels of knowledge and skill development (Prensky, 2006; Rouvrais and Gilliot, 2004). Twenty-first century learning environments clearly need to take into account the networked nature of knowledge, opportunities afforded by teamwork and the importance of participation in knowledge generation in technology-rich environments (van Weert, 2006). Connectivism, (Siemens, 2005) acknowledges the centrality of learning through the generation of ideas, supported by social activity, enabled by personal networks, interactivity and engagement in experiential tasks and viewing the teacher as having the role of a mediator. Learning is the process of creating connections, a view that is congruent with the ways in which people engage in socialisation and interaction in the Web 2.0 world. A key idea is that learning starts with the connections students make with one another, as opposed to engagement with a fixed body of content.

Various researchers, (Birenbaum and Rosenau, 2006; Ashcroft and Hall, 2006) investigated the role of e-portfolios in assessing the development of life long learning skills and continuing professional development. Birenbaum and Rosenau placed reliance in earlier research conducted by Entwistle, (1991), and utilised Biggs' (1996) methodological measuring tool: the Motivated Learning Strategies Questionnaire. Biggs' research identified the importance of student attitudes towards learning and how the identification of attitudinal motivation influences individual student perceptions of the learning environment and its inevitable impact on their ultimate success within these learning environments. Tochel et al's (2009) study findings suggested there is good evidence that if well implemented, portfolios are effective and practical in a number of ways including increasing personal responsibility for learning and supporting professional development. Of further interest is their conclusion that a well-informed mentor can have considerable impact on [e-portfolio] uptake, especially when regular feedback is given. Reflective practice encourages synthesis of not only learning experiences, but also the personal value of other situations, (Conrad and Donaldson, 2011) such as internship experiences.

Over the past twenty years, the Internet has had a profound effect on the teaching and learning practices in higher education programs. Carbonaro, King, Taylor, Satzinger, Snart, and Drummond (2008) found that students reported enjoying the novelty and flexibility afforded by the use of online technologies. Studies suggest that there is a strong movement towards providing online learning as students appreciate the flexibility and enjoyment of learning in this environment (Kenny, 2002; Carbonaro, et al., 2008).

In spite of the plethora of studies on the effectiveness and advantages of online learning, there are several specific gaps in which the authors have planned studies. One is the lack of evaluation of online learning programs within professional industry associations. The other is the minimal amount of research conducted around the effectiveness of online assessment, particularly in online only courses. Finally, there is a gap in perceptions of online students who defer or withdraw from study environments.

ACSEducation application of online learning tools

Given Moodle's wide use in Higher Education delivery, and that education delivery was clearly moving towards e-learning, ACSEducation decided to adopt Moodle for its e-learning system in 2006. ACSEducation works with Bright Cookie, an educational technology company based in South Australia, which hosts the Moodle server and provides maintenance. Another strength that attracted ACS to Moodle was the usability. ACS decided to implement e-learning because of its position as a professional body in the IT sector.

A further open source learning tool utilised within the ACSEducation online environment is that of Mahara, a personalised, professional electronic portfolio (e-portfolio) within which students can document and plan their professional life achievements, career plans and long-term goal objectives.

In addition to offering materials for learning for PY students, Moodle and Mahara are used for all assessment of students in the course. Following a face to face workshop in which students are introduced to Moodle, Mahara, the SFIA (2011) capabilities framework and the PY course itself, student operate completely on line with the assistance of a tutor who interacts, monitors and assesses their progress.

Within the online course itself, students are divided into groups of 15-20 within a Moodle shell. Over the course of 12 weeks, they are introduced to a number of learning objects including a skills framework, ethical decision making, risk management, project management, initial career development information. Assessments include online weekly quizzes, discussion forums, reflective journals, and three assignments. The assignments include analysis of an ICT ethics case study, a risk management report and the development of a career based personal e-Portfolio. Each part of the online course is monitored by an ICT professional providing assistance and advice to the student. Whilst the student is engaged in the PY course, they are also completing a 12-week internship. This provides the student with an opportunity to gain valuable experience in the Australian ICT environment, and to reflect on this experience within the course.

The first tool offered within ACSEducation programs to assist students in an objective, documented self-analysis of their own particular IT skills is the introduction of an internationally recognised skills framework - the Skills Framework for the Information Age (SFIA, 2011) – the structure of which aids participating students in identifying demonstrable, current levels of professional achievement across generic and specialised skills, mapped against specific measurable standards (www.sfia.org.uk).

Current and future research

The authors took on board the recommendation of Bliuc, Ellis, Goodyear, and Piggott (2009) that further extensive research over a wide range of disciplines, involving large samples and a range of instruments to determine the effects of student perceptions in the effects of the online environment on ultimate educational outcomes as the starting point for our research design.

The approach adopted by the authors' current research into student perceptions of how Moodle and Mahara develop deep approaches to learning and the perceived quality of these tools has been influenced by previous qualitative research studies (Baeten, Dochy, and Struyven, 2008; Ellis, Calvo, Levy, and Tan, 2004). Research into the role of Moodle and Mahara as effective digital tools for reflective practice facilitation is reliant on the case study research conducted by Hegarty (2009) and George-Palilonis and Filak (2009). Birenbaum and Rosenau suggested a need to further analyse student perceptions of the online learning environment through the adoption of a mixed-methods research approach.

Since one gap the authors identified within the literature review was the exclusion of student perceptions from those who defer or withdraw from online open source study environments, it was decided to include all identifiable Professional Year (PY) enrollees within the questionnaire survey roll out, rather than merely those currently engaged within the medium or who had successfully completed the subject.

Following the completion of the study detailed above, the authors wish to investigate whether the existing online learning environment is an effective tool for creating a reflective learning environment. Subsequent papers will involve analysis of larger data sets extended to include the perceptions of both students and tutors, with a view to identifying, recording and implementing any remedial actions required to improve positive educational outcomes in the acquisition of professional development certification.

Hegarty's (2009) preliminary case study, which examined the role of reflective writing practices within the development of student skills, is an area of research identified as requiring further investigation. Finally, the authors will explore whether the concept of reflective learning could be easily grasped and self-reported as a positive learning conduit. Does the e-portfolio medium assist in facilitating student-centered learning and an ability to demonstrate a solid understanding and application of the required learning outcomes?

Conclusion

This paper detailed the structure of the ACS Education PY offerings, literature around the use of online learning, assessment and e-Portfolio use, and current research to establish effectiveness of the current environment. Existing research supports future research plans for the introduction of the chosen methodological framework for what is envisaged as a longitudinal study intended to offer further data to supplement current educational literature. The results of the pilot study investigating student perceptions of the role of the online and e-portfolio environment in the ACS Professional Year program will inform this future research.

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The life and death of Webfuse: principles for learning and leading into the future

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Drawing on the 14-year life and death of an integrated online learning environment used by tens of thousands of people, this paper argues that many of the principles and practices underpinning industrial e-learning – the current dominant institutional model – are inappropriate. The paper illustrates how industrial e-learning can limit outcomes of tertiary e-learning and limits the abilities of universities to respond to uncertainty and effectively explore the future of learning. It limits their ability to learn. The paper proposes one alternate set of successfully implemented principles and practices as being more appropriate for institutions seeking to learn for the future and lead in a climate of change.

Keywords: e-learning, LMS, design theory, organizational change

Introduction

In the mid to late 1990s it seemed like most of the early adopters of web-based learning were developing their own "cottage industry" e-learning systems. The design of one such system at CQUniversity was described in a 1996 ascilite paper (Jones & Buchanan, 1996) and implemented in 1997 as Webfuse. Unlike many such cottage systems, Webfuse survived the top-down selection and adoption of a single, enterprise-wide Learning Management System (LMS) in the early 2000s. A practice labeled here as industrial e-learning. While CQUniversity did officially select WebCT (1999) and then Blackboard (2004) as the official institutional LMS, Webfuse was widely used until 2009 and the adoption of Moodle.

During its lifespan work on Webfuse developed a range of innovative and context specific features – many of which are still not available in other systems - that were adopted at significantly greater rates than that of other systems both within and outside CQUniveristy. Some of those features are still in use at the institution in the middle of 2012, even though Webfuse is no longer officially supported. This paper argues that a significant contributing factor to this apparent success is that the principles and practices underpinning the design and support of Webfuse are significantly different than those underpinning industrial e-learning. In particular, these principles better enabled the design and use of Webfuse to learn from prior experience and evolve more rapidly.

This paper draws on this work to demonstrate the source of the limitations of industrial e-learning and to propose that the principles abstracted from Webfuse as offering a more appropriate alternative for tertiary e-learning. The paper starts by briefly explaining the research on which this work is based and summarizing the evidence that suggests it is worth consideration. The paper then examines the source of the limitations of industrial e-learning by analyzing three different components: product, process, and people. For each of these, how industrial e-learning sees each component is described, the problems of these conceptions is illustrated, and the emergent alternative is presented. While not positioned as being without problems or as the only alternative to industrial e-learning, it is suggested that these alternative principles can offer significant advantage to tertiary institutions.

Research method and limitations

From the initial stages of its design the Webfuse system was intended to be a vehicle for both practice (it hosted over 3000 course sites from 1997-2009) and research. Underpinning the evolution of Webfuse was an on-going process of action research that sought to continually improve the system through insights from theory and observation of use. This work has contributed in varying ways to over 25 peer-reviewed publications. Other researchers have also studied Webfuse when investigating institutional adoption of e-learning systems (Danaher, Luck, & McConachie, 2005) and shadow systems in the context of ERP implementation (Behrens, 2009; Behrens & Sedera, 2004). Starting in 2001 the design of Webuse became the focus of a PhD thesis (Jones, 2011) that made two contributions towards understanding e-learning implementation within universities: the Ps Framework (Jones, Vallack, & Fitzgerald-Hood, 2008) and an Information Systems Design Theory (ISDT) titled "*An ISDT for emergent university e-learning systems*". The Ps Framework arose out of an analysis of existing e-learning implementation practices and as a tool to enable the comparison of alternate approaches to e-learning implementation (Jones et al., 2008). The ISDT offers guidance for e-learning implementation that brings a number of proposed advantages over industrial e-learning. This paper draws on the Ps Framework and the ISDT to illustrate the limitations of industrial e-learning and a promising alternative by focusing on three (of the seven) components of the Ps Framework: product, process and people.

The ISDT – and the sub-set of principles presented in this paper - seek to provide theoretical guidance about how to develop and support information systems for university e-learning that are capable of responding to the dominant characteristics (diversity, uncertainty and rapid change) of university e-learning. This is achieved through a combination of product (principles of form and function) and process (principles of implementation) that focus on developing a deep and evolving understanding of the context and use of e-learning. It is this deep and evolving understanding and the ability to make rapid changes to the system, which ultimately encourages and enables adoption and on-going adaptation. The argument is that any instantiation built following the principles of the ISDT will support e-learning in a way that: is specific to the institutional context; results in greater quality, quantity and variety of adoption; and, improves the differentiation and competitive advantage of the host institution.

As with all research, this work has a number of limitations. Through its use of action research, this work suffers the same limitations, to varying degrees, of all action research. Baskerville and Wood-Harper (1996) identify these limitations as: (1) lack of impartiality of the researcher; (2) lack of discipline; (3) mistaken for consulting; and (4) context-dependency leading to difficulty of generalizing findings. These limitations have been addressed within this work through a variety of means including: a history of peer-reviewed publications throughout the project; use of objective data sources; the generation of theory; and, an on-going process of testing. The nature of this research means that the resulting ISDT and the principles described here have not been “proven”. This was not the aim of this work. Instead, the intent was to gather sufficient empirical and theoretical support to build and propose a coherent and useful alternative to industrial e-learning. The question of proof and further testing of the ISDT in similar and different contexts provides – as in all research aiming to generate theory - an avenue for future research.

On the value of Webfuse

This section aims to show that there is some value in considering Webfuse by summarising the empirical support for the ISDT by presenting evidence that the development of Webfuse led to a range of features specific to the institution and to greater levels of adoption of those features. From 1997 through 2005 Webfuse was funded and controlled by one of five faculties at CQUniversity. During the life-span of Webfuse CQU adopted three different official, institutional LMSs: WebCT (1999), Blackboard (2004), and Moodle (2010). In 2005/2006, Webfuse became a system controlled by a central IT division. After this centralization development of Webfuse was restricted by much the same practices – but not entirely - as industrial e-learning.

Specific to the context

During the period from 1999 through 2002 the “Webfuse faculty” saw a significant increase in the complexity of its teaching model including the addition of numerous international campuses situated within capital cities and a doubling in student numbers, primarily through full-fee paying overseas students. By 2002, the “Webfuse faculty” was teaching 30% of all students at the University. Due to the significant increases in complexity of teaching, a range of teaching management and support services were added to Webfuse including: staff and student “portals”, an online assignment submission and management system, a results upload application, an informal review of grade system, a timetable generator, student photo gallery, academic misconduct database, email merge facility, and assignment extension systems. Many of these tools and especially some of the features provided by these tools are not present in other systems, then and now. For example, Rossi and Luck (2011, p. 68) describe some of the differences between the Webfuse and Moodle online assignment management systems.

The value of these tools to the faculty is illustrated by this quote from the Faculty annual report for 2003

> [t]he best thing about teaching and learning in this faculty in 2003 would be the development of technologically progressive academic information systems that provide better service to our students and staff and make our teaching more effective. Webfuse and MyInfocom development has greatly assisted staff to cope with the complexities of delivering courses across a large multi-site operation (Danaher, Luck & McConachie, 2005, p. 39).

Further evidence of the contextual value of these services is that by 2003 the faculties not using Webfuse were actively negotiating for access to the services. By 2009, over 12,000 students and 1100 staff from across the institution made use of these services. Even though Webfuse is no longer officially supported, a few of these services continue to be used by the university into 2012.

Quotes from staff using the Webfuse systems reported in various publications also provide some insights into how well Webfuse supported the specific context at CQUni.

> my positive experience with other Infocom systems gives me confidence that OASIS would be no different. The systems team have a very good track record that inspires confidence (Jones, Cranston, et al., 2005, n.p.)
>
> The key to easy use of OASIS is that it is not a off the shelf product that is sooooo generic that it has lost its way as a course delivery tool. (Jones, Cranston, et al., 2005, n.p.)
>
> I remember talking to [a Webfuse developer] and saying how I was having these problems with uploading our final results into [the Enterprise Resource Planning (ERP) system] for the faculty. He basically said, "No problem, we can get our system to handle that"…and 'Hey presto!' there was this new piece of functionality added to the system … You felt really involved … You didn't feel as though you had to jump through hoops to get something done. (Behrens, 2009, p. 126)

Webfuse also included a number of context-specific learning and teaching services, a sample includes:

- the *course barometer*;
  Based on an innovation seen at a conference (Svensson, Andersson, Gadd, & Johnsson, 1999) the barometer was designed to provide students a simple, anonymous method for providing informal, formative feedback about a course (Jones, 2002). Initially intended only for the author's courses, the barometer became a required part of all Webfuse course sites from 2001 through 2005. In 2007/2008 the barometers were used as part of a whole of institution attempt to encourage formative feedback in courses hosted by both Webfuse and Blackboard.
- *Blog Aggregation Management* (BAM); and
  BAM allowed students to create individual, externally hosted web-logs (blog) and use them as reflective journals. Students registered their external blog with BAM, which then mirrored all of the students' blog posts on an institutional server and provided a management and marking interface for teaching staff. Created by the author for use in his own teaching in 2006, BAM was subsequently used in 26 course offerings by 2050+ students and ported to Moodle as the BIM module. In reviewing BAM, the EDUCAUSE Learning Initiative's Guide to Blogging suggested that

  > One of the most compelling aspects of the project was the simple way it married Web 2.0 applications with institutional systems. This approach has the potential to give institutional teaching and learning systems greater efficacy and agility by making use of the many free or inexpensive—but useful—tools like blogs proliferating on the Internet and to liberate institutional computing staff and resources for other efforts (Coghlan et al., 2007, n.p.).

- A *Web 2.0 course site*.
  While it looked like a normal course website, none of the functionality – including discussion, wiki, blog, portfolio and resource sharing – for this 2007 course site was implemented by Webfuse or any other institutional system. Instead, freely available and externally hosted Web 2.0 tools and services provided all of the functionality. For example, each student had a portfolio and a weblog provided by the site http://redbubble.com. The content of the default course site was populated by using BAM to aggregate RSS feeds (generated by the external tools) which were then parsed and displayed by Javascript functions within the course site pages. Typically students and staff did not visit the default course site, as they could access all content by using a course OPML file and an appropriate reader application. The presence of the course site satisfied an expectation that there still be a course site.

Greater levels of adoption

Encouraging staff adoption was one of the main issues raised in the original Webfuse design paper (Jones & Buchanan, 1996). A difficulty in encouraging high levels of quality use of e-learning has remained a theme in the broader industrial e-learning literature. Initial use of Webfuse in 1997 and 1998 was not all that successful in achieving the goal. With only five – including the designer of Webfuse who made 50% of all edits using the system - of 60 academic staff making any significant use of Webfuse by early 1999 (Jones & Lynch, 1999).

These limitations were addressed from 1999 onwards by a range of changes to the system, how it was supported and the organizational context. The following illustrates the success of these changes by comparing Webfuse adoption with that of the official LMS (WebCT 1999-2003/4; Blackboard 2004-2009) used primarily by the non-Webfuse faculties. It first examines the number of course sites and then examines feature adoption.

From 1997 Webfuse automatically created a default course site for all Faculty courses by drawing on a range of existing course related information. For the official institutional LMS course sites were typically created on request and were then manually populated by the responsible academics. By the end of 2003 – 4 years after the initial introduction of WebCT as the official institutional LMS – only 15% (141) of courses from the non-Webfuse faculties had WebCT course sites. At the same time, 100% (302) of the courses from the Webfuse faculty had course sites. Due to the need for academics to populate WebCT and Blackboard courses sites, the presence of a course website didn't necessarily imply use. For example, Tickle et al (2009) report that 21% of the 417 Blackboard courses being migrated to Moodle in 2010 contained no documents.

Research examining the adoption of specific categories of LMS features provides a more useful insight into LMS usage. Figures 1 through 4 use the research model proposed by Malikowski, Thompson, & Thies (2007) to compare the adoption of LMS features between Webfuse (the thick continuous lines in each figure), CQUni's version of Blackboard (the dashed lines), and a range of adoption rates found in the literature by Malikowski et al (2007) (the two dotted lines in each figure). This comparison is available for four of the five LMS feature categories identified by Malikowski et al (2007): content transmission (Figure 1), class interaction (Figure 2), student assessment (Figure 3), and course evaluation (Figure 4).

The Webfuse usage data included in Figures 1 through 4 only include actual feature use by academics or students. For example, from 2001 through 2005 100% of Webfuse courses contained a course evaluation feature called a course barometer, however, only courses where the course barometer was actually used by students are included in Figure 4. Similarly, all Webfuse default course sites contained content (either automatically added from existing data repositories or copied across from a previous term). Figure 1 only includes data for those Webfuse course sites where teaching staff modified or added content.

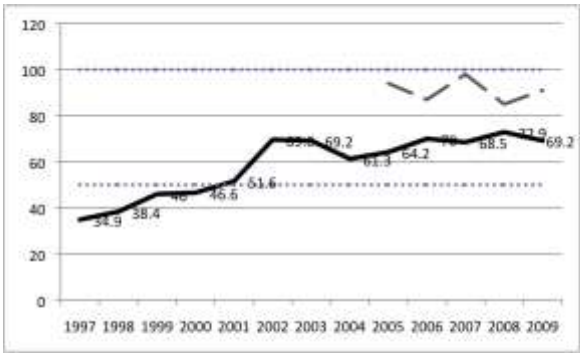

Figure 1: Adoption of content transmission features: Webfuse, Blackboard and Malikowski

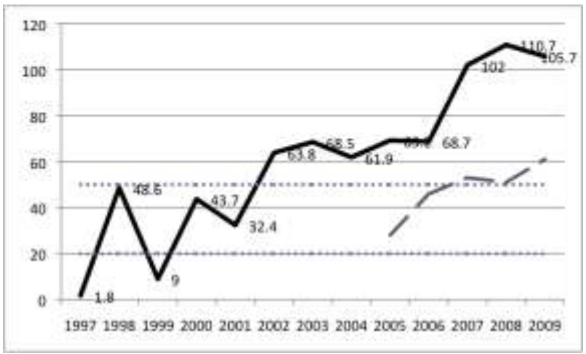

Figure 2: Adoption of class interactions features: Webfuse, Blackboard and Malikowski (missing archives of most pre-2002 course mailing lists)

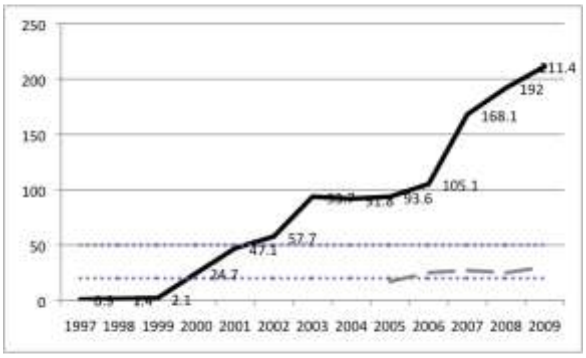

Figure 3: Adoption of student assessment features: Webfuse, Blackboard and Malikowski

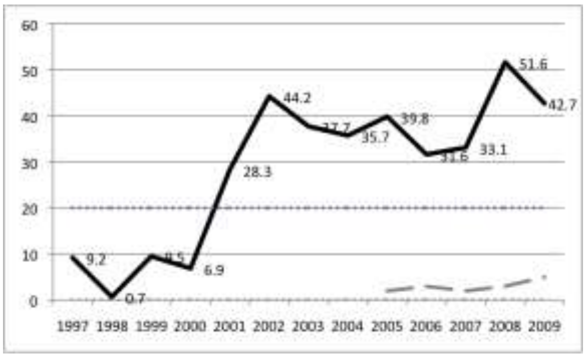

Figure 4: Adoption of course evaluation features: Webfuse, Blackboard and Malikowski

Figures 2 and 3 indicate Webfuse adoption rates of greater than 100%. This is possible because a number of Webfuse features – including the EmailMerge and online assignment submission and management tools - were being used by Blackboard courses (i.e. non-Webfuse courses). Webfuse was seen as providing services that Blackboard did not provide, or that were significantly better than what Blackboard did provide. Similarly, the spike in Webfuse course evaluation feature adoption in 2008 to 51.6% is due to a CQU wide push to use the Webfuse course barometer tool to improve formative feedback across a range of courses regardless of the LMS. Figures 2, 3 and 4 show that adoption of Webfuse features was significantly higher than the adoption of equivalent Blackboard features at CQU. It was also significantly higher than the adoption rates found by Malikowski et al (2007) in the broader literature.

Product

One of the defining characteristics of the industrial e-learning paradigm is the reliance on the Learning Management System (LMS) – be it open source or proprietary - as the *product* component of e-learning. The LMS is an example of an integrated or monolithic information system. Different types of information systems have specific sets of advantages and disadvantages that make them appropriate for certain circumstances. An integrated system offers cost efficiencies and other benefits through standardization but, at the same time, such systems constrain flexibility, competitiveness, autonomy, and increase rigidity (Light, Holland, & Wills, 2001; Lowe & Locke, 2008). Such systems are best suited to circumstances where there is commonality between organizations and stable requirements with low uncertainty. This does not seem to be a good description of tertiary e-learning over the last 10 years and especially not for the next 10. This section looks at two of the repercussions of this mismatch: 1) organizations and people must adapt to the system; and, 2) the single vendor limitation – before describing the alternate principles from the ISDT.

The first repercussion of an integrated system is captured a technical staff member participating in CQUni's 2003 LMS selection process who suggested that "we should seek to change people' behaviour because information technology systems are difficult to change" (Sturgess & Nouwens, 2004, n.p.). Rather than being an isolated perspective, this comment captures the accepted industry best practice recommendation to implement integrated systems in their "vanilla" form because local changes are too expensive (Robey, Ross, & Boudreau, 2002). Maintaining a vanilla implementation constrains what is possible with the system, limiting change, innovation and differentiation. So rather than enable exploration of and learning from contextually appropriate pedagogical designs, the nature of an LMS encourages adoption of pedagogical designs that are supported by the LMS.

For example, in 2007 an instructional designer working on a redesign of a CQUni course was stymied by the limitations of the Blackboard LMS. Blackboard could not support the required number of group-based discussion forums required by the new course design. Normally, with an integrated system the pedagogical approach would have to be changed to fit the confines of the system. Instead the implementation of the course site was supplemented with use of one (at this stage Webfuse had three different types of forum) of the Webfuse discussion forums allowing the original educational design to be followed. Similarly, when CQUni adopted Moodle, academic staff teaching large first year courses using the Webfuse BAM functionality were encouraged to modify this practice to better fit with the capabilities of Moodle.

The regular forced migration to another version of an LMS is the extreme example of the organization being forced to change in response to the technology, rather than the technology fitting to organizational needs. It is not uncommon to hear Universities being forced to adopt a new LMS because the vendor has ceased supporting their current system. The cost, complexity and disruption caused by an LMS migration has significant ramifications. First, institutions seek a long period of "vanilla" use to recoup the cost of migrating to the new system. This reinforces the problems of forced adaptation of practice to fit the technology's limitations. Second, there is the problem of the "technology dip" (Underwood & Dillon, 2011) where the introduction of new technology creates a reduction in learning outcomes while teaching staff grapple with the new technology. Lastly, the cost and complexity of the upgrade encourages organization to engage in a long period of vanilla use of the integrated system in order to recoup the expense of the forced migration.

Another characteristic of an integrated system is that the quality of the tools available is limited to those provided by a single vendor or community. For example, a key component of the disquiet about the Curt Bonk MOOC hosted within a Blackboard LMS was the poor quality of the Blackboard discussion forum (see Lane, 2012). Similar reservations have been long held about the quality of the Moodle Wiki and Blog tools. LMS-based tools also tend not to fare well in comparisons with specialist tools. In addition, integrated systems tend to support only one version of every given tool. Leading to the situation where users can pine for the previous version of the tool because it suited their needs much better than the new.

The ISDT formulated from the experience of developing Webfuse proposes 13 principles for the form and function of the product for emergent e-learning (Jones, 2011, p. 344). These principles were divided into 3 groups:

1. Integrated and independent services.
   Rather than a system, Webfuse was positioned as the glue used to "fuse" together widely different services and tools into an integrated whole. Webfuse was an example of a best-of-breed system, a type of system that provides more flexibility and responsiveness to contextual needs (Light et al., 2001). For example, when the existing discussion forum tool was seen as limited, a new discussion forum tool was selected and integrated into Webfuse. At the same time the old discussion forum tool was retained and could be used by those for whom it was an appropriate fit. While new tools could be added as required, the interface used by staff and students remained essentially the same. There was no need for expensive system migrations and the resulting technology dip.
2. Adaptive and inclusive architecture.
   Almost all LMS support some form of plug-in architecture where external users can develop new tools and services for the LMS. This architecture, however, is generally limited to tools written specifically for the LMS and its plug-in architecture. The Webuse "architecture" was designed to support the idea of software wrappers enabling the inclusion of a much broader array of applications.
3. Scaffolding, context-sensitive conglomerations.
   A conglomeration is not simply a service such as a discussion forum. Instead, it may combine multiple e-learning services with additional scaffolding such as institutionally specific information and expert knowledge. Conglomerations should also provide opportunities for academics to observe, question and discuss applications of the services. This echoes Laurillard's (2008, p. 144) suggestion that academics need tools and environments that enable them to gain "access to others' ideas and outputs, but also to support their own innovation, changing others' design, exploring, experimenting, adapting, reflecting and collaborating".

Writing about the need for universities to embrace diversity Thomas (2012) talks of Procrustes who "would stretch and sever the limbs of his guests to fit the size of his bed. We, too, are continuing to stretch and shape our higher education to a particular standard to the detriment of students and society alike" (para 22).
In terms of e-learning, that "particular standard" is defined by the integrated information systems – the products - we are using to implement industrial e-learning. Rather than learn from the use of these systems, universities are being constrained to a particular standard.

Process

Industrial e-learning – almost by definition – uses a planning or purpose driven approach to its process. Such an approach to process – labeled as teleological by Introna (1996) – has dominated organizational theory and practice to such an extent that it has become taken for granted. Anything else is often seen as irrational or inefficient. This is despite the debate between the "planning school" of process thought and the "learning school" of process thought being one of the most pervasive debates in management (Clegg, 2002). Prior papers (Jones, Luck, McConachie, & Danaher, 2005; Jones & Muldoon, 2007) have used the nine attributes of a design process formulated by Introna (1996) to demonstrate the limitations of teleological approaches to process when applied to the practice of e-learning. Rather than repeat the argument from these papers, this section offers two new examples of the limitation of teleological processes to e-learning before briefly describing the alternative, emergent approach used in Webfuse.

The strategic process used to transition CQUni to the Moodle LMS described by Tickle et al (2009) is almost an archetypal example of a teleological process. One of the institutional policies introduced as part of this strategic process was the adoption of Minimum Service Standards for course delivery. This approach was intended to act as a starting point for "integrating learning and teaching strategies that could influence students study habits" and to "encourage academic staff to look beyond existing practices and consider the useful features of the new LMS" (Tickle et al., 2009, p. 1042). The minimum standards were planned ahead of time and embedded in a web-based checklist. The expectation was that teaching staff would actively compare the design of their course site against the minimum standards and tick off elements against the checklist. A senior lecturer widely recognized as a quality teacher described the actual process adopted as

> I go in and tick all the boxes, the moderator goes in and ticks all the boxes and the school secretary does the same thing. It's just like the exam checklist (Anonymous, personal communication, 1st October, 2010).

The checklist was removed in 2011.

One of the three necessary requirements for teleological processes identified by Introna (1996) is that the designers must be able to manipulate the system's behaviour. Such manipulation is necessary to ensure achievement of the plan. Technology development and diffusion needs cooperation, however, it takes place in a competitive and conflictual atmosphere where different social groups – each with their own interpretation of the technology and the problem to be solved – are inevitably involved and seek to shape outcomes (Allen, 2000). In terms of tertiary e-learning, academics form a significant part of the social group. Academics are trained not to accept propositions uncritically and subsequently cannot be expected to adopt strategies without question or adaptation (Gibbs, Habeshaw, & Yorke, 2000).

By definition, a teleological process is focused on achieving the established purpose. Introna (1996) identifies two other requirements for teleological processes: a stable and predictable system, and the ability to accurately determine goals ahead of time. Such assumptions do not provide space for learning and changes to the plan. The philosophical foundations of teleological processes –"notions of rationality, science and method" (Ciborra, 2002, p. 1) – are in direct contradiction to views of learning meant to underpin the best learning and teaching. Rossi and Luck (2011) talk about how "[c]onstructivist views of learning pervade contemporary educational literature, represent the dominant learning theory and are frequently associated with online learning" (p. 62). Wise and Quealy (2006) argue, however, that

> while a social constructivist framework may be ideal for understanding the way people learn, it is at odds not only with the implicit instructional design agenda, but also with current university elearning governance and infrastructure (p. 899).

Amongst the many negative ramifications of this mismatch is where staff development sessions become focused on encouraging use of the features of the chosen LMS, rather than quality learning and teaching. It is one of the factors that contributes to staff developers being "seen as the university's 'agent'" (Pettit, 2005, p. 253). It encourages the perception that change is being done to academic staff, rather than with or for them.

The ISDT abstracted from the Webfuse work includes 11 principles of implementation divided into 3 groups (Jones, 2011, p. 354). The first and third groupings will be described in the next section. The second grouping – An adopter-focused, emergent development process – involves using in-depth knowledge of the human, social and interpersonal aspects of the institutional context to actively develop the system to respond quickly to real, contextual needs. It is through this type of process that the institutional implementation of e-learning – more correctly the people involved with e-learning - can learn from what is going on, prepare for the future and lead in a climate of change.

People

The conceptions of product and process found within industrial e-learning directly influences the type of positions created to support industrial e-learning and the organizational structures within which they operate. The cost of an integrated system, the assumption that it is the only valid tool for e-learning, and a process focused on achieving a planned purpose (i.e. widespread effective use of the LMS) leads to the creation of positions tasked with achieving that process, rather than with responding to changes in the environment. In addition, it leads to these roles being slotted into hierarchical structures that divide roles (e.g. technical, instructional design, teaching etc.) into different branches of the organization with separate reporting lines. This section briefly examines just some of the limitations of this approach.

The logical decomposition inherent in teleological design creates numerous, often significant, organizational boundaries between the people involved with using and supporting e-learning. Such boundaries inhibit the ability to integrate knowledge across the organization as illustrated by Rossi and Luck (2011):

> During training sessions … several people made suggestions and raised issues with the structure and use of Moodle. As these suggestions and issues were not recorded and the trainers did not feed them back to the programmers ... This resulted in frustration for academic staff when teaching with Moodle for the first time as the problems were not fixed before teaching started (p. 68).

Logical decomposition separates out the trainers, the programmers and the academic staff that hinder knowledge sharing. This separation is typically bridged by a governance structure that requires any need for changes to flow up from the users to a central committee that includes senior leaders from the faculties, academics and central IT and learning and teaching representatives. If approved, changes are passed onto programmers. The length of the communication chain from the source of the original need up to this central committee (and back again) translates into a game of Chinese Whispers as the original need is interpreted through the experiences and biases of the people along the way. Leading to the impression reported by Rossi and Luck (2011) "[t]he longer the communication chain, the less likely it was that academic users' concerns would be communicated correctly to the people who could fix the problems" (p. 69). In addition, the significant cost of traversing this chain of communication also means that it is typically not worth the effort of raising small-scale changes thereby starving such needs of attention. Especially when the nature of the process and the product typically precludes the ability to make small changes efficiently.

Logical decomposition also encourages different organizational units to focus on their part of the problem and lose sight of the whole picture. An IT division evaluated on its ability to minimize cost and maximize availability is not likely to want to support technologies in which it has limited expertise. This is one explanation for why the leader of an IT division would direct the IT division's representatives on an LMS selection panel to ensure that the panel selected the Java-based LMS. Or a decision to use the latest version of the Oracle DBMS – the DBMS supported by the IT division - to support the new Moodle installation even though it hasn't been tested with Moodle and best practice advice is to avoid Oracle. A decision that - at one institution - led to significant periods of unavailability during the first few weeks of the "go live" term.

An extension of the problem of mixed purposes is the need to have the support and engagement of a senior leader. Often seen as a critical success factor for any significant change project, this also brings problems as the successful completion of the project is tied to the leader's progression within the leadership hierarchy. Consequently creating the situation where the project will be deemed a success, regardless of the outcome.

The first five Principles of Implementation from the Webfuse ISDT (Jones, 2011, p. 354) were grouped under the label "A multi-skilled, integrated development and support team". The Webfuse development team were responsible for and had expertise in help-desk support, software development, user training and some ad hoc instructional design/staff development. The team was a part of the faculty and members regularly interacted with academics in the common room, in corridors, and on social occasions. Members of the Webfuse team had been students and took on a range of teaching tasks. Team members were able to make changes to the system in response to their experience. At its best, the team organized the governance process with oversight from faculty management and academic staff members. The people and organizational structures enable the on-going modification of the system in response to new insights gained during system use.

Conclusions

It has been argued that the characteristics of the industrial e-learning model currently dominating the practice of tertiary e-learning are inappropriate for the requirements of tertiary e-learning, both now and especially into the future. In particular, the nature of the components of industrial e-learning examined here – product, process and people – actively prevent the individuals and organizations involved from learning from their experience and responding to change. The product – the LMS, an example of an integrated system – is difficult to change and best-practice advice is to implement it as is. The process – a plan-driven approach to process – is typically focused on the successful and efficient implementation of the chosen integrated system, rather than responding to and learning from change. Finally, the people and roles involved in industrial e-learning are created and organized to support the chosen process. These mutually reinforcing trio of conceptions appear to limit the capability of university e-learning from learning for the future and leading in a climate of change.

An alternative to industrial e-learning was presented. This alternative is based on a product that can be rapidly modified in response to learning that arises from an adopter-focused, emergent development process implemented by a multi-skilled development team interacting regularly and deeply with the users of the system. As implemented with the Webfuse system this alternative approach has resulted in a system that is specific to the needs of the institutional context and shown greater levels of adoption. The underpinning philosophy of this alternative is closer to that of social constructivism, situated cognition and communities of practice and seems a better match for institutions wishing to learn for the future and respond effectively to a climate of change. While by no means a simple set of principles to adopt - not the least because of the entrenched and almost unquestioned acceptance of the principles of industrial e-learning – this approach does appear to offer a better fit for the requirements of tertiary e-learning and the broader context within which it operates.

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Teachers, and their opinions, matter: Analysing staff perceptions of the effectiveness of online discussion forums

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This paper analyses a recent survey on staff perceptions of the effectiveness of discussion forums in a small private institution. The responses will inform future opportunities and strategies for professional development and student support within the College; setting of expectations and benchmarks for staff and students and increasing awareness of these as well as curriculum and learning design. The overall aim of the research is implementing practices that will be sustainable and address current challenges within the College of improving student retention, engagement and learning. Results indicate that while staff are generally inexperienced in the online environment they are comfortable with many aspects of online discussion forums. Main areas of concerns for staff are low levels of student engagement with each other and subject material. Staff are most interested in developing strategies to help with improving student engagement. Two profiles of staff from opposite ends of the spectrums of responses are developed and compared.

Keywords: effectiveness of online discussion forums, staff perceptions, student engagement

Introduction

Future challenges for institutions and academics come in many facets, on many levels. This paper discusses a specific challenge in the online environment - how can students be encouraged to engage in discussion forums. Whilst on the surface this may seem a simple challenge there are in fact many layers and aspects to this, including why do institutions want students to engage, how and when is this explained to them, what support and training is needed for teaching staff and students, how can curriculum and learning environments be designed to best support and encourage this. What benchmarks and examples exist on which future development can be modelled? What institutional cultures will need to be developed; what workload and administrative implications will arise and how can this be achieved in a way which will allow the innovations to be sustainable in the long term? This paper does not seek to answer all of these questions, rather it takes a snapshot of where staff believe they currently are and seeks to use the responses as a starting point in developing a road-map to the future.

Context

The Australian College of Applied Psychology is a small, private college offering courses across Vocational and Educational Training (VET) and Higher Education from Diploma to Masters level in the disciplines of counselling, communication, coaching, people management and psychology. The College is multi-campus and offers on-campus and Flexible Delivery (FD) subjects. FD, in this college, involves online learning, utilising the Moodle platform, supplemented by occasional on-campus workshops and/or workplace placements. Most teaching is completed by casual staff (educators) working with small groups of no more than 20 students. Staff are usually practitioners who teach on a part-time basis, with a small number of full- and part-time academic staff in the College also teaching FD classes. Educators, and students, are provided with all subject content in written format (either hard copy and/or via Moodle) which includes weekly activities, assessment tasks and associated readings and resources. Flexible Delivery classes have only be offered for a few years having evolved from a distance education model. Discussion forums are provided in three areas – Announcements, for educator communication; general discussion forum where staff and students can initiate and contribute to discussions on any aspect of the subject and learning forums which are pre-determined and associated with specific learning activities. This delivery model helps to create a consistent and transparent learning environment for all students.

The survey discussed in this paper is part of an ongoing research project evaluating the use of discussion forums in FD classes, with an aim to improve the effectiveness of this usage and hence increase student engagement and retention. This project was commenced as part of the ascilite Collaborative Community Mentoring programme in 2011(Jones, 2011). The results of the staff survey and the larger project will inform future staff development options and teaching practice; student support; setting of expectations and benchmarks for staff and students and

increasing awareness of these as well as curriculum and learning design. The larger project involves an ongoing, detailed analysis of discussion forum usage with the aim of determining how these are being used and to then inform how practice and culture can be changed to improve student engagement and retention.
This research is important as it looks across sectors, analysing responses from staff in VET and HE and making comparisons between the sectors for one of the survey questions (space does not allow this for all questions). Although the College is a small private institution the results and discussion will be relevant to public universities and other institutions. The results will be able to inform others who are looking at implementing a change in the way educational technology is used within their institution. As a quantitative survey approach, specifically related to online discussion forums, involving staff teaching across many subjects in both VET and HE sectors in Australia this research adds a new dimension to the existing literature.

Research Questions/Rationale

The aim of the research is to analyse staff perceptions of current levels and types of student engagement; learning occurring within online discussion forums, and the effectiveness of these discussions. The research will investigate whether staff have a clear understanding of discussion forum usage and whether they perceive these are an effective component of learning online for FD students. Gaining insight into staff perceptions will enable us to determine how closely those perceptions match reality (as measured from usage logs and quantitative analysis of postings) and will help determine what (if any) measures will need to be implemented to help improve the usage of the forums.

Asking educators about their perceptions affirms that they are being heard and they are being empowered to be involved in the future of their development and the way in which discussion forums are developed (Baran, Correia & Thompson, 2011). The results also give a baseline so future research can determine if innovations influence change.

Literature Review

This literature review included the usual Google scholar, databases and journal indices searches using the keywords of student engagement, staff perceptions and online discussion forums, separately and in combinations. The focus of the searches was to find examples of similar studies and determine if there is consensus on best practice in engaging students in online discussion forums, with a particular emphasis on the importance of the teacher's role in encouraging this.

Fundamental to the purpose of this research is what is meant by student engagement. The definition that has been adopted through this research is that of Beer Clark & Jones: "engagement is the amalgamation of a number of distinct elements including active learning, collaborative learning, participation, communication among teachers and students and students feeling legitimated and supported." (Beer, Clark & Jones, 2010; p76). A complementary view is that there are many types of student engagement which occur during their learning including engagement with content, educators, other students and technology (Fleckhammer & Wise, 2011). This survey includes questions on all of these aspects of engagement. It is important to note that whilst these definitions and terms refer to student engagement in general terms, they do also apply to the specific area of online discussion forums.

There is an extensive body of literature on student engagement and the factors that can positively impact on this. These factors include pedagogical and technology-related aspects, student and teacher conceptions as well as curriculum and learning design (Biggs & Tang, 2007; Salmon, 2002; Trigwell & Prosser, 1996). A more detailed discussion of this literature is not included here due to time and space constraints but will certainly be undertaken as the College maps out future directions, as this will be a vital component in determining overarching principles and frameworks to be adopted. One factor though is now briefly discussed.

There is much evidence in the literature that teacher presence in online discussion forums is an important factor in student engagement (Garrison & Cleveland-Innes, 2005; Oliver & Shaw, 2003). This presence includes a number of roles and associated responsibilities; including leading, encouraging, summarising, responding to direct questions and providing feedback and cover content, pedagogical, technological and administrative areas. (eg Goodyear et al., 2001; Jahnke, 2010; Salmon, 2011). There are many variables that impact on the quality and quantity of teacher's posts including their pedagogical framework, whether they believe discussion forums serve a useful purpose in their context and their levels of experience and confidence in the use of forums (Anderson et al 2001) The survey draws out staff perceptions of their abilities in many of these aspects.

Previous studies of staff perceptions of the use of discussion forums, or other learning technologies, have mainly focussed on qualitative analysis using interviews and focus groups, involving small numbers of staff. (Challis, Holt & Rice, 2005). One report of a large survey of staff (and student) perceptions of use of a Learning Management System (LMS) at a large American university was found (Lonn & Teasley, 2009) This though was for on-campus teaching, supplemented by the LMS. There is agreement that there are perceived benefits from using technologies in the areas of student learning, enhanced communication (Lonn & Teasley, 2009) and student engagement (Waycott et al, 2010). Limitations of technologies were also noted in some studies, including increased workloads; technology being the driver, rather than pedagogy; inappropriate language on discussion forums; and loss of face-to-face interaction (Waycott et al., 2010).

As is reported in more detail later, many respondents to this survey mentioned the possibility of making participation in discussion forums compulsory and/or assessable. A review of literature on this matter indicates that there is no one dominant position on this. If an approach based on constructive alignment is adopted(Biggs & Tang, 2007) it may be more appropriate to ensure that learning activities and associated discussions are aligned with the learning outcomes, rather than having the discussion forums themselves assessed. Oliver (2002) offered alternative viewpoints of this debate suggesting assessment could help meet learning outcomes versus this could take responsibility for learning away from students. Oliver and Shaw (2003) also provide two very different views of the influence of assessment on participation. Markel (2001, p1) notes “making weekly participation in the discussion a requirement “institutionalizes” the discussion forum within the course” while Christie & Garrote note that the “way forward in the more active and productive use of LMS and OADs[1] is to weave continuous assessment into the use of such tools” (Christie & Garrote, 2011; p 237). This contrasts with O’Reilly and Newton (2002) who report that in the area of humanities structured, assessable discussion forums are no longer used as there is a high uptake of student interaction on the discussion forums, suggesting that as students become more confident and aware of the benefits of active engagement, assessment is no longer needed as an incentive. There will need to be considerable discussion and further research to allow the College to make decisions on this.

One of the limitations of the literature is that there does not appear to be much, if anything, written on benchmarks for participation in discussion forums with no research being found on minimum levels of contributions from staff or students. This may well be due to the fact that every institution, subject, teacher has different ideas and uses for discussion forums and hence there are no relevant benchmarks. Benchmarks can though provide guidance for staff on their reflection of their abilities as an online teacher and may be needed to ensure staff are reflecting on appropriate characteristics (Northcote, Seddon & Brown, 2011). As part of the ongoing project, decisions will need to be made as to the educational philosophies, pedagogical frameworks and curriculum and learning designs that will underpin future directions and these will then be able to inform any benchmarks that are set.

The Australasian Council on Open, Distance and E-Learning (ACODE) have developed a series of benchmarks including guidelines and good practice statements which are relevant to the use of technology in learning and teaching (ACODE, 2008). Of particular relevance to this research are Benchmarks 4, 5, 7 and 8 which relate to pedagogical application and staff and student support and training. The ALTC Good practice report: technology-enhanced learning and teaching prepared by Keppell, Suddaby and Hard (2011) provides ten outcomes that represent best practice in this area and all of these have relevance to this project and the future challenges in developing the use of online discussion forums within the College.

Methodology

The survey for staff was created in surveymonkey and 112 invitations to participate were sent to all staff and casual educators who were identified as teaching by FD mode at the beginning of 2012. This was distributed by email with one school sending a preceding message advising staff about the survey, confirming their support for the project and encouraging staff to respond. The survey was distributed in Week 4 of Term 1 as this was considered a relatively quiet period for staff, after the initial rush at the beginning of Term and prior to any assessment. One reminder email was sent two weeks after the original request. All responses were anonymous and ethics approval was sought and granted for this project (ACAP HREC Approval No 046110112).

The survey questions were developed within the College after discussion and consultation with senior staff around the types of questions and taking into account the main ways in which the discussion forum, and other

[1] OADs are online asynchronous discussions

technologies are currently used. The questions were generally Likert scale questions with some free response questions at the end of the survey. The full survey is available upon request, and some of the questions are included in the following section.
In addition an analysis of logs for Announcement posts was conducted in the Moodle online classrooms for all subjects taught by FD in terms 1-3 for 2011 for VET and HE courses for comparison with the perceived usage as identified by staff in their survey responses and this is discussed in a later section.

Survey results

This section looks at some of the results from the survey; not all questions are reported here due to lack of space. The consequences of these results and possible areas for future action and research are discussed in a later section. Forty eight responses were received from 112 invitations emailed. However 10 of these were only partial responses and were eliminated from the analysis as they had only answered the first question, which was agreeing to participate. This means there were 38 valid responses which represents a response rate of 34%.

Respondents are from across all schools and both sectors of the College. Where responses are compared across sectors, the responses from the five staff are who indicated they teach across both the School of Counselling (SoC) and VET are duplicated in both sectors. The results for the one respondent who did not respond to the question regarding in which school they taught, were not included in any comparison across sectors.

There were two questions relating to teaching experience and the responses to these showed that, as would be expected, educators have a range of experience. Responses indicate that most participants are relatively new to the College as well as the online environment, rather than one or the other. The largest group are those educators who have no experience teaching online, although they have been teaching at the College for 1-5 years.

There were three questions related to time spent on discussion forums, with workload expectations at the College, for both HE and VET, being that educators spend approximately three hours per week facilitating learning in the online class space over two or three days each week. The responses from these questions, shown in Table 1, indicate that most educators spend more time in the online class space than is expected of them. They also indicate that there is a large variation in the level of engagement of educators and that generally those educators who spend more time reading students' posts also spend more time making their own posts. A positive result from the question "On how many days per week (on average) do you read discussion forums and/or post to these forums, for each group?" is that 60% of respondents view or post on 4 or more days per week which would indicate that they do have a visible presence in their groups. This is also above the minimum expectations of the College.

Table 1: Time spent on discussion forums

	Time posting (per week)			
Time reading (pw)	<30 minutes	30-60 minutes	1-2 hours	>2 hours
<30 minutes	1	2	1	0
30-60 minutes	1	5	3	0
1-2 hours	0	4	2	4
>2 hours	0	0	3	9

(Note: Three respondents only answered one of these questions and hence are not included in this Table)

Educators were specifically asked about the number of Announcements they post each term. Announcements, in this College, are a discussion post utilised to present important information to students by educators. They differ from general discussion forums in that only staff can post to the forum and students cannot respond to them. Within the College these are considered an essential form of communication and there is an expectation that educators will post at least one announcement per week over a twelve week term. Figure 1 shows that the majority of respondents (22 of 35 or 62.9%) indicated that they post at least 15 Announcements per term, indicating they are communicating regularly with their students and meeting the minimum requirements.

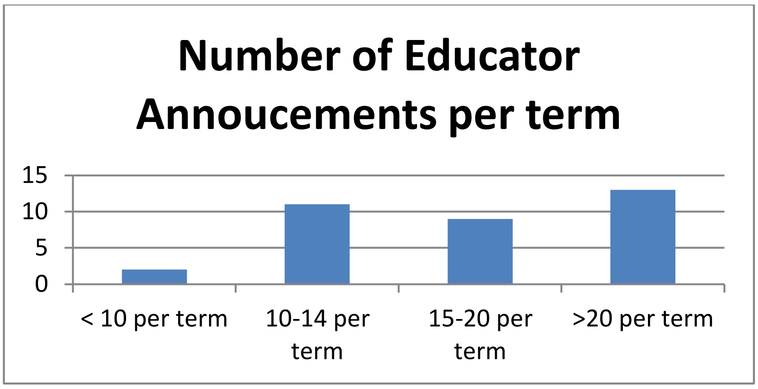

Figure 1: Number of announcements per term

Figure 2 shows the comparison of perceived numbers of announcements, sorted by VET and HE sectors, with a summary of actual posts taken from quantitative analysis of discussion forums for all FD subjects over the full 2011 academic year (707 groups in total). This comparison shows that the perceived situation has quite a different pattern to the actual situation. The most likely explanation for this is that those educators who did respond to the survey are those who are more dedicated and engaged and hence will be in the group who post more frequently. Some respondents may have answered this question taking into account the expectation that staff will make weekly announcements. Different trends between VET and HE for both perceived and actual results, can be seen, with VET staff overall having a lower engagement than HE staff.

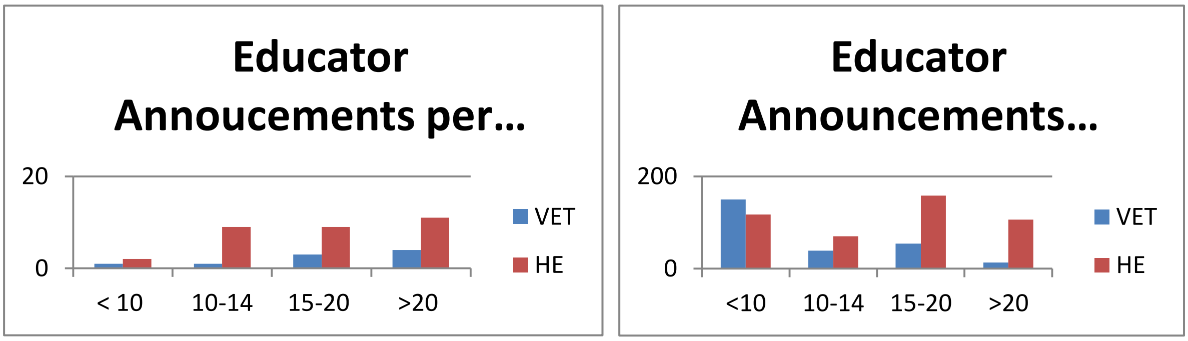

Figure 2: Comparison of perceived and actual announcements

Staff were asked to rank from 1 (most used) to 6 (least used) the most common uses of discussion forums by themselves and their students. These results are summarised below. One pleasing aspect of these responses is the perceived low level of discussion about administration and process questions, as this tends to suggest that both staff and students either have a good understanding of these areas and /or that the discussion forums are not considered the most suitable forums in which to raise these questions. Of concern though is the fact that community building is towards the bottom of the priorities for both staff and students.

Most used by educator
1. Weekly announcements
2. Introductions
3. Responding to assessment questions
4. Responding to content questions
5. Community building
6. Responding to admin and process questions

Most used by students
1. Assessment questions
2. Content questions
3. Introductions
4. Weekly announcements
5. Admin and process questions
6. Community building

The survey also asked a series of questions in regards to educators' current ability in all aspects of discussion forums. Results are summarised in Table 2 which suggests that the majority of staff are comfortable with the fundamentals of using discussion forums and responding to students as well as the more difficult tasks of encouraging critical thinking and summarising threads. The main areas of concern for staff are in encouraging those students who are not actively participating in the forums, whilst also dealing with those students who dominate a discussion.

Table 2: Current Ability

	Very limited	I can get by	I feel comfortable with this	I do this regularly	This is one of my strengths
Start a new discussion thread	0 (0%)	0 (0%)	5 (13.2%)	19 (50.0%)	14 (36.8%)
Post a response	0 (0%)	0 (0%)	4 (10.5%)	20 (52.6%)	14 (36.8%)
Engage students in discussions regarding content	1 (2.6%)	4 (10.5%)	14 (36.8%)	13 (34.2%)	6 (15.8%)
Summarise a discussion thread	2 (5.3%)	2 (5.3%)	19 (50.0%)	8 (21.1%)	7 (18.4%)
Encourage students to think critically about the content	1 (2.6%)	4 (10.5%)	13 (34.2%)	13 (34.2%)	7 (18.4%)
I am able to lead a discussion	0 (0%)	4 (10.5%)	10 (26.3%)	15 (30.5%)	9 (23.7%)
Encourage students who are not posting to the forums	4 (10.5%)	10 (26.3%)	10 (26.3%)	11 (29.0%)	3 (7.9%)
Deal with students who dominate a discussion	1 (2.6%)	8 (21.1%)	21 (55.3%)	4 (10.5%)	2 (5.3%)

Table 3 illustrates responses in regards to student engagement on different levels. Of particular concern is the perception that there is limited engagement between students (73.8% of respondents rated this as very low or limited) and with the content (58.3% rated this as very low or limited), as these are the areas in which most learning would be expected to be occurring. Quantitative and qualitative analysis of actual usage is currently underway which will allow a comparison between perceptions and reality.

Table 3: Student engagement levels

	Very low	Limited	Satisfactory	More than I would expect	Very engaging
How do you rate the percentage of students from each group who engage in the online discussion forums?	8 (21.1%)	16 (42.1%)	10 (26.3%)	3 (7.9%)	1 (2.6%)
How do you rate the number of postings from students?	6 (15.8%)	18 (47.4%)	11 (29.0%)	2 (5.3%)	1 (2.6%)
How do you rate the engagement of students with each other?	7 (18.45%)	21 (55.3%)	8 (21.1%)	2 (5.3%)	0 (0%)
How do you rate student's engagement with course content through the discussion forums?	3 (7.9%)	18 (47.4%)	13 (34.2%)	4 (10.5%)	0 (0%)

The survey included six open response questions which were grouped as most important uses, most effective uses and professional training/support needed for staff and students. Figure 3 indicates the range of responses from staff for the questions regarding usage. It is pleasing to see that most staff consider community building and critical thinking/enhancing learning as the most important uses. Questioning is considered the most effective use for both student learning and engagement. The fact that staff consider questions posed by themselves as the most effective use for learning and engagement could suggest that a student-centred approach to learning is not being adopted and/or that students don't take the lead in posing questions

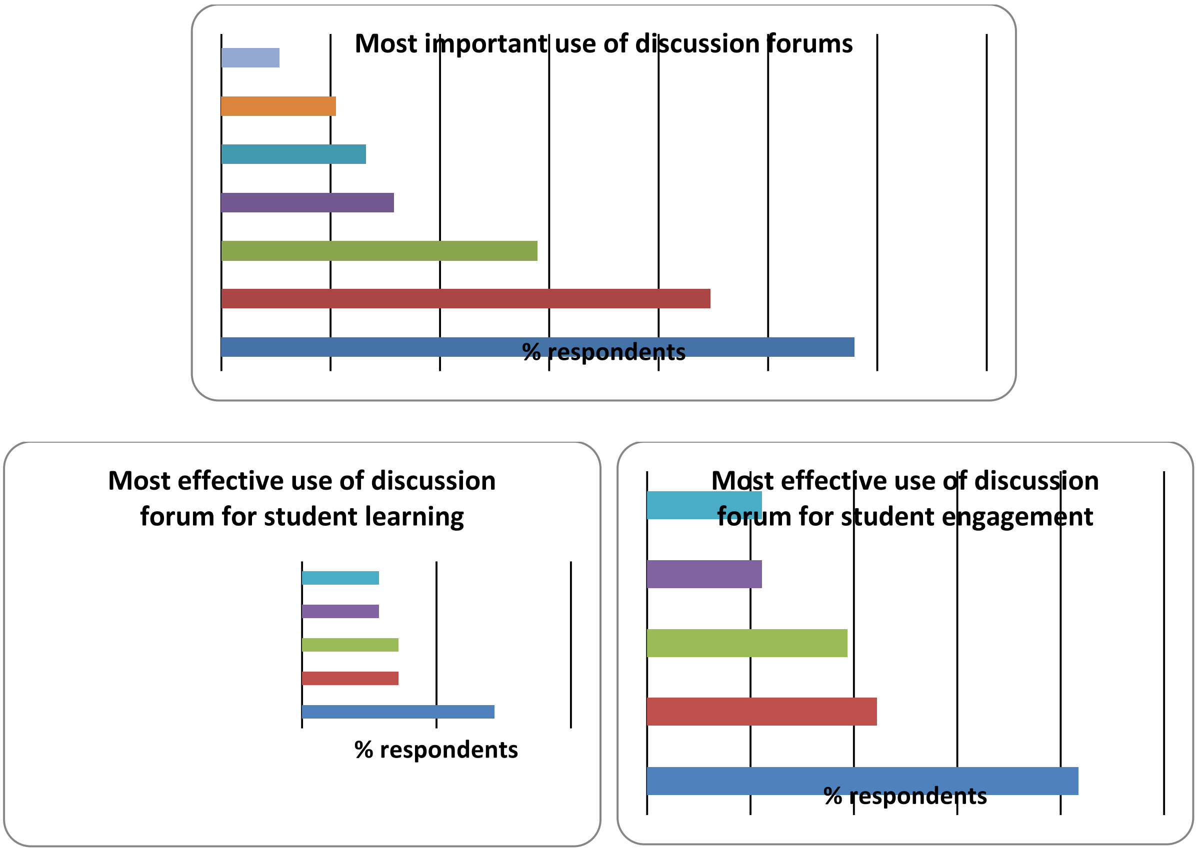

Figure 3: Uses of discussion forums

In terms of staff and student development responses were mainly split between technological areas (28.6% for staff development and 37.5% for student training), for example how to navigate site, how to use other technologies and pedagogical issues such as how to encourage and maintain student participation and engagement (32.1% for staff development). For student support some main areas suggested were in explanation of why it is important to engage and indicating levels of participation expected (25%). There was also support for student training to occur as part of an orientation programme before the start of term (18.8% of respondents). 14.3% of respondents indicated they have either completed the FoLTO[2] course or are currently participating in this or other training and just 7.1% indicated they did not wish to receive any training. It is interesting that there is no mention of workload issues at all in any responses, especially as this has been mentioned in informal conversations with some educators, and this is also in contrast to other studies.

The final question gave respondents the opportunity to make any further comment on any aspect of discussion forum usage. 54.3% of respondents offered the opinion that there needed to be some compulsory (and possibly assessable) component to encourage student participation and engagement. Other suggestion made were providing expectations of participation levels, having more structure and including more interactive learning materials. Some of the main issues raised included students lacking in confidence to post; students being too busy or not interested in participating and participation rates dropping during term, especially when assessment items are due.

[2] FoLTO is a recent initiative within the College for staff development (Foundations of Learning and Teaching Online course). This is a 12 week course offered to staff new to teaching by FD. The course is run completely online, giving staff experience at being an online learner.

Analysis of responses

This section discusses two sample areas of the survey, indicating the depth and breadth of analysis that has occurred from the survey – space does not allow for in-depth analysis of all questions.

Making participation compulsory

Whilst there were many respondents who advocated for discussion forums being made compulsory and or assessable there was at least one person who expressed caution in their comments for the final question "With a unit with a compulsory test component this has changed the nature of the discussion forum, where students are often wanting their responses to be marked, discourages free flowing thought". This is a comment worth considering when determining if forums will be made assessable – does this affect the learning and free flow of thought – will students concentrate on those forums that are compulsory in detriment of others.

Profile of two extremes

The variety of responses to the open response questions indicates that staff do view the effectiveness of discussion forums in very different ways, which is consistent with previous literature. Whilst there is a small minority of staff whose responses indicated only superficial engagement with the forums, a large proportion gave detailed responses regarding the most important use, often suggesting multiple uses of the forums. Examples of responses from the extremes are: "Assessments and Introductions" which contrasts with

> I use the Unit Announcements forum for content postings and information. I view the Discussion Forum as a space where building of a learning community can occur. I believe that connection between the students counters the isolating aspect of FD. A space in which any concerns, thoughts, questions can be shared and there can also be sharing of resources. I invite all students to participate as I believe it adds to the richness of the learning experience.

The responses to all questions in the survey (including those not discussed elsewhere in this paper) from the two staff who offered the above responses were analysed to develop profiles of the extremes of perceptions that currently exist within the College.

The first respondent has very limited experience, engages with discussion forums for less than two hours per week over 4-5 days and makes 10-15 announcements, are comfortable with most aspects of discussion forums, perceived student engagement on all levels to be limited, indicated that Introductions were the reason they most used the discussion forums and assessment questions the reasons most used by students. They initiate 80% of threads, contribute to 100% of threads, yet 50% of student posts were unanswered by anyone, and only 20% of students actively participate. From a list of other tools (email, podcasts, LiveChat and teletutorials), they considered only emails as less effective than discussion forums. They believe that discussion forums will only be more effective if "... they are linked to overall grade...". They felt they didn't need any staff development as they "did FOLTO it was brilliant" and believe that students don't need any training or support.

The second respondent has been teaching online for less than five years, engages with the discussion forums for more than three hours per week over 2-3 days and make 15-20 announcements. They are comfortable with all aspects of the forums, feel only student engagement with content is limited, all other aspects being satisfactory or better. Introductions are the ways in which forums most used by themselves and students and Announcements are least used by educator and community building by students. They initiate 50% of discussion threads, 50% of their posts are unanswered, whilst 30% of student posts are unanswered. They indicate that they contribute to 100% of threads and only 25% of their students are active participants. Teletutorials and podcasts are more effective than discussion forums, email about the same and they don't use LiveChat. For the open-ended questions they offered in-depth and insightful responses, suggesting use of structured activities and linking to resources as motivators for student engagement, engagement levels decrease as assessment tasks are due and that both staff and students would benefit from more support and development.

The first profile indicates someone who does not see much, if any, value in using discussion forums in their current format.This would indicate a Level 1 teacher (Biggs & Tang, 2007) or a teacher with low level conceptions of teaching and learning (Trigwell & Prosser, 1996).Whilst this profile can be thought of as somewhat alarming it does give us much food for thought on how progress can be made on the journey to effective discussion forums. Their response regarding staff development indicates it will be important to take a holistic approach and that one initiative by and of itself will not be enough to reach that goal. One focus for staff development for teachers at this level "…needs to be on helping staff examine and change their conceptions of teaching and learning" (Trigwell & Prosser, 1996). The second profile, in contrast, indicates someone who engages well with the discussion forums and their students, is comfortable in the online environment, believes there is some room for improvement in levels of student engagement and that ongoing support and training for staff and students is important. This would put them Level 3 (Biggs & Tang, 2007) or someone with sophisticated conceptions of learning and teaching (Trigwell & Prosser, 1996).

It will be important for the College to acknowledge these differing opinions and ensure that educators are kept informed of any developments that occur as a result of these responses and subsequent recommendations. As well as explaining what is happening, it will be important to indicate why changes have (or have not) occurred, otherwise staff may be left with the impression that their opinions are not valued. The following section of this paper outlines some of the initiatives that have commenced within the College.

What is already happening

There are a range of initiatives that have been implemented in the College which include

- FoLTO – as already mentioned this is a staff development programme, implemented in 2011, with 3 intakes having occurred. Analysis of the effectiveness of this course is the subject of a separate research project.
- Tech Talks – a recurring series of seminars/webinars for educators around effective use of educational technologies covering both pedagogical and technological aspects.
- Guides for students – both SoC and VET have developed and distributed brief guides regarding effective online discussion posts
- Curriculum design and learning design – as new subjects are developed and existing subjects revised, wording of activities and instructions for postings are being adapted to encourage engagement. e-tivities (Salmon, 2002) and constructive alignment principles(Biggs & Tang, 2007) are influencing these changes.

At present many of these initiatives have begun in a particular school or unit, with little co-ordination or visible institution-wide plan. It is hoped that this research will inform development of a College-wide plan, including setting of sustainable expectations, and overarching philosophies and good practice guides. The effective use of discussion forums is just one (though very important) aspect of learning and teaching online, and these principles could also be adopted for other aspects of learning and teaching.

Conclusions and future actions

This section first discusses the specific aspect of engagement with announcements, as an example of how this journey can begin, and then moves to some suggestions for the big picture. This survey is merely the first step and many of the ideas for the road-map will not become clearer until further research is completed.

The relatively low levels of engagement with announcements could be addressed by providing all educators with clearer expectations and the pedagogical reasons for this; exemplar announcements and guidelines of the content and timing of announcements. These points have already been incorporated into the FoLTO course. There is an argument that teachers who post more than 2 announcements a week, particularly later in a term, may be inhibiting student engagement and critical thinking and this is an area that could be further researched by comparing student results and feedback across different styles of educators. Reducing the input from educators later in term would be in line with moving students through the five stages of Salmon's e-moderating model (Salmon, 2011). It is also likely that these educators are early adopters of technology rather than part of the mainstream staff (Wilson & Stacey, 2004) and that this level of posting would not be seen as sustainable by the majority of staff. A more effective use of educators' limited time could be to facilitate student engagement in the discussion forums rather than the one-way transmission of information through the Announcements. This could also act as a way of decreasing workload through reduced number of posts whilst also increasing quality of engagement and depth of student learning (Anderson et al., 2001). Quantitative data cannot tell the full story (Beer, Clark & Jones, 2010) so this study is only the beginning – qualitative analysis of discussions forums in a pilot group of first year subjects is now being undertaken to determine what type of interactions are occurring, who is participating in the discussions and how much learning is happening.

Discussion and debate will be encouraged within the College to determine what pedagogical frameworks and educational philosophies will be adopted. Once this is resolved and all aspects of the larger research project are complete, a series of recommendations will be developed and distributed to senior management. These will include recommendations for future staff development and support; student support; setting of expectations and benchmarks for staff and students and increasing awareness of these, including why they are being adopted. The issues of assessment and compulsory participation; curriculum and learning design, and developing and adopting good practice guides to support any changes will also need to be addressed. This will hopefully enable a holistic approach to improving the effectiveness of online discussion forums. Important areas for ongoing research will include looking for any correlations between engagement and results as well as any links between teacher presence, student engagement and retention.

Whilst this study has been mainly about collecting data, the larger picture is to use this information to inform future practice and decision-making within the College. A picture of the current environment has been formed, which shows that engagement levels are relatively low, there is a wide range of perceptions of the effectiveness of online discussion forums and there is a call for staff and student support. Our challenge as we move forward is to develop a sustainable model that will develop the best possible online learning environment for our students.

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A model for the effects of online social networks on learning

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Online social networks enabled by social networking software, such as Facebook or Google Plus, provide opportunities for e-learning and affect the behaviour of learners that participate in them. Based on social network theory, social learning theory, and theory of planned behaviour, we propose a model explaining the effects of online social networks on learning success.

Keywords: learning success, online social networks

Introduction

A social network is a structure formed by people and by connections between people, with the connections enabling interactions and exchange of information and influence (Knoke, 2008). The recent emergence of online social networks enabled by social networking software, such as Facebook or Google Plus, resulted in renewed interest in social networks in e-learning research. Social networking software can be used by instructors to create e-learning experiences. More importantly, learners may use social networking software in ways that affect their learning engagement and learning outcomes even independently, outside the control of the instructors.

Online social networks differ from offline social networks because they are not constrained by space. Online social networks can be built very fast because it is easy to establish connections and because it is easy to discover potential connections by using Internet search. Therefore, it is easy for a learner engaged in online social networks to connect to a broad variety of individuals (both other learners and non-learners). Consequently, social networks have a potential to influence learners in profound and unexpected ways.

The view that online and offline social networks can affect learning engagement and outcomes is consistent with a number of well-established theories emphasizing connections between individuals. Social constructivism (Vygotsky, 1978) asserts that learning happens via learners' interactions enabling negotiation of meanings. Social learning theory (Bandura, 1977) asserts that that individuals learn by observing others (models) and by copying behaviours perceived to lead to desirable outcomes. The theory of planned behaviour (Ajzen, 1991) suggests that an individual's behaviour is affected by subjective norm— the perceived beliefs of the individual's peers. Nonetheless, learning thus attained may differ from what instructors aim to achieve; for example, social networks may be used to learn strategies for achieving formal success by superficial learning with minimal learner engagement.

The existing research evidence on the effects of offline and online social networks is mixed. Thomas (2000) found a positive relationship between the learner's connectedness in an offline social network and learning outcomes. Cho et al. found that better-connected distance learners achieved better outcomes in an online learning environment. Yu et al. (2010) found that learners more involved in social networking using Facebook performed better academically.

In contrast, Junco and Cotton (2011) found that the use of instant messaging negatively affected learning outcomes and Junco (2012) found that the use of Facebook resulted in diminished student engagement. Both studies attributed negative effects to cognitive effort associated with social networking. In our view, subjective norm influenced by social networking peers is a plausible alternative explanation. Indeed, Junco also found that the use of Facebook resulted in increased involvement in co-curricular activities. Subjective norm may explain both of the effects discovered by Junco.

In summary, both the relevant theories and the empirical evidence suggest that even though the use of social networking software and the resulting online social network may promote higher learner engagement and better learning outcomes, the effect (including its sign) is moderated by the quality of the online social network. Based on this view, we propose the model of the effects of online social networks presented in Figure 1.

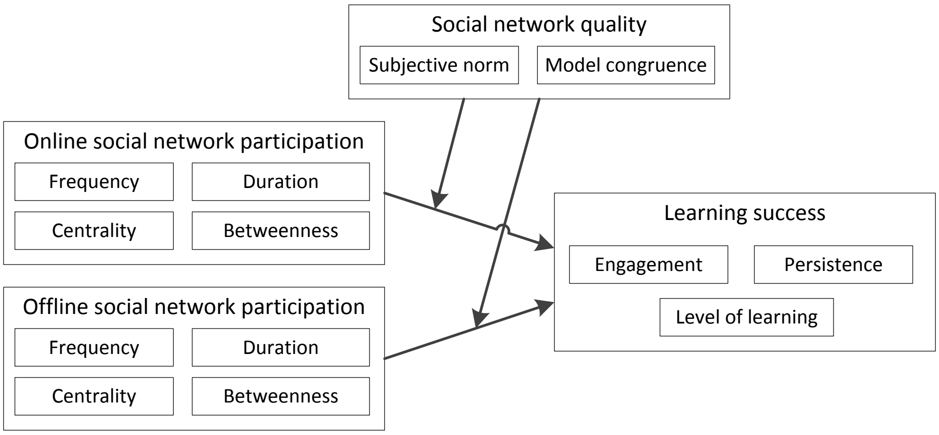

Figure 1: Effects of social networks on learning success

In the model, social network participation encompasses the duration and the frequency of online and offline contacts as well as the learner's structural role in the social network. The learner's structural role characterises the likelihood for the learner to be influenced by the network from the perspective of how the learner is connected. The structural role—a concept from the social network theory (Knoke, 2008)—is measured by centrality (the number of peers connected to, directly and indirectly) and betweenness (the extent to which the learner is important for maintaining the connectivity in the network). Social network quality encompasses the social norm induced by the network and the extent to which the models provided by the network are congruent with the learning objectives as seen by the institution of learning. Finally, learning success encompasses learner engagement, the level of learning, and learner persistence at pursuing the long-term educational objectives.

The model suggests that instructors and institutions of learning should seek ways to improve the quality of online social networks in which their learners engage. Even though online social networks are difficult to influence, they may be more open than offline networks (Cook, 2008); therefore, positive interventions may be possible.

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Fostering teamwork for health care professionals in the online learning environment

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The inclusion of group assignments as part of teaching and learning in the education of health professionals is an expectation of registration bodies and health care stakeholders. Effective teamwork skills are seen as essential for productive working relationships in multidisciplinary teams and contributing to better health outcomes for staff and health care consumers. The translation of traditional approaches to teaching health care professionals to the online learning environment requires course coordinators to re-examine the relevance, design and assessment of group work. This presentation showcases the development of online group assessments that applies these education principles to the development of an assessment initiative in a multidiscipline health curriculum. It is anticipated that this translation of group work in higher education to the online learning experience will enhance the learning outcomes and experience for health care professionals and better meet the needs and expectations of students and key stakeholders.

Keywords: online learning, group assessment, multidisciplinary teams

Developing collaboration in multidisciplinary health care teams

The preparation of students using group activities has been a long standing expectation of higher education and is a consistently identified attribute of graduates. The use of group activities has shown that there is a significant development of questioning abilities, higher order cognitive skills and promotion of deeper learning in students (Boud, Cohen & Sampson 1999). Federman Stein (2000) highlight the need for graduates to have the capabilities to work with people of different ages, gender, race and religion if they are to be able to function effectively in the current culturally diverse workplace. Furthermore healthcare employers, professional accreditation organisations and community stakeholders expectations are that healthcare professionals are able to work collaboratively (B-HERT 2002, ANMAC 2006). Health professional graduates are required to be able to establish and sustain professional relationships and demonstrate competency as a member of a team, know how to define their role as part of a team and apply teamwork skills to a range of situations.

This poster presentation will outline a Masters program developed for health care professionals in aged care that acknowledged the importance for graduates. A program outcome identified that graduates should have skills that enhance workplace partnerships and a capacity for working with users, carers and colleagues in health care. Course developers were challenged with achieving these learning outcomes in a program that was mandated to provide an entirely online learning experience.

Group assessment designed for online learning environment

There is general concurrence in the educational literature with regard to the principles which inform high-quality design of group assignments. These principles state that effective group assignments should: align to the learning outcomes; be considered by students as authentic learning experiences; involve analysis, critical thinking and problem solving skills; require students to work collectively and engage in discussion of concepts and ideas and incorporate opportunities for students to reflect (Burke, Jones & Doherty 2005; Ohl & Cates 2006).

The initiative being showcased in this poster presentation was developed for a Masters program in aged care and incorporated two group assessments, a poster and debate. The outcomes of the course were to develop student's capacity to work in partnership with health care professionals, users, carers and service providers. The online group poster assessment was developed to provide an opportunity for students to explore health care issues, policy and practice relevant in the care of older people and develop a deeper understanding for appropriate responses to the needs of this group. The online group debate was designed to facilitate students' development of a deeper understanding of the concepts and practice of rehabilitation care through its associated partnerships

As with any learning activity and assessment the principles of good design emphasise that it is vital for the assessment to be relevant to the course outcomes, differentiate between the rudiments of content, process and assessment and provide clear instructions on the expectations and deliverables required of students (Ohl & Cates 2006). Furthermore the premise for using group assessments as a mechanism for preparing students for the workforce necessitates the inclusion of feedback to students about their development of skills and attributes (Johnston & Miles 2004). Commonly it is also upheld that opportunities for students to reflect on their practice experiences is a valuable component of group assessment (Boud, Cohen & Sampson 1999).

The design of the group assessments in the Masters program incorporated educational principles by ensuring each of the assessments was closely aligned to the course outcomes. The two assessments were constructed around realistic and authentic aspects of the role and practice of health professionals in a multidisciplinary team. A commonality of the group activities was that both required students to work together across an extended period of time with a number of scaffolded outcomes that involved both formative discussions, summative decisions by the groups and individual reflection on the experience. The integrated components of the assessment activities were supported with comprehensive instructions and regular facilitation by the subject coordinators. Feedback from the students shifted from initial concerns regarding the challenges of forming and maintaining group in an online forum to a general consensus that the experience had deepened not only their understanding of the health care issues, policy and practice relevant in the care of older people but also their skills to work as a productive member of a team. This translation of group work in the Master program in aged care to an online learning experience appears to have enhanced the learning experience for these students and potentially improve their capacity as health care professionals to better meet the needs and expectations of students and key stakeholders.

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The Go/No Go Association Task as a New Technology for Teaching Anti-Prejudice

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Implicit measures of association have allowed researchers to study implicit prejudice based on the degree of association between representations of groups that are the target of prejudice and negative versus positive attributes. These implicit prejudice measures show that people find it more difficult to respond to a representation of the group (e.g., photo of an Aboriginal Australian) and a positive attribute (e.g., "HAPPY") using the same key than to the same representation of the group and a negative attribute (e.g., "SILLY"). Using measures of implicit association as a technology for teaching anti-prejudice is highly useful because it allows people to experience their own implicit biases. Thus, this technology makes prejudice a personally relevant issue (i.e., not something that other people possess) and, consequently, facilitates the engagement with this topic that is so essential to prejudice reduction.

Keywords: Implicit prejudice, anti-prejudice, prejudice reduction, Go/No Go Association Task

Setting the stage for teaching anti-prejudice in Australia

There are three primary reasons to include anti-prejudice teaching as a central topic of higher education courses, particularly those which produce educators, community and health service providers, or human service workers. First, discrimination on the basis of age, disability, race, and sex is illegal in Australia (e.g., Australian Human Rights Commission, 2007). There are also many other characteristics (e.g., religious belief, sexual orientation) which are protected under the Equal Opportunity Act; State Government of Victoria, 2010). These laws play an important role in the positions and activities of individuals working in a range of jobs which serve the community (e.g., nurses, teachers, lawyers, and psychologists). Second, prejudice has a known significant negative effect on the health and wellbeing of those who are the targets of prejudice (e.g., Paradies, 2006; VicHealth, 2007) and an, as yet, largely unexplored consequences for the prejudiced individual (Page-Gould, 2010). Estimates suggest that more than one quarter of (27%) Australians are directly affected by prejudice or discrimination (e.g., Dunn, Forrest, & Burnley, 2011); however, the indirect impact is potentially inestimable. There is agreement among researchers and policy makers that racism is becoming a key issue in modern Australia due to increasing multiculturalism (e.g., Australian Federal Government, 2011; Pedersen, Walker, Paradies, & Guerin, 2011). Furthermore, if one also considers other prejudices (e.g., ageism, homophobia), it is likely that many Australians will experience prejudice and discrimination, and the effects of these on their health and well-being (e.g., Barrett, Lewis, & Dwyer, 2011; Kendig & Browning, 2011). Finally, prejudice has several substantial negative consequences for universities including poorer student learning (e.g., Steele, 1997) and experiences (e.g., Graycar, 2010; Mullins, Quintrell, & Hancock, 1995; Schram & Lauver, 1988) and devaluing of the Australian university "product" to international students who cite personal safety as the most important reason for choosing an Australian university over other English-speaking universities (Marginson, 2010). Thus, the inclusion of anti-prejudice teaching in higher education courses would make it possible to ensure that graduates have greater awareness of the issues and consequences of prejudice. Furthermore, if this awareness is managed well, these graduates would not only have greater knowledge, but also less anxiety about intergroup relations which has been found to be associated with prejudice reduction (Pettigrew & Tropp, 2008). As a result, these graduates would be capable of undertaking an educated discussion on anti-prejudice and leading by example to shape the future of Australia on this important social issue.

This paper explores contemporary definitions and issues of prejudice, and reviews current literature on ant-prejudice teaching before presenting a new technology for teaching anti-prejudice, called the Go/No Go Association Task (GNAT; Nosek, & Banaji, 2001). The strengths and weaknesses of GNAT for anti-prejudice teaching, and an example on how to implement this technology are also provided. In so doing this paper to identifies the potential for social change through higher education. Finally, this paper highlights the role of learning in the present to create a better and less prejudiced future, and emphasises the role of teachers as creators of that future.

Explicit prejudice

Prejudice is commonly defined in psychology (as opposed to in law) as "an unfair negative attitude toward a social group or a person perceived to be a member of that group" (Dovidio, 2001, p.829). This definition encompasses older (e.g., traditional and blatant prejudice; Gilbert, 1951) and newer forms of prejudice (e.g., modern racism; McConahay, 1986) which can be simplistically characterised by the variation in the degree to which prejudiced people freely express or admit their prejudiced views. For example, blatant forms of prejudice involve the explicit expression of negative attitudes toward groups or individuals (e.g., "Aboriginal Australians are less intelligent than white Australians"; Pedersen & Walker, 1997) whereas modern prejudice includes the expression of negative attitude towards a groups which are contextualized or qualified (e.g., "I'm not racist, but,….") or accompanied by justification (e.g., the criticism of Aboriginal Australians as being lazy because this group experiences a documented higher level of unemployment; Australian Bureau of Statistics, ABS, 2010) or normative agreement (e.g., "everyone agrees that….").

It has been argued that modern prejudice has changed to be aligned with contemporary values and laws (e.g., anti-discrimination; Pedersen, Griffiths, Contos, Bishop, & Walker, 2000). Researchers argue that the expression of prejudice has decreased consistent with modern values and laws that promote equality and anti-prejudice, but the prejudice itself has not decreased, its expression finding increasingly subtle and insidious forms. Support for this contention can be seen in the substantial reduction in overt expressions of prejudice during the 1990s (Banaji & Greenwald, 1994), which bore no relationship with documented levels of discriminatory behaviours (e.g., aggression, helping behaviours and nonverbal communication; Schuman, Steeh, Bobo, & Krysan, 1997). These findings suggest that people were able and willing to manage their views to limit explicit expressions of prejudice, but that there was no noticeable change in prejudice and discrimination beyond the laboratory. Furthermore, a shift in research to the use of modern measures which allow people to express prejudiced views in defensible or normative ways has revealed that prejudice was still very much present (e.g., *they* are demanding too much from the rest of society; McConahay, 1986).

Implicit prejudice

Implicit prejudice is a relatively new topic of study. Implicit prejudice can be defined as the implicit negative evaluation of social group, or member of that group, on the basis of their membership. As a result, implicit prejudice cannot be directly observed by their possessor unless they are deliberately measured, thus, resulting in a more useful definition of this construct as the stronger implicit association between negative and an outgroup compared to positive (e.g., Banaji & Greenwald, 1995; Son Hing, Chung-Yan, Hamilton, & Zanna, 2008).

Different implicit measures achieve the assessment of this implicit prejudice differently. For example, implicit measures of association assess implicit prejudice using a target compatibility paradigm which uses the speed or accuracy with which a person can respond to representations of a group (e.g., photo of a Aboriginal Australian) and a positive attributes (e.g., "HAPPY") or negative attributes (e.g., "SILLY") using the same key as the measure. Thus, if Aboriginal Australian is more compatible with positive attributes responding to these two types of stimuli will be faster or more accurate. This pattern of responding is interpreted as evidence of positive implicit associations. However, if the negative implicit association is stronger, this is interpreted as evidence of implicit racism towards Aboriginal Australians. Another implicit measure of prejudice is based on the use of priming paradigms. Priming implicit procedures assess implicit prejudice as the increased speed of identification of a target when preceded by a related prime (e.g., Wittenbrink, Judd, & Park, 1997). For example, implicit racism would be indicated by the significantly faster accurate identification of words such as "AWFUL" or "HATE" as real words (e.g., a simple lexical decision) compared to words such as "SMILE" or "LIKE", following the subliminal presentation of a photo of an Aboriginal Australian. What makes these two measures tools for assessing "implicit" prejudice is not that the task itself is implicit. Rather, these are said to measure implicit prejudice because the prejudiced that is being measured is never explicitly expressed or endorsed by the person completing the measure. Thus, it is possible for individuals to express anti-prejudice, but still to demonstrate implicit prejudice which is both a strength of implicit measures (i.e., they are less prone to faking; Steffens, 2004) and a source of considerable controversy (e.g., Arkes & Tetlock, 2004).

The most well studied implicit prejudice is implicit racism (e.g., McConnell & Liebold, 2001; Son Hing, et al., 2008), although research has been undertaken to explore other prejudices including sexism, homophobia, and ageism (e.g., Banaji & Greenwald, 1995; Banse, Seise, & Zerbes, 2001; Cesario, Plaks, & Higgins, 2006). Generally, research exploring implicit prejudices has found that the majority of individuals demonstrate implicit prejudice, and that implicit prejudice rarely correlates with explicit prejudice (e.g., Nosek, 2007). However, implicit prejudice have been found to be uniquely related to automatic behaviours (e.g., Latof & Vaes, 2012; McConnell & Liebold, 2001; Ziegert & Hanges, 2005), contributing beyond explicit prejudice to the prediction of observed behaviour.

Teaching anti-prejudice for prejudice reduction

The teaching anti-prejudice occurs in many universities in Australian and internationally. For example, stereotypes, prejudice, and discrimination are widely taught topics in undergraduate social psychology units, and all accredited psychology programs taught in Australia require the topics of intercultural diversity and indigenous psychology to be taught (Australian Psychology Accreditation Council, 2010). However, the efficacy of such programs to reduce prejudice is rarely assessed. The few studies which have explored the efficacy of anti-prejudice programs, including diversity programs, suggest there is limited empirical evidence for that these programs do, in fact, reduce prejudice, although there is some evidence for their effectiveness in increasing awareness of prejudice and even white privilege.

Psychological research has found inconsistent results for the efficacy of anti-prejudice programs as tools for prejudice reduction. For example, one study found that the completion of a unit in which diversity or prejudice was a topic of study did have a positive effect on the perceptions of minority students compared to student who had not commenced or completed such units (Hogan & Mallot, 2005). However, these findings also revealed that components of prejudice were differentially affected by the completion of this unit. Specifically, while students reported lower levels of denial (e.g., discrimination is a problem of the past), no persistent effect was found for resistance to intergroup contact or intergroup antagonism (Hogan & Mallot, 2005). Another study using a pre- and post-test design to explore the effectiveness of a 15 week unit on the psychology of race and gender including prejudice and racism found that, while student's support for affirmative action and awareness of white privilege increased following the unit, prejudice towards various racial groups was either unchanged or increased (Case, 2007).

Finally, the teaching of diversity topics in psychology has been found to have no positive effect on the teachers of these topics (Boysen, 2011). Specifically, a survey of psychology educators revealed that the multicultural awareness required to manage the sensitive teaching of these issues were a property of individuals, and were not acquired via the teaching of these unit.

Taken together, the findings of studies examining the effects of anti-prejudice teaching in psychology units is not particularly consistent with the overwhelming conclusion that these units do not lead to reduced prejudice for students or increased multicultural awareness for staff. In effect, these units are not a good approach to teaching anti-prejudice for prejudice reduction.

There are fields beyond psychology which have embraced teaching of anti-prejudice for prejudice reduction. For example, there is a growing literature in the field of nursing which suggest nursing educators are introducing programs including elements either anti-racist or a multicultural approaches (e.g., Nairn, Hardy, Parumal, & Williams, 2004). However, while these issues are of considerable interest to nursing educators, the most recent literature reveals a focus on educators approach and conceptualisation of the issues rather than on the efficacy of the enterprise (e.g., Nairn, Hardy, Harling, Parumal, & Narayanasamy, 2011). Plausibly, where these programs are similar to psychology programs (e.g., lectures and tutorials on topics of race, gender etc.), they will also be plagued by limited prejudice reduction.

New approaches to overcome limited efficacy of anti-prejudice teaching

In their recent review of approaches to teaching anti-prejudice, Pedersen and colleagues (2011) described 14 mechanisms for reducing prejudice which might enhance the efficacy of traditional approaches. The first of these approaches resembles the traditional approach of introducing students to new information about minority groups, however, their approach emphasises dialogue rather than instruction with the dispelling of fallacies and myths the main aim of this approach. In fact, it is this difference in emphasis that characterises each of the proposed mechanism which essentially attempts to place the student in control of their learning by way of largely self-motivated, respectful discussion of the issues of prejudice and discrimination. This approach addresses one of the main impediments to anti-prejudice reduction, namely, students' failure to engage with anti-prejudice information in a way that facilitates personal change and, thus, reduces their prejudice. However, many of the mechanisms discussed may be difficult in a classroom setting because of the highly personal nature (e.g., freely expressing and discussing fallacious beliefs about racial groups or notions of white privilege) or because class sizes would make such discussion difficult to manage, especially under the guidance of less expert tutors.

Adams, Edkins, Lacka, Pickett, and Cheryan (2008) present a simple alternative to the traditional approach to anti-prejudice teaching by adopting a systemic, rather than personal focus in a tutorial on stereotypes, prejudice, and discrimination. This approach begins by demonstrating an implicit racism measure, and then discussing individual, institutional and systemic sources of stereotypes, prejudice, and discrimination. Using this approach, Adams and colleagues found that students who completed the systemic tutorial demonstrated greater awareness of systemic racism and were more supportive of antiracism policies than students in the personal focus (i.e., traditional) tutorial, or those who did not complete a tutorial on the topic. In contrast to Pedersen and colleagues (2011) mechanisms, it seems likely that Adams and colleagues approach facilitated engagement with the topic by reducing personal responsibility and, as a consequence, potentially limiting personal prejudice reduction.

Together, the new approaches highlight the positive consequences of both engaging individual and reducing personal responsibility in anti-prejudice teaching for prejudice reduction. However, these approaches have not been used in conjunction. Furthermore, the strengths and weaknesses of these approaches make them differentially useful in the tertiary teaching environments. As a result, I happily accept Pedersen and colleagues (2011) conclusion that "one discipline does not have all the answers" (p. 46), and willingly offer one further approach to anti-prejudice teaching for prejudice reduction.

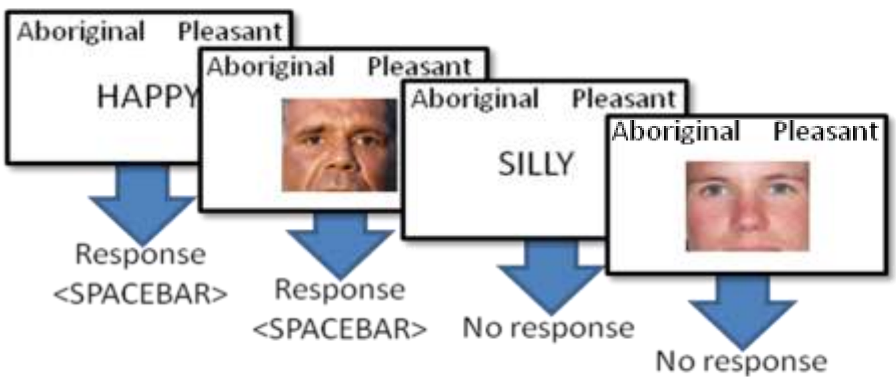
The GNAT as a New Technology for Teaching Anti-Prejudice

The GNAT

The Go/No Go Association Task (GNAT; Nosek & Banaji, 2001) is a stimulus compatibility, shared response method which measures implicit associations between a single target category (i.e., FRUIT) and a single attribute (i.e., GOOD) by assigning both targets to a single response (i.e., "go"). As a result, participants sort targets, to which they make a response, from distracters (e.g., a second category and attribute) to which they make no response. Consequently, the GNAT is simple, transparent once explained, and robust to method effects making it one of the best solution to several key issues in implicit measurement (e.g., De Houwer, Teige-Mocigemba, Spruyt, & Moors, 2009).

The GNAT is capable of measuring implicit prejudice (described previously) as the differential negative versus positive implicit evaluation of racial group (e.g., Aboriginal Australian). Thus, to measure implicit racism towards Aboriginal Australians, participants would be asked to respond to pictures or words that are presented very quickly on a computer screen that belong to either a category (e.g., Aboriginal Australian) or an attribute (e.g., pleasant) using the spacebar (see Figure 1). They would be asked to make no response to pictures or words that belong to any other category (e.g., Caucasian) or attribute (e.g., unpleasant), which would disappear after approximately 750 ms. The accuracy with which this task is performed is then compared to the performance for a block where the participants respond to the category (e.g., Aboriginal Australian) and the opposite attribute (e.g., unpleasant). Greater accuracy, as previously stated, is interpreted as greater stimulus compatibility and, in the case where performance for the category and negative pairing is better than the category and positive pairing, implicit prejudice.

Aboriginal – Pleasant block



Aboriginal – Unpleasant block

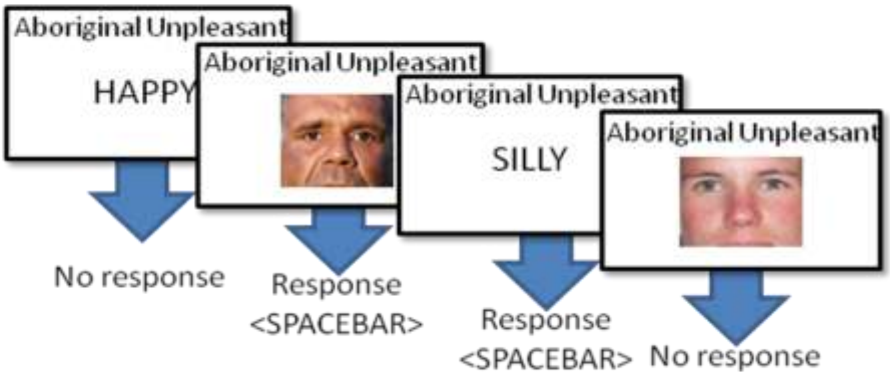


Figure 1: Screenshots of four trials with correct responses in the two implicit racism GNAT blocks

At the conclusion of the two-block (i.e., positive and negative evaluations) GNAT, participants can be provided with a summary of their performance. Specifically, they can be given feedback on their accuracy for each block, either a difference score comparing the accuracy for each block, or an overall summary for each block based on their performance (see Figure 2). This allows instructors to tailor the level of feedback to more or less knowledgeable participants.

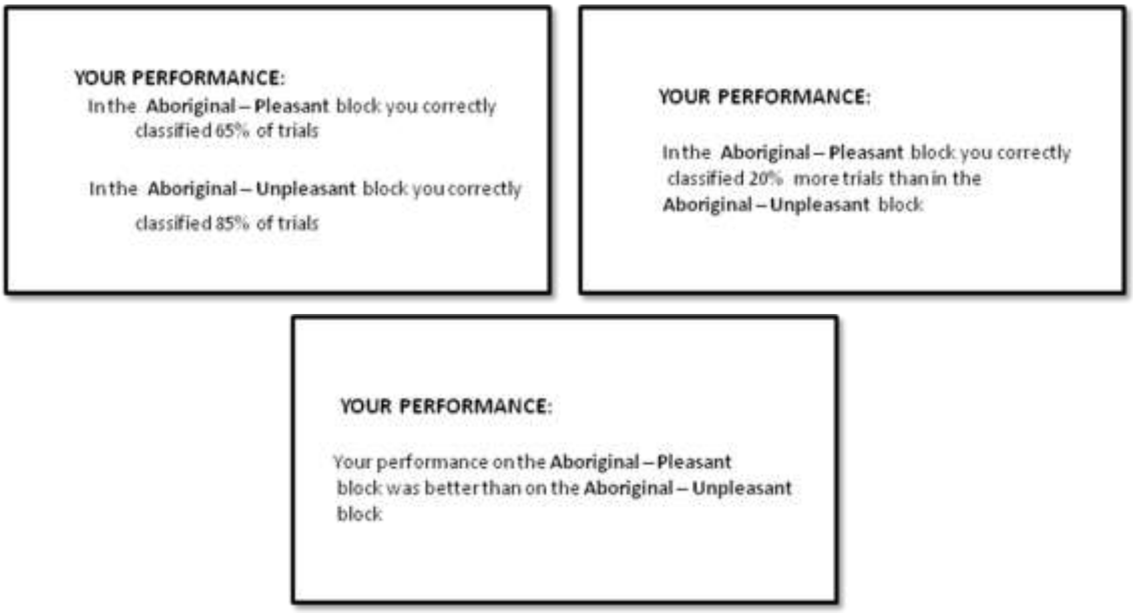


Figure 2: Screenshots of three alternative forms of feedback

Following feedback, participants can also be given generic interpretation information to assist them to interpret their results (see Figure 3). This information has the potential to ameliorate the negative experience of receiving information which is likely to be at odds with the desired outcome (e.g., demonstrating no prejudice, regardless of actual levels of prejudice) by explaining that most people have implicit biases.

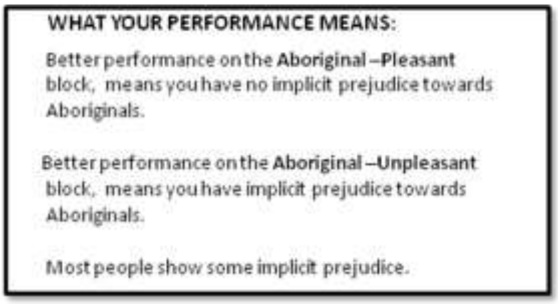


Figure 2: Screenshots of interpretation information

Using the GNAT as a technology for anti-prejudice teaching

The GNAT may be used as an approach to anti-prejudice teaching by having students complete a race-based GNAT in class, if a computer laboratory is available, or in their own time. It should be noted that there are benefits to having students complete the GNAT in the tutorial context. Specifically, they will all receive feedback at the same time which may strengthen the normative effect (i.e., most students will perform better on negative compared to positive blocks). However, some students may find this experience confronting which highlights the benefit of allowing students to complete the GNAT in their own time. The drawback of this option is that, if they receive feedback that they have demonstrated implicit prejudice, they may feel uncomfortable or angry and will have to wait until their tutorial to be guided through this experience.

Once students have completed the GNAT and received their feedback, they will have several personally relevant experiences to reflect on and share in relation to prejudice. First, they will have their feedback, and the feedback that it is typical for people to demonstrate some implicit prejudice. In addition, they will have the palpable experience of the difficulty of pairing positive words with an out-group (Greenwald, Nosek, & Sriram, 2006). This is, in fact, one of the greatest strengths of measures of implicit association compared to other measures (e.g., priming where participants do not experience the relationship between the race and attribute because of the use of subliminal primes). In this way measure of implicit associations such as the GNAT create a window allowing student to observe thoughts and feelings that we cannot typically access. Moreover, these thoughts and feelings are physically experienced as a inability to act in the ways that would be explicitly chosen (i.e., responding as quickly and effortlessly to Aboriginal Australian faces and positive words using a single key as we do to Australian faces and negative words). Thus, the GNAT is ideal for the teaching of anti-prejudice because this is an experience that cannot be externalised or denied. Rather, this information comes from within the participant, overcoming the issue of denial (i.e., I am not prejudiced) which has been argued to be the first step in addressing racism (Babacan, 2008).

Some of the benefits of the GNAT as an approach to anti-prejudice teaching include the opportunity to broaden the discussion to include a more comprehensive and contemporary definition of prejudice (e.g., Son Hing et al., 2008) which includes implicit prejudice. Moreover, the experience of the GNAT provides a basis for understanding the distinction between implicit and explicit prejudice, and their unique consequences. Furthermore, the GNAT is a reliable and flexible measure of implicit associations including implicit biases (Williams & Kaufmann, 2012). As a result, this approach can be used to teach a range of anti-prejudice topics from anti-racism to anti-ageism, anti-homophobia, and even anti-religion. Further advantages of this approach, at least currently, is that is it novel and, therefore, interesting. It is administered online and takes approximately five minutes to complete, and it is both compelling (i.e., because of the palpable encounter with one's own "unconscious") and engaging.

A race-GNAT tutorial for anti-prejudice teaching

I have used the race-GNAT for teaching implicit prejudice toward Aboriginal Australians and other racial groups (e.g., people from Asia or the Middle East) for the last three years. Both tutors and I have lead these computer-laboratory based tutorials which involve the completion of at least one race-GNAT and a structured discussion and I have found that these classes are routinely among the most animated I have experienced. I begin by having students complete the race-GNAT and provide them with accuracy feedback on their performance (e.g., the first alternative presented in Figure 2) and information on interpretation (e.g., Figure 3). I do not ask students to openly report their performance report to the class, but ask all to sit quietly until all students are finished. I then begin the semi-structured discussion: Question 1 – Can you think of any methodological factors that might have affected your performance?; Question 2 – Can you think of any contextual factors that might have affected your performance?; Question 3 – Can you think of any personal factors that might have affected your performance?; Question 4 – Do you believe the feedback you received about your implicit prejudice?; Question 5 – Did you feel one block was harder than another block, and if so, why do you think this is? Finally, the discussion concludes with the presentation of the Son Hing and colleagues (2008) two-dimensional model of prejudice and a discussion of why it is important to understand both implicit and explicit prejudice (e.g., presentation biases, personal and systemic sources of prejudice, automatic and controlled behaviours). These discussions take on a life of their own and to date, I have yet to have one of these classes conclude before the end of the scheduled class time and am frequently approached by students after class who have questions or comments about the topic.

Conclusions

It was the aim of this paper to explore contemporary definitions and issues in prejudice, and teaching anti-prejudice, and introduce the GNAT as a new technology for teaching anti-prejudice. In addition, I have provided some guidelines and alternative for the implementation of the GNAT in computer-based tutorial classes. However, it is a limitation of this paper that I have only anecdotal evidence to present in favour the GNAT as a new technology for teaching anti-prejudice. This limitation is yet to be addressed, but is an important next step for this research.

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(Trans) Formation through educational technologies

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Historically, the 3Rs (reading, writing, and arithmetic) have laid the foundations for student life-skills, however, to function in the 21st century, students need to embrace the 4Cs (collaboration, creativity, critical thinking and communication). Teachers need to employ a variety of educational technologies, which embrace various aspects of the 3Rs and 4Cs in their practice. This work provides a framework for teachers to practically implement the 4Cs in a transformative space so they are then able to apply the 4CS through technology by implementing this approach to their teaching. This mode of teaching prepares students with the necessary tools for the 21st century.

Keywords: Transformation, Educational Technology, Critical Thinking, Communication, Collaboration, Creativity.

Introduction

There is widespread agreement amongst educators and the general public about the importance of the traditional fundamental building blocks that underpin student learning. These skills are often referred to as the 3Rs – reading, writing and arithmetic. Traditionally considered to be the foundations of learning, nowadays, the 3Rs alone are not enough to provide students with the necessary skills needed to function in the 21st century.

Given the saturation of information and communications technology in education and industry, students' reliance on such technologies as the Internet, mobile devices, smart phones, social media and learning management systems has challenged the way teachers use these technologies in the classroom. Additionally, we need to prepare students for the future. They need to have a broader skillset than the 3Rs in order to function and contribute in the 21st century. The American Management Association, a leading body that provides services to businesses and government agencies, commissioned the Critical Skills Survey in 2010 and identified that employers want their employees to have more than the basic 3Rs. In fact, for workforce readiness in the 21st century, employers want their employees to have developed skills in the 4Cs, which are:

- critical thinking & problem solving
- effective communication
- collaboration & team building
- creativity & innovation (American Management Association, 2010)

The current work provides guidance to teachers who are leading in a technological environment of change. Employing technology in a transformative space prepares students with the necessary tools for the 21st century.

Successful learning

It has been long understood that for students to be successful learners, much more than the 3Rs is required. In developing the Taxonomy of educational objectives, Bloom's Taxonomy (1956) outlined ways of learning and thinking in a hierarchical structure. Bloom's Taxonomy defined thinking skills into six categories, namely: evaluation, synthesis, analysis, application, comprehension and knowledge. Using technology as a mode of instruction, Bloom's Taxonomy was revised in the 1990s to reflect the changes in the education landscape (Anderson et al., 2001). The revised taxonomy replaced the nouns with verbs to form the following categories: creating, evaluating, analyzing, applying, understanding and remembering. Biggs and Collis (1982) developed the SOLO taxonomy with five levels to distinguish between surface learning and deep learning. While not as hierarchical as the Bloom taxonomy, the SOLO taxonomy describes different levels of learning.

Other theories of learning such as Gardner's Multiple Intelligence (1983), and De Bono's Six Thinking Hats (1985) were developed to describe different approaches to thinking and therefore different ways of learning and communicating. Gardner's work describes how different individuals are predisposed to learning in different kinds of ways, whether they be, spatial, linguistic, kinesthetic, musical, interpersonal, intrapersonal, naturalistic and existential. On the other hand, De Bono's Six Thinking Hats, describe specific approaches to thinking with, particular application to problem solving. In contrast, Costa and Kallick (2000) identify 16 Habits of Mind which lead to successful learning. Most of these Habits are best described as psychological dispositions, which the learner brings to the task.

The mainstream use of the Internet in the 1990s along with the proliferation of personal computers has led to a great deal of discussion and debate about the effect of ICT on education and the types of thinking required for success in the digital age. One thing that is clear is that computers and networks have had a profound effect on modern society and education. This can be seen most crudely in the proliferation of 1:1 computer programs and government initiatives to provide students with computers (Rudd, Smith, & Conroy, 2007). The advent of mobile devices such as iPads© and Netbooks brings with it the ability to deliver information to students whenever and wherever they want (Johnson et al., 2011; Pohio & Falloon, 2010). According to the 2011 Horizon Report (Johnson et al., 2011), mobile devices have been embraced by schools for 1:1 programs due to their affordability and ease of internet connectivity (Morgan, 2010; Schachter, 2009).

It is in this changing technological context, that schools need to focus on more than just the basics (3Rs). For example, in the United States, the report titled "The New Commission on the Skills of the American Workforce (2006) asserted that it not only basic skills, but creativity and innovation which are essential for future economic and job security. Silva (2008) argues that "integrating 21st century skills into teaching and assessment, then, is not only an economic imperative, driven by changes in the workforce, but a vital aspect of improving learning." The necessity to ensure students acquire 21st century skills has been recognized in the Australian Curriculum (Australian Curriculum Assessment Reporting Authority, 2012). The development of the Australian Curriculum, is guided by the Melbourne Declaration (MCEETYA, 2008). According to the Melbourne Declaration, successful Learners:

- have the essential skills in literacy and numeracy and are creative and productive users of technology, especially ICT, as a foundation for success in all learning areas
- are able to think deeply and logically, and obtain and evaluate evidence in a disciplined way as the result of studying fundamental disciplines
- are creative, innovative and resourceful, and are able to solve problems in ways that draw upon a range of learning areas and disciplines
- are able to plan activities independently, collaborate, work in teams and communicate ideas (MCEETYA, 2008)

4Cs

Critical thinking is vital for problem solving. Often situations that are complex, uncertain and have no precedent require employees to solve problems. Critical thinking is the discipline of actively and skillfully conceptualizing, applying, analyzing, synthesizing and/or evaluating information gathered from, or generated by observation, experience, reflection, reasoning or communication.

Whilst students take for granted that they can communicate with others, there are various degrees of communicating effectively. To explain complex ideas, a concise, organized and measured approach is necessary.

To solve problems, students need to interact in teams. This provides the necessary social and learning environment to solve problems. Often educators underestimate the importance of working globally in virtual teams and asynchronously. As we are now heavily reliant on technology, and can use tools to assist in communicating with teams that may be dispersed internationally, collaboration and team building are necessary skills.

Creativity may be defined as *pushing the boundaries* to develop new ideas, and *innovation* is the development of these ideas into actuality. For example, though mobile phones were around for at least 20 years, the late Steve Jobs was able to convince the public in June 2007 that his new creation of the iPhone© (Isaacson, 2011) with its multi-media, touch screen, combined a number of innovative technologies such as a music player, camera, wireless internet connection, Bluetooth and *Apps*, was the mobile phone to have!

3Rs + 4Cs = 21st century skills

Technology is an important component for the development of the 4Cs. Students in the 21st century live in a technology and media rich environment where they have access to a plethora of information, new, powerful digital tools, and the ability to collaborate and communicate with others. To be effective, students need to be able to demonstrate the 4Cs in relation to an online world. It is tempting, then, to believe that the simple way to address the development of the 4Cs is by providing students with computer devices. Certainly there has been a good deal of government policy that has been based on the assumption that access to technology is the key to achieving success. However, simply providing students with mobile devices such as netbooks, iPads©, tablets, and laptops will not develop these skills and enhance their learning. What the teacher does in the classroom with these devices is important for improved student outcomes.

There are those groups like Partnership For 21st Century Skills - a national American organization - that promote the importance of 21st century readiness for every US student. They fuse the 3Rs and the 4Cs, and provide resources and tools for these skills (Partnership for 21st Century Skills, 2012).

A framework for technology adoption

According to Puentedura (2011), the SAMR Model for technology adoption, divides technology usage into four distinct level as seen in Figure 1. In this model, *substitution* is the lowest level of technology usage where it is used to simply replace whatever was being done without that technology. For example, a word processor – without the use of enhanced features for editing - is used as a substitute for pen and paper. At the next level, *augmentatio*n is where the technology acts as a direct tool with some functional improvement, following on from the previous example, the use of sophisticated editing functions are used is this level. For example, the difference between *substitution* and *augmentation* is the use of features to improve the product. However, only basic learning skills take place. These two levels of technology use are defined as the *enhancemen*t stage.

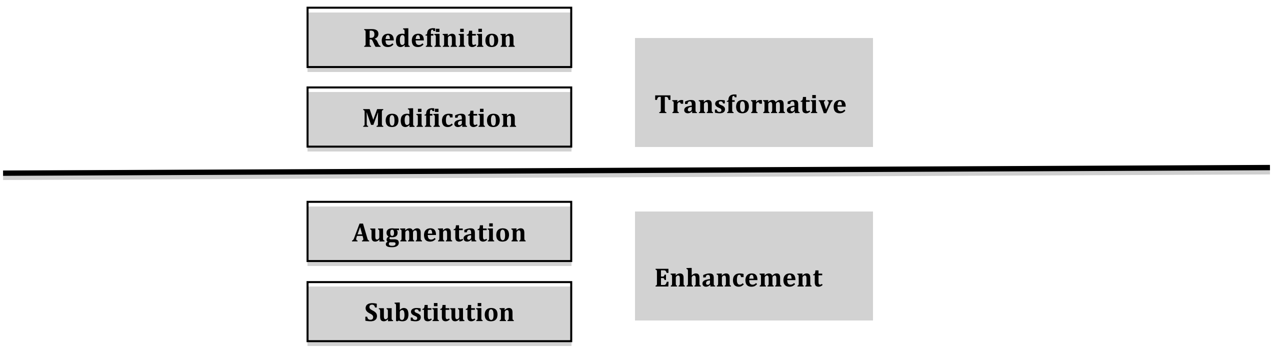

Figure 1: SAMR Model for Technology Adoption (Puentedura, 2011)

Whereas, in the *enhancement* stage, the task could have been completed satisfactorily without using technology, at the *modification* level the task becomes something quite different. So that rather than complete a word-processed piece to be printed out, the writing becomes part of a blog, wiki or social network exchange. The final level of *redefinition* is where the technology allows for the creation of new tasks previously inconceivable. This final level is difficult to describe as we are constantly redefining what is possible using technology in advance forms. These two levels, *modification* and r*edefinition* are identified as the *transformative* stage. It is proposed that teachers use the higher levels of the SAMR model in relation to technology adoption as their framework to improve student outcomes. The SAMR framework provides a dialogue to frame a discussion around teaching achievements and future directions.

Effects on learning

The possible effect on learning is mitigated when technology is only used in the *enhancement* stage (Herrington, Herrington, Mantei, Olney, & Ferry, 2009). Student mastery of the 4Cs happens when we operate in the *transformative* stage, which provides ideal learning conditions to be deployed. According to Oostveen, Muirhead & Goodman (2011), “It seems that meaningful learning is far more likely if the new technologies are recognized as providing transformative opportunities.” Designing assessment tasks that require students to demonstrate their 4Cs is in alignment with the *transformative* stage in the SAMR model. What happens in the classroom with technology usage in schools occurs at the *enhancement* rather then *transformative* stage. Therefore we need to provide the appropriate situations that will allow students to develop a mastery of the 4Cs. Hattie (2009) argues that “It is what teachers get the students to do in the class that emerged as the strongest component of the accomplished teachers’ repertoire, rather than what the teacher, specifically, does. Students must be actively involved in their learning, with a focus on multiple paths to problem solving” (p. 35).

Concluding comments

If the teachers’ use of digital tools is confined to word-processing, emailing and researching the Internet, then it is little wonder that students do not have a broader skill set. To prepare learners for the future, schools need to cultivate higher levels of teachers’ professional learning and so extend the students’ development of the 4Cs. Professional development needs to focus on what teachers can get their students to do, so that the use of technology can help students confidently master the 4Cs. Future work will focus on determining the effectiveness of implementing the 4Cs for teacher professional development and evaluating student outcomes in a technological transformative environment.

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Designing evaluation and research into educational initiatives: the Global Perspectives Program

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We describe the planning for evaluation research using a curriculum initiative project as a case study. The project was to design a generic *Global Perspectives* (GP) learning program to embed in first year units of study offered by the Faculty of Health Science. The pilot phase of the GP program delivery was used to explore and define an educational evaluation research (EER) plan that addresses, 1) the GP program design; 2) its implementation and ongoing refinement and, 3) the management of the project. The GP program is presented from an e-learning design perspective and its EER plan is based on the design framework in (Phillips, McNaught et al. 2012). The paper provides a high level view of the EER plan for the GP program over each stage of the design life cycle and for the evaluation of project management. The paper discusses the rationale for an EER plan, the book as a guide for research and practice in evaluating e-learning and the relationship of the GP program to learning, teaching and leading for the future.

Keywords: e-learning program evaluation, project-management evaluation, evaluation research design

Introduction

The focus of this paper is the design of a systematic plan for educational evaluation and research (EER) aligned with the design, delivery and management of a curriculum initiative: to teach a generic graduate attribute to first year students. The *Global Perspectives* (GP) program is designed to support first year Faculty of Health Science (FHS) students from the University of Tasmania (UTAS) to learn and demonstrate the 'Global Perspective' or 'cultural competence' graduate attribute. The context of the EER plan is nationally regulated higher education and a future environment where evidence of quality learning experiences and learning outcomes are expected with, "Course and discipline-specific skills and knowledge, as well as the generic skills developed through higher education will be considered by TEQSA when reviewing learning standards" (Tertiary Education Quality and Standards Agency 2011, p.7). It presents the plan for evaluating and researching the design, implementation and improvement of the GP program. The intended outcomes are evidence-based improvements to the GP program design and a reliable and valid evidence base for demonstrating learning outcomes and usefulness of resources. The tight integration of educational evaluation and research informing the ongoing design and re-design of a learning program increases confidence that students are equipped for future roles in a global society.

The paper begins with the policy and strategic environment driving the project. It provides an introduction to the concept of graduate attributes, and the 'global perspective' (or 'cultural competence') attribute. Cultural competence was identified as a critical attribute for FHS graduates training for clinical professions. The GP program built on prior curriculum initiatives, directed at students unfamiliar with Australian culture, to prepare them for clinical professional experience placements and interactions with clients. The expanded vision for the future is the GP program as a compulsory, assessable component of curriculum to ensure, "Cultural competence for life-long learning and work in a global society" for *all* students. The paper presents the GP program from the perspective of e-learning design and describes the rationale for developing an EER plan based on (Phillips, McNaught et al. 2012). The paper presents the EER plan, developed in the context of the 2012 Ascilite mentoring program, and comments on the book as a guide for research and practice in evaluating e-learning.

21st century learning environments and UTAS

Increasingly, universities are providing blended learning environments to support flexible access to learning opportunities for students. UTAS is a multi-campus university and the FHS provides a number of courses fully online and in blended delivery mode to students at the Hobart, Launceston, Cradle Coast and Sydney campuses. However ensuring high-quality learning experiences in an online environment requires strong pedagogical design as well as good technical design of e-learning artefacts and environments. UTAS has adopted a Technology Enhanced Learning and Teaching Action Plan (CALT 2011), invested in a new Learning Management System (LMS) and adopted a "Minimum Online Presence" requirement for all courses. UTAS is developing a Learning and Teaching Evaluation policy with associated Course Review Procedures and Course Review Guidelines to embed continuous evaluation and review of Unit and Course designs (UTAS 2012).

Educational Evaluation and Research

E-learning evaluation is a complex mixture of evaluation and research requiring a systematic and planned approach to ensure rigor and relevance (Phillips, McNaught et al. 2012). It benefits from a mixed methods, or hybrid, approach because, "'appropriate' assessment of curricular innovations is an *argument* that includes diverse kinds of scientific evidence, as well as the theoretical rationale and the social significance of the innovation" (Ruhe and Boudreau 2011, 188). Benefits of designed evaluation include opportunities to improve program design; communication between project team members; identifying additional/alternative types of data to collect, reviewing evaluation procedures, and preventing misunderstandings including with those with oversight of the project (Sanders and Nafziger 2011[1976]).

Phillips *et al* (2012) argue for, "an evaluation framework and a scaffolded approach to the design of an e-learning research study" (2012, p.13). The authors provide a holistic, systematic and planned approach to educational evaluation and research which, "explicitly maps evaluation-research activities to the design-and-development cycle of an e-learning artefact, and applies across many, if not all, of those development phases" (2012, p.87). The book distinguishes four interrelated, and potentially concurrent, evaluation-research activities: *baseline analysis, design evaluation, formative evaluation* and *effectiveness research* with *project management evaluation* as a separate, related, activity. Project management evaluation is about the conduct of an e-learning project, primarily formative and concerned with processes although summative elements, for example in reporting to funding bodies (Phillips, McNaught et al. 2012).

Graduate Capabilities and Cultural Competence

Graduate capabilities are also referred to as competencies, generic skills, graduate attributes and 21st century skills. These are the skills required to be successful knowledge workers and citizens, and they combine with subject-based knowledge to produce the 'expertise' of a graduate (Bransford, Brown et al. 1999). Allan (1996) distinguishes between *personal transferable outcomes* (acting independently, working with others, using information technology, communicating effectively, organisational skills, etc.) and *generic academic outcomes*, (making use of information, thinking critically, analysing, synthesising). A further distinction is between these personal skills and abilities, and complex interwoven aspects of human ability, which are difficult to explicitly teach or assess in traditional university experiences (e.g. Independent and lifelong learning, Ethics, Social justice) (Barrie 2005).

The UTAS *Global Perspective* graduate attribute is, "Graduates will be able to demonstrate a global perspective and inter-cultural competence in their professional lives" (CALT 2001). Graduate attributes must be integrated into curriculum and evaluation/quality assurance processes, as well as support students, "in the development, assessment and documentation of the achievement of graduate attributes throughout their study" (CALT n.d.). The global mobility of graduates and multi-cultural demographic of most countries means that the ability to relate effectively and appropriately with colleagues, clients, and the community at large is a critically important attribute wherever a graduate chooses to work.

Education design for 'Cultural Competence': the Global Perspectives program

Background

The Global Perspective attribute was explicitly taught in a support program developed in the School of Nursing & Midwifery (SNM) (Spratt and Sondermeyer 2006). This program included workshops and tutorial discussions designed to prepare Culturally and Linguistically Diverse (CALD) students unfamiliar with Australian culture for clinical professional experience placement. The learning objective was to equip target students to interpret and respond in culturally appropriate ways to clients seeking health care services. Sondermeyer and Van den Berg (2005) suggested that a program for *all* students and teaching staff would significantly improve this 'deficit' model. In 2011, a faculty-wide project was established to leverage expertise in the SNM and extend the program to teach and assess cultural competence for all students, regardless of cultural background. It represents a significant shift in both target student cohort and intended scale of engagement.

Baseline analysis

The problem the GP program design seeks to address is that graduates in the 21st century will live and work in a rapidly changing global society. Capability in cultural competence, including intercultural awareness and communication skills, will determine the extent to which graduate health professionals succeed in practice environments in Australia and in other countries (Sondermeyer, van den Berg et al. 2005).

To avoid a 'deficit' model of supporting targeted students (Sondermeyer, van den Berg et al. 2005) or a 'tokenistic' approach to cultural competence, the first decision was to design a learning environment that could embed *global perspective* into core curriculum to enrich the learning experience of all students and staff. Thus the GP program is discipline-agnostic and can be embedded in any first year unit of University study.

A review of the literature on "cultural competence" (and equivalent concepts) identified four major components which informed the working definition of *cultural competence* used to frame the learning design:

> An ability to communicate/interact effectively and appropriately with people of different cultures, comprising four components:
> a) AWARENESS of one's own cultural worldview;
> b) ATTITUDE towards cultural differences;
> c) KNOWLEDGE and ACCEPTANCE of different cultural practices and worldviews;
> d) SKILLS (including COMMUNICATION).

Four learning objectives were derived from this definition:

1. Student identifies awareness of his/her own worldview in the context of other worldviews;
2. Student demonstrates a respectful attitude towards cultural differences;
3. Student demonstrates recognition and understanding of different cultural practices;
4. Student uses communication effectively and appropriately to enhance intercultural understanding.

These learning objectives are embedded in the core elements of the GP program and were the criteria for deciding content, structure, learning processes (including sequencing) and supporting resources.

GP Program Design

Table 1 sets out the components of the GP program as it was developed 2011-2012. The learning design is structured around three elements: an online *Quiz*, a face-to-face teaching *Module* and, for students who are required to participate in clinical Professional Experience Placement, a *Workshop* component.

The Module is delivered via a "plenary session" and "tutorial discussion" sequenced over four weeks with each week aligned to a Leaning Objective. It is designed to fit within the traditional structure for a Unit and utilises the timetabled lecture and tutorial slots. The learning design assumes a Minimum Online Presence on the UTAS LMS. Each plenary session is a highly interactive lecture, scaffolded by a PowerPoint presentation, which is recorded and uploaded to the Unit presence on the LMS. Additional resources are provided on the LMS including journal articles, recorded interviews and video clips that relate to each part of the Module. The tutorial discussions include reflective exercises, paired and group discussion, and focus on supporting students to apply the concepts delivered in the plenary session to their personal and professional/disciplinary context. The Quiz is designed to provide students an opportunity to respond to a number of questions and scenarios for which a variety of responses or interpretations of 'what is going on' are possible. It is administered in the week before the first plenary session via a link on the LMS. It also provides a shared experience for students to use to respond to questions in the plenary session and begin discussions in the tutorial.

Table 1: Global Perspectives program

Components	Purpose	Delivery mode	Delivery sequence
Quiz Not assessed	- (self)-'consciousness raising' Conversation scaffold for Module.	Online - Via link on LMS - Voluntary and anonymous	- Administered prior to Module - Students notified via LMS email
Module Four instances of **plenary session** (with follow-on **tutorial discussion** Assessed - Exam	Module – 4 learning objectives (LOs) - content related to an LO for that part of the Module - discussion and exercises to consolidate and apply the LO to personal and professional practice	Face to Face - whole of student cohort interactive plenary session - small group tutorial discussion (25 max) Online via Unit LMS - plenary session recorded and uploaded to LMS.	- Plenary session – one hour per week for four weeks - Tutorial discussion – one hour per week for four weeks
Workshop - Component of a compulsory two hour PEP workshop	Preparation for students' Professional Experience Placement	Face to Face - GP content for workshop is 30 min	- Delivered in following semester

The lifecycle of the Global Perspectives program

The concept of 'life cycle' for an e-learning artefact or environment is grounded in the inescapably 'designed' nature of learning in online environments; it is also a scaffold for the evaluation research framework presented in (Phillips, McNaught et al. 2012), Figure 8.1, p. 119. The development cycle of an e-learning artefact or environment has four phases: *analysing the requirements*, *specifying design*, *development* and *implementation* and each phase in the life cycle suggests a focus for evaluation and research (Phillips, McNaught et al. 2012).

The focus, or unit of analysis, for e-learning evaluation tends to be the design of an artefact (which will later be embedded into a learning environment). However, the orientation of the GP program design is curricular, not artefactual; thus some of its design phases do not neatly align with the phases in (Phillips et al 2012). The GP program, in its current form, is a learning environment that is delivered in blended mode. Face-to face teaching and peer interactions are assumed critical to the development of students' cultural competence capability.

The project plan compasses three phases of activity: pilot implementation (phase one, Semester 1, 2012), implementation (phase two, Semester 2, 2012) and faculty-wide roll-out (phase three, 2013). Phase one was preceded by an extended period of research and consultation to produce the GP program design (phase 0). The GP program, in its final form, will be housed in an online environment from which a variety of learning and teaching resources will be available for downloading and embedding in any Unit of study. This implies an additional design activity beyond the current project plan (phase four, 2014): the GP program, and documentation to guide teaching and learning practice, for use in contexts not supported by the project team.

Phase 0 – GP program design (to solve the problem of how to build cultural competence)

The requirements analysis and initial design for the GP program took place during late 2011 up to May 2012. Initial inputs to the GP program design (see Table 1) included: Sondermeyer's workshop design; definitions, learning objectives and learning designs sourced from a range of literature in the cultural competence and internationalisation domains and the collective experience and knowledge of project team members. A three day consultation with Dr Darla Deardorff, Dec 2011, provided expert information and advice based on current scholarship and practice of educating students in 'cultural competence'. A key learning design decision from the consultation was to first establish learning objectives for the assessment of cultural competence and apply them to the Quiz and Module components of the GP program (Table 1). The next step was designing learning activities for the learning objectives. Working parties were formed to develop the Quiz, Module and Workshop elements of the GP program. Working parties presented their learning designs to the project team for discussion and the team decisions on what should be added or changed incorporated into the learning design.

Phase one – pilot implementation

The pilot implementation of the program was delivered in the last five weeks of Semester one, 2012 to approximately 500 first year Bachelor of Nursing students enrolled in CNA116 *Introduction to Nursing.* The pilot implementation was used to trial data collection tools and to develop the preliminary EER plan to guide the evaluation of the GP program.

Phase two – implementation

In phase two, semester 2, 2012, GP program was revised, based on evaluation of phase one, and embedded in a first year Unit delivered to approximately 55 first year Bachelor of Pharmacy students. First year BN students participated in a Workshop prior to Professional Experience Placement (PEP), to reflect and discuss how to apply the learning from the GP program in a clinical context. Students attended focus groups post-PEP to “de-brief”. Training workshops were designed for UTAS staff members, new to the GP program, planning to embed it in a Unit in phase three. Work began on a fully online version of the GP program for distance students.

Phase three – FHS roll-out

In phase three, semester 1, 2013, the revised, predominantly face-to-face GP program will be embedded in a Unit taken by all first year medical students; an online version will be embedded in a Unit undertaken by first year Bachelor of Paramedic Practice students. Other Schools in the Faculty will also have opportunity to embed the GP program in their first year Units. Preliminary design for a GP program for embedding in second and third year Units will begin.

Phase four – GP program available online *for embedding in first year Units*

In addition to the planned rollout of the GP program for all first year courses in Faculty Health Science Schools, it is envisaged that both face-to-face and online versions of the GP program will be made available for Unit Coordinators to embed within Units in other Schools and disciplines across UTAS. The design of the GP program, as developed in phases one to three, assumes the project team members either deliver the program or provide hands on support and training to those who embed the GP program in their Unit. Phase four will initiate a significant shift in the design focus: to the GP program as a standalone online resource that can be downloaded, embedded in a Unit, and delivered without support by the project team.

Planning and implementing Educational Evaluation and Research

EER plan principles and foundations

The EER plan for the project has two foci: evaluation of the *project* (plan, structure, processes) and evaluation research of the project output – the *GP program*. The project evaluation is discussed first, summarised in Table 2. The GP program evaluation is presented in the following section and summarised in Table 3.

The broad aim of the EER plan is to conduct formative and summative evaluation of the GP program design and implementation. Particular goals are to:

- evaluate the process and outcomes of the project in order to make recommendations for the management and design of future educational projects;
- improve the educational design of the GP program;
- evaluate the effectiveness and impact of the GP program on student engagement and student learning;
- evaluate the staff experience of delivering the GP program;
- determine if, and to what extent, the GP program produces a ‘cultural shift’ in participating students and staff members.

The project structure includes an EER working party whose remit is to design the EER plan and to support project team members, individually or in groups, to engage in a program of educational evaluation and scholarly research aligned with the plan. The EER plan includes: overarching research questions, data collection instruments, data analysis methods and suggested publication and reporting targets. Some of these elements are not yet fully developed; most will change and adapt over time as the project progresses.

The EER plan is based on the evaluation-research process in (Figure 7.1, Phillips et al 2012) and uses the planning tools it provides for managing the change in focus required over time as a design-based learning project evolves to a mature system. Table 3 maps the phases of the project to the e-learning life-cycle and identifies the evaluation-research elements for each stage.

Project Management Evaluation

The EER plan focuses on formative project management evaluation throughout the project; summative evaluation will be conducted at the end of the project. Table 2 summarises the core elements of the project and its characteristics as set out in the project plan submitted with a successful UTAS Teaching Development Grant application. Project management evaluation is best concerned with formative evaluation of project processes with outcomes addressed by other evaluation-research activities (Phillips, McNaught et al. 2012). Two lines of formative investigation are: 1) the effectiveness of the project structure (particularly working parties developing learning designs for review by the project team) and 2) the effectiveness of project processes. The criteria for measuring effectiveness is, *To what extent are project outputs meeting stakeholder needs?* The final project report and FHS's desire to use the project as a blueprint for similar educational initiatives suggests a broad research question, *What was the overall success of the project, including its impact on stakeholders, and how can the process be improved?* The project structure and processes were explicitly designed to ensure a planned and holistic approach to EER. This suggests a further research question, *What is the impact of designing and planning educational evaluation research into the project?* A formative and summative evaluation process will also used to evaluate the effectiveness and impact of designing and planning educational evaluation research into an (e)-learning project.

Table 2: Project Evaluation

<table>
<tr><th>Elements</th><th>Characteristics</th><th>Evaluate (Phillips et al 2012, ch.10)</th></tr>
<tr><td>Project plan</td><td>Objectives
Major tasks
Timeframe
Budget</td><td rowspan="4">Formative Process Evaluation
• How effective are the project structure and processes and how can they be improved?
• To what extent are project outputs meeting stakeholder needs?
Summative Outcomes Evaluation
• To what extent was the project implemented as planned and funded?
• What was the overall success of the project, including its impact on stakeholders, and how can the process be improved?
Formative evaluation of EER
• What is the impact of designing and planning educational evaluation research into the project?
External formative evaluation
• External consultant - design
• 'Critical Friend' – EER plan</td></tr>
<tr><td>Project structure</td><td>Project leader
Project manager
Working parties (Quiz, Module, Workshop design; Evaluation)
Project team (fluid membership)</td></tr>
<tr><td>Project processes</td><td>Project team meetings and email communication
Working party meetings and report back
Deliver and reflect
Observation of delivery and debrief
Reflection and planning workshop
Training workshops to deliver GP program</td></tr>
<tr><td>Project personnel</td><td>Team membership
- members from all Schools in the FHS
- invited members from Student Support Services
FHS resources
- project manager
- academic support (EER plan and implementation)</td></tr>
</table>

GP Program: Educational Evaluation and Research (EER) plan

The development and implementation of the GP program is planned over five phases: 0: *Design*; one: *pilot implementation*; two: *implementation*; three: *FHS roll-out* and four: *online version* for embedding in Units. The EER plan for the GP program covers phases one through three with indicative comments for phase four.

Table 3 is based on the assumption that evaluation and research goals need to align with different life cycle stages of a learning design. Research goals and broad research questions for each phase of the GP program were selected by mapping the development and implementation phases to the life cycle phases of an e-learning project in (Phillips, McNaught et al. 2012); identifying type of activities (analysis, design, develop, implement) and EER questions for the evaluation research focus appropriate for that phase.

Table 3: GP program life cycle: adaptation of Tables 8.1 & 8.2 (Phillips, McNaught et al. 2012)

GP Phase	Cycle	Analysis	Design	Develop	Implement	Questions to ask	Evaluate – Research
0	0	Analysis of problem				What is the problem and how can we solve it?	Baseline analysis
0	1		Design e-learning environment	Document-ation		How good is the design?	Design evaluation
1	2		Refine design	Develop e-learning environment	Initial trial	How can the e-learning environment be improved?	Formative evaluation of the e-learning environment
2	3	Refine problem analysis	Refine design	Revise e-learning environment	Deploy to learners (full trial)	How well does the e-learning environment work to support cultural shift?	Formative evaluation of the e-learning environment and processes
3	4	Refine problem analysis	Refine design	Revise e-learning environment	Deploy to learners	How effective are the learning processes in generating 'cultural shift' in students? What is the impact on students' capabilities in managing cultural diversity?	Effectiveness research into learning processes and outcomes
4	5	In phase four, the GP program will be designed as an online teaching resource with accompanying teaching training materials to support delivery. This will begin a new design phase and the EER focus will return to the characteristics of phase 0, cycle 0 for the GP program.					

EER phase 0 – baseline analysis and design evaluation
The focus of design activity in phase 0 was analysis of the problem, *How to build cultural competence in first year students?* The focus of EER during this phase was research to identify potential design solutions and to evaluate their potential as a learning environment. An external consultant provided advice and guidance on the learning objectives for the GP program. Once a coherent design was formulated, the focus shifted to the evaluation question, *How good is the design?*

The method for evaluating Quiz and Module designs was that working parties would present their proposed designs for review and discussion by the project team. The criteria for evaluation were: 1) content alignment with the Learning Objectives and 2) impact on learners of Quiz and Module learning design.
Several iterations of team-based discussion resulted in significant design changes to the Module and Quiz.

The Module was trialled with two cohorts of students from another institution. Feedback forms, with questions on the content and delivery experience, were collected from participants. The data was analysed by the Module working party to identify design aspects that needed changing. The Quiz design was trialled by the 20 plus members of the project team and the design evolved significantly. Its planned purpose of 'diagnostic tool' to measure the impact of the program on students was changed to a 'consciousness raising' and 'fun' activity for students to participate in, and as a prompt for tutorial discussions.

EER phase one – design evaluation and formative evaluation of the e-learning environment
Phase one and phase 0 overlap in terms of life cycle. The broad research question for phase one was, *How good is the design?* and subsequently, *How can the design be improved?*

EER for these phases was evaluation for improving the GP program design. The project team monitored student comments about the GP program on the LMS blog for the Unit. The UTAS Student Evaluation Teaching and Learning (SETL) Unit survey included questions specifically about the GP program embedded in the Unit. This data was used to evaluate the pilot delivery of the GP program. The analysis of student comments and SETL data was done by working parties who then proposed design changes to the project team for discussion and approval. Members of the project team attended the Module plenary sessions and tutorial discussions as observers. Additional data included: project meeting minutes (recording post-observation feedback), observation field notes, and emailed feedback comments.

At the conclusion of phase one, the GP program was evaluated from both student and staff perspectives and revised and refined for phase two delivery. During phase one, the EER working party developed a diagnostic tool for measuring the GP program's impact (or 'cultural shift' in knowledge, skills, capabilities) on individual students. The *My Perspective* questionnaire was trialled in phase two and evaluated for validity and usefulness.

EER Phase two – formative evaluation of the e-learning environment
The focus of phase two was the design of the GP program as a learning environment. The broad research questions for phase two were, 1) *Does the learning environment work as intended?* and 2) *How can it be improved?*

Phase two data collection added student focus groups and student assessment items as data sets. To determine effectiveness and 'impact' on student learning from the GP program a long-term plan was initiated to develop, trial and validate a diagnostic tool to answer the question, *How well does the GP program as learning environment support 'cultural shift'?* The *My Perspective* questionnaire was administered pre- and post- Module (during the first plenary session and again, at the conclusion of the last tutorial discussion). This tool was explicitly aligned to the GP program learning objectives and sought to elicit the students' perceptions of their personal curiosity, comfort, confidence with other cultures and their understanding of their worldview. A second diagnostic tool is being designed and validated to establish a baseline of cultural competence that is not explicitly aligned to the GP program learning objectives and capable of establishing a baseline of 'cultural competence' for first year students and to validly assess the effectiveness and impact of the GP program.

During phase two, the Nursing students participated in a Professional Experience Placement Workshop. This workshop incorporated a 30-minute component designed by the GP program Workshop working party to revisit and apply the learning objectives of the GP program to practice in a clinical setting. As for the Module and Quiz, the Workshop is evaluated from a design perspective, *How good is the design and how can it be improved?* Student feedback data from the Workshop and post-PEP focus groups will be analysed to identify and trial specific research questions and data collection methods to measure the impact of the GP program on students' cultural competence capabilities in clinical professional experience placement settings.

The literature review was updated and focused on 'cultural competence' as a construct and scholarship and practice in tertiary education learning design. At the conclusion of phase two, analysis of data (student and staff perspectives) was conducted from an educational evaluation perspective. Data was interpreted within the framework of learning design principles synthesised from the literature review. The various data collection methods and data sets were also interrogated to assess their ability to establish a baseline of student knowledge, skills and capability in cultural competence and to measure cultural shift in response to achieving the learning objectives of the GP program.

EER Phase three – formative evaluation of the e-learning environment and processes and effectiveness research into learning processes and outcomes
The GP program design will ultimately be finalised for large-scale delivery in phase three. In this phase, the focus of the EER plan is researching how learners engage with the GP program as a learning environment. The broad research questions identified for phase three are: 1) *How well does the GP program as a learning environment support learning?* 2) *How effective are the learning processes in generating 'cultural shift' in students?* and 3) *What is the impact on students' capabilities in managing cultural diversity when on Professional Experience Placement (PEP)?*

On the basis of the pilot implementation (phase one) and implementation (phase two), the EER working party will develop or identify a range of instruments to facilitate and guide ongoing evaluation of the GP program. The design and content of additional data collection instruments (for example survey/questionnaire, student focus groups, interviews) will be decided based on the data analysis and outcomes from phases one and two of the project. Standardised questions for students to evaluate the GP program, as embedded in their Unit, will enable summative evaluation of the Quiz, Module and Workshop design and the effectiveness of delivery from student perspective for each Unit. The *My perspective* questionnaire and cultural competence diagnostic tool will be evaluated for validity in establishing a baseline and in determining if the intended learning outcomes / objectives have been demonstrated by a measurable cultural shift in students' capabilities.

Phase three will test the sustainability of the GP program's design: *Is the GP program design sufficiently clear and robust to be delivered independently of the project team?* and *How effective are the training and teaching resources provided?* A feature of the GP program is the requirement for skill in a highly interactive teaching style for delivering the plenary sessions, in contrast to 'lectures' whereby teachers talk and students listen, and skill in facilitating tutorial discussions of sensitive topics that can produce strong emotions. Hence the GP program design will include teaching materials and training for academics intending to embed the program in a first year Unit.

The EER working party will oversee and monitor any evaluation and research projects that are proposed by members of the project team who wish to investigate specific aspects of the GP program as it is implemented during phase three.

EER Phase four – effectiveness research into learning processes and outcomes (mature GP program) and baseline analysis and design evaluation (GP program as online resource)
The approach to evaluating and researching this stage of the GP program life cycle will be developed in the EER plan in more detail during phase three when the GP program is evaluated as a mature system. The focus of evaluation of the mature GP program design will be effectiveness research into learning processes and outcomes, emphasising demonstrated achievement of learning outcomes. This phase will revisit the design evaluation to determine if the learning environment embodied in the GP program is consistent with the baseline analysis of educational need and learner characteristics and if it is achieving the intended learning objectives (Phillips, McNaught et al. 2012). Additional data will include peer review on the final learning design of the GP program as it is embedded in Units and taught by academics independently of the project team.

Evaluation-research activities for the GP program as an online resource will be framed by e-learning design principles explicated in relevant literature on e-learning best practice. The baseline analysis of the problem, *How to build cultural competence in first year students?* will be adapted to include teacher and learner characteristics for an online delivery mode. The focus of EER during this phase will be to identify potential design solutions and evaluate their potential as a learning environment. Once a coherent design is formulated, the focus will shift to the evaluation question, *How good is the design?*

Guidance for research and practice in evaluating e-learning

This paper had its genesis in Ascilite's community mentoring program. The intended outcome specified in the mentoring agreement between the first author and mentor, Phillips, was for the novice researcher in e-learning to develop skills in EER and to apply the evaluation research framework provided by (Phillips, McNaught et al. 2012) to a project involving e-learning design.

This section is a short account of (Phillips, McNaught et al. 2012) as a guide for research and practice when evaluating e-learning. The context of this account is the project effort thus far to design and evaluate the GP program as well as plan for future evaluation and research activities. The book presents a strong case for, "an evaluation framework and a scaffolded approach to the design of an e-learning research study" (p.13). A proposal to develop an EER plan for the GP program argument resonated strongly with the primary stakeholders, the project team, who were concerned to ensure an evidence base for improving the GP program design and for establishing its impact and effectiveness on student learners.

The book sets out a holistic, systematic and planned approach to educational evaluation and research. It is holistic in that it takes into account the different goals of educational evaluation (judgment and decisions to improve design) and research (understanding what is going on in the learning environment). It also guides EER planning to take into account the design-and-development cycle of an e-learning artefact or learning environment: life-cycle stage in design affects what research goals, and therefore what research questions, are appropriate.

Two key concepts key to the process of 'doing' an EER plan are the following:

> "… the challenge with evaluation research occurs most often early on in the process - in deciding on the direction of the study (what questions are to be asked), instantiating the direction into a clear methodology and then planning the specific details" (Phillips, McNaught et al. 2012: 111).
>
> "design evaluation is not a *one-off* activity. While it is clearly a major activity at the beginning of the e-learning life cycle, the design needs to be revisited after each cycle of design, development and implementation. Evaluation data at each stage will inform a revised design for the learning environment. Each new design should be subjected to a design evaluation, which may require a new round of peer review or expert judgment." (p.123).

The process diagram for evaluation-research (Fig. 7.1, p. 104) was followed to design the EER plan. There were several challenging aspects to this process, which benefitted from the mentoring relationship and access to specific advice on how to map the guiding principles and techniques in the book to the messy reality of the project. The perennial 'problem' of tacit knowledge articulated by Michael Polanyi, remains,

> Common experience also tells us that in teaching we rely on an intellectual effort of the learner for recognizing that which we are conveying to him. … the intellectual effort to find out how it is done. … our teaching relies on the capacity of the learner to discover for himself a considerable part of that which we are trying to impart to him, and to this extent we are imparting to him something that we cannot tell, and which he, in his turn, then knows and cannot tell (Polanyi 1969).

Thus while the book was a very useful guide for designing the EER plan, the experience of the first author was similar, perhaps, to that of a contestant in the Masterchef television program given the task of reproducing the signature dish of a renowned chef. It can be difficult to follow an unfamiliar recipe and reproduce a complex culinary outcome; careful reading of the recipe and exact following of steps is rarely sufficient. Personal encouragement and advice by the chef reduces likelihood of failure, however success also requires intellectual effort and imagination on the part of the learner to translate the meaning of words into personal knowledge, evidenced by the capacity to do what has been learned.

The project team is culturally diverse, geographically dispersed and multi-disciplinary. The unifying vision is to contribute to the development of students' 'cultural competence for life-long learning and work in a global society', so they can, in future personal and professional lives, fruitfully and effectively interact with people of diverse culture-based perspectives and practices.

The project team culture reflects this vision, fostering collaborative design effort and inclusiveness. Individual members are variously interested in evaluation and research activities and this suggested the need for a mechanism to produce, and then manage, a coherent and strategic plan of evaluation and research work. The formative evaluation of the project management processes confirmed the effectiveness of a 'working party' model for developing the Quiz, Module and Workshop elements of the GP program design. This model was applied to the task of EER design. The EER working party has developed the plan to date and will be responsible for its implementation. Its remit is to facilitate and document the evaluation research effort arising from the project and ensure formative evaluation of the EER plan, recommending improvements. Additionally, data collection methods and data sets trialled in the early phases of the GP program life cycle (phase one and two) could not be analysed to establish to what extent students acquire the 'global perspective' or 'cultural competence' graduate attribute through the GP program. This reinforced the need to design a diagnostic tool to measure 'cultural shift' with a view to having a validated tool ready for the mature educational design.

The result of the EER planning effort is a comprehensive plan that addresses the educational design, project management and scholarship. The current version includes research questions that are suitable and relevant to each of the life cycle phases of the GP program as its design is developed over time. The EER plan has been embedded in the project plan and will provide a framework to guide the ongoing quality assurance process for the GP program and a scaffold for developing research questions and methods so that as the GP program enters the maturity phase of its life cycle and questions of 'impact' and 'effectiveness' can be addressed.

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Evaluation of lecture captures in mathematics and statistics for internal, hybrid and distance modes

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For several mathematics and statistics subjects we included a variety of video-based resources including lecture captures. We surveyed students and found they appreciated and felt they learnt from the videos. Additionally, we recorded usage data and found a positive relationship between number of lecture captures downloaded and exam performance.

Keywords: lecture capture, mathematical education, video-based resources, usage data

What we did

- In several mathematics and statistics undergraduate subjects;
- For various modes: internal (with traditional lecture), hybrid and distance;
- Gave an assortment of video-based resources.
- We counted how many resources all students downloaded.
- We surveyed students for preferences.

Video-based resources used

For all subjects, the weekly lectures were captured to video and made available to all cohorts. Additionally, the following resources were used in some (but not all) the subjects:

- Shorter videos of single problem or concept;
- Video of solutions for assignments;
- Online interactive lectures (both live and recorded).

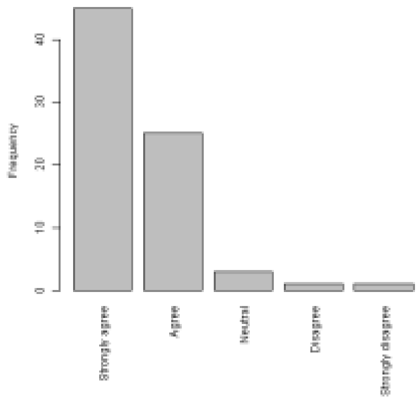

Figure 1: The lecture captures assisted with my learning

Results

Students felt they greatly benefitted from the lecture captures (Figure 1).

As a group, there was no clear preference for video vs text materials (Figure 2). To cater for all learning styles, written materials and video must coexist.

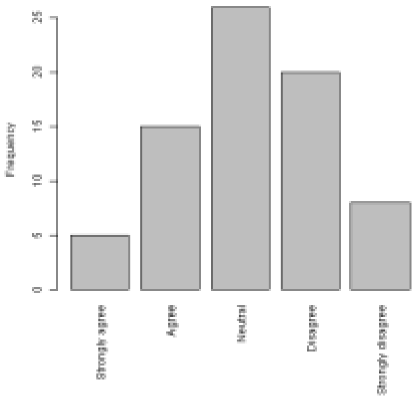

Figure 2: I learn more effectively using text based resources

About half the students (who had used both) preferred lecture captures to shorter videos (Figure 3). Furthermore, about a third of students (22 of 67) who had access to both types of resources did not look at any of the shorter videos. The most common reason selected was because the rest of the materials were sufficient.

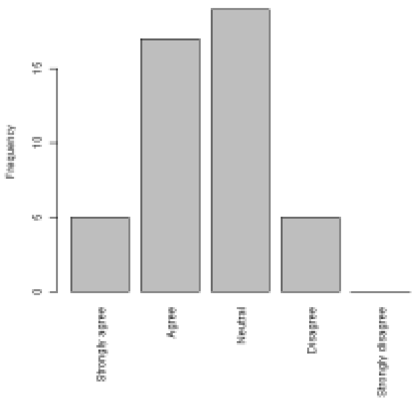

Figure 3: I prefer lecture captures to the shorter videos

Students were asked what video resources they would like to see in the future: recorded lectures, online lectures (combined and coloured red in Figure 4) and shorter videos and videos of solutions of assignments (combined and coloured blue). Students generally wanted to see more of everything, but there was a small but significant ($p=0.004$) bias to the non-lecture type resources.

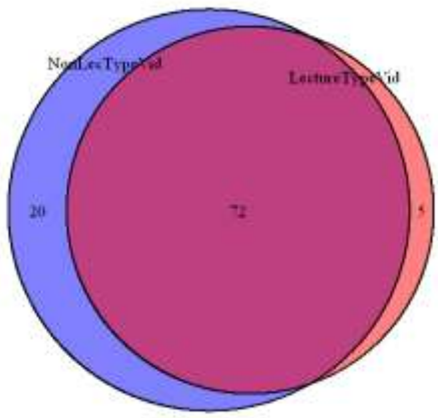

Figure 4: Preferred video resource (by type)

MTH101 - First year mathematics class

One particular subject in the study- a typical first year, first session mathematics subject – was offered in three modes: traditional lectures, hybrid = inverted classroom and distance. The difference in modes was based on geography and the cohorts' ability to learn independently. Figure 5 shows the number of lectures by mode that students downloaded in the 13 week session.

Two way ANOVA was used to investigate how exam performance was related to the number of lecture captures watched in MTH101. Mode was included in the model to avoid potential bias. There was a significant ($F=5.215$. $df=3,104$, $p=0.002$) relationship. Tukey's HSD shows (Figure 6) that students who downloaded most of the lectures (10-13) had a higher average exam mark than those who watched none or hardly any (0-2). Also, students who watched some (3-9) had a higher average mark than those who watched none. [Note: cause and effect cannot be determined from this data.]

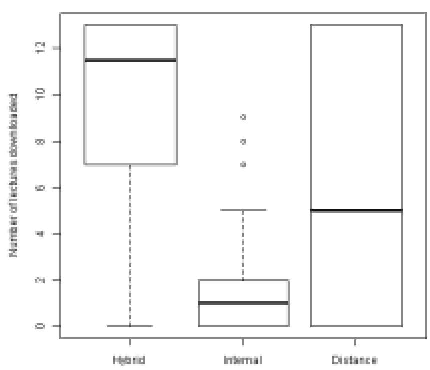

Figure 3: Number of lecture captures downloaded for different modes

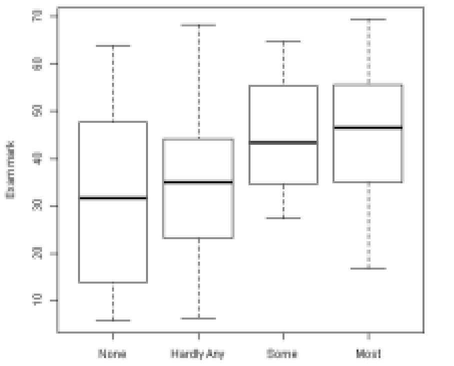

Figure 4: Exam performance versus number of lecture captures downloaded.

Conclusion

Students appreciated and felt they learnt from lecture captures and other video resources. Students who watched more lectures had a higher exam mark on average.

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Data mining interactions in a 3D immersive environment for real-time feedback during simulated surgery

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The analysis and use of data generated by students' interactions with learning systems or programs – learning analytics – has recently gained widespread attention in the educational technology community. Part of the reason for this interest is based on the potential of learning analytic techniques such as data mining to find hidden patterns in students' online interactions that can be meaningfully interpreted and then fed back to students in a way that supports their learning. In this paper we present an investigation of how the digital data records of students' interactions within an immersive 3D environment can be mined, modeled and analysed in real-time, to provide formative feedback to students as they complete simulated surgical tasks. The issues that emerged in this investigation as well as areas for further research and development are discussed.
Keywords: Data Mining, Feedback, Immersive Simulation, Learning Analytics.

Introduction: Analytics Rising

In recent years we have seen increased interest in the use of 'learning' or 'academic' analytics in education. It seems that after a long period of quiet contemplation, a mass of researchers, practitioners and administrators in the higher education and educational technology communities suddenly realized they were sitting on gold mines of electronic data that could be useful in understanding a range of educational processes. Like any gold rush, there has been a flurry of activity and interest as people gravitate towards the new boom. After being absent from the widely referred to Horizon Report, prepared annually by the New Media Consortium, analytics first appeared on the radar in 2011 and was touted as four to five years away from adoption. This year's Australian Horizon Report predicted that analytics is one year or less away from widespread adoption (Johnson, Adams & Cummins, 2012). While often proffering optimistic predictions, the Horizon Report does reflect the topics and issues that, at a single point in time, are in the frontal lobes of the educational technology community. And it seems from 2011 'analytics' was it.

Early educational writing on analytics tended to focus on how information in University databases could be used to support institutional reporting and decision-making. An area that received initial interest was how data from institutional repositories could be harnessed to predict students who were at risk. As Goldstein (2005) argued, in a competitive, resource-constrained environment, Universities are under "pressure to maximize student retention and shorten time to graduation" (p. 1). For example, in their paper on academic analytics, Campbell, DeBlois and Oblinger (2007) provide a number of examples where institutions in the United States have made use of data such as GPA, SAT scores, visits to campus, and students' use of the learning management system to predict outcomes such as students who are at risk and student retention. Similarly, Arnold (2010) reports on a system at Purdue University called "Signals", which takes data from the University's central systems and, using algorithms, "generates a risk level with supporting information for each student, represented by a green, yellow or red indicator " (p. 2). In an Australian context, the University of New England recently developed the

“Automated Wellness Engine” which shares some of the same goals.

Just prior to these developments, educational technology researchers became interested in how small and large sized teaching and learning tools could be used to capture data that could be used to support their understanding of students’ learning processes in electronic learning environments. In the early 2000s educational technology researchers such as Phillips, Baudains and van Keulen (2002) and Kennedy and Judd (2008) harvested data from electronic learning environments and used them to describe how students were completing learning activities. Some of these were based on students’ activities within learning management systems such as number of hits, the amount of time students were logged on, and frequencies of interactions. Researchers such as Judd and Kennedy (2008) sought to use similar kinds of data to find patterns in students’ interactions within interactive multimedia programs (Kennedy & Judd, 2008). This research into the more fine grained, micro-level behaviour of students within electronic learning systems was different to, but shared many similarities with, the macro, institutional level analytic approach described above. The need to parse, analyse, meaningfully interpret and report on large, complex data sets that had been digitally generated by learning and administrative systems was common to both.

However the differences between these two types of analytic endeavours has recently caused researchers to make a useful distinction between ‘Academic Analytics’ on the one hand and ‘Learning Analytics’ on the other. The recently formed Society for Learning Analytics Research [SOLAR] (Siemens et al., 2011) suggests that:

> Learning Analytics is the measurement, collection, analysis and reporting of data about learners and their contexts for the purposes of understanding and optimizing learning, and the environments in which it occurs …[while]… Academic Analytics is the improvement of organizational processes, workflows, resource allocation, and institutional measurement through the use of learner, academic, and institutional data. (p. 4)

Siemens et al. (2011), like Siemens and Long (2011), suggest that the target audience for these different analytic endeavours is different. Learning analytics is more focussed on providing an analysis to the learner, the educator and the teacher while academic analytics is more focused on providing advice to managers, administrators and funders.

The focus of this paper is on the application of learning analytics in an immersive simulation-based learning environment. It considers how data mining techniques can be used with large data sets generated by a simulation-based learning environment to generate meaningful, real-time feedback to students as they complete a complex educational task.

Learning analytics in education technology: A short history

The field of academic or learning analytics is seen as relatively new (Long & Siemens, 2011; Olmos & Corrin, 2012), based in part on the size and type of data being analysed (see Long and Siemens, 2011). However, the investigation and characterisation of students’ learning processes based on digitally generated user data – and the subsequent use of these characterizations for the purpose of student feedback – has a short but significant history in education. Two areas of educational technology research and development dominate here: Intelligent Tutoring Systems and User Interaction or Interactivity Research.

Intelligent tutoring systems (ITS) emerged in the 1970s after the educational technology community’s sustained interest in ‘Computer Aided Instruction’. Where Computer Aided Instruction programs were often based on simple drill and practice tasks, the goal of ITS was to “engage the students in sustained reasoning activity and to interact with the student based on a deep understanding of the student’s behavior.” (Corbett, Koedinger & Anderson, 1997, p. 850). A fundamental aim of ITS is to use artificial intelligence techniques to understand what students are doing with a piece of educational software so that advice and feedback can be provided to them to assist with their learning and understanding.

Most ITS are based on establishing an ‘expert model’ of interactions and inputs to the system that represents the ideal or optimal path or pathways through an educational task. This expert model may be used to create a ‘pedagogical model’, which is used to construct an ideal educational process for individual learners (see Beck, Stern & Haugsjaa, 1996). The system then records and analyses the behaviour, interactions and inputs of the student, which forms an individual ‘student model’. Crudely, by comparing the student model to either the expert or the pedagogical model for a particular task, the ITS can determine the difference between the two models – for example, where steps are not completed, where inputted data is incorrect, or stages of a procedure that are out of order – and provide intelligent, individualized feedback.

The learning activities upon which ITS are based often reflect tasks that have discrete steps or stages. As Van Lehn (2006) suggests “most tutoring consists of a chronological sequence of tasks that the student does with the aid of the tutor” (p. 228). While these learning activities and tasks can be used to support a range of types of learning outcomes – declarative, conceptual and procedural knowledge and understanding – the discrete and staged nature of the activities makes them amenable to the application of ITS. We do not mean to imply that these applications of ITS are simple; far from it. ITS often use sophisticated methods (e.g. Bayesian networks) to model very complex scenarios (e.g. complex physics or biomedical simulations) in order to determine both the expert and the student model. However, despite the clear success of some ITS, a number of researchers have noted that, for a variety of reasons, the ITS movement is yet to live up to its educational promise (Corbett et al.,1997; Dede, 2008). Cumming and McDougall (2000) go as far to say that by the late 1980s “ITSs were recognised as narrow and brittle” (p. 198).

In more mainstream educational technology research, user interaction or interactivity researchers have used log files or audit trails to gather data on students’ learning experiences in electronic environments. Weaver, Kemm, Petrovic, Harris and Delbridge (1999) created a multimedia program to help students learn about biological control systems and used audit trails to track how they went about the task of building models of these systems. Kennedy and Judd (2008) used a cluster analysis of students’ interview interactions with a virtual patient to show how there were clear groups of students within a single cohort that reflected different types of interactions. They suggested these groups had implications for both the design of the learning program and the nature of what different students may be able to learn from it. In a web-based environment, researchers have used log files or the tools within learning management systems to track how students interact and engage with both content (lecture recordings, lecture notes, web pages) and other students in activities like discussion forums (see, for example, Phillips et al., 2002; Dawson, McWilliam, & Tan 2008; Dawson, 2006a, 2006b; Dawson, Bakharia, & Heathcote, 2010).

While interactivity researchers often note the educational benefit that could come from providing students themselves with any analysis of their own learning behaviour and interactions (or possibly their teachers), typically this feedback loop is not completed. This represents something of a ‘holy grail’ for interactivity researchers in the educational technology community. Previous interactive educational programs have displayed limited adaptivity – the notion that the program would come to genuinely know or understand the student user and adapt or respond to his or her needs like an expert teacher or facilitator would (see Jonassen, 1985). When adaptivity has been built into a system, it has typically amounted to directing students to different parts of a referentially structured program on the basis of their past responses or performance. While ITS made a better fist of both feedback and adaptivity by employing more sophisticated expert and student models in complex domains, as mentioned above, these systems and techniques have not enjoyed widespread use. In short, the highly valued educational technology characteristics of genuinely intelligent feedback and adaptivity remain elusive.

Using Mined Data to provide Real Time Feedback

This brief history highlights that the field of educational technology has had a sustained interest in characterising students’ learning processes based on digitally generated user data and then using this to inform either the student, the designers of educational programs or students’ teachers. The lessons from these past research and development activities provide useful background for those with a new-found interest in learning and academic analytics. Our review also shows that in many cases the use of students’ on-task data is either relatively unsophisticated or is not used to provide immediate formative feedback to students while they are completing an educational task. For example, Computer Aided Instruction feedback is often very simple, while within the area of interaction research, the analysis of students’ interactions is typically completed long after the students have exited the system, if not the course.

More sophisticated Intelligent Tutoring Systems, such as those based on Bayesian networks, implemented in complex domains fare better (see for example, Conati, Gertner, VanLehn & Druzdzel 1997; Gamboa & Fred 2001). However, such models are based on a priori knowledge not only of what specific ‘input variables’ should lead to students’ success in any domain (the basis of the expert or pedagogical models) but also on the varied interdependencies between these input variables. This approach becomes problematic in domains where the experts find it difficult to fully articulate the input variables that lead to success (for example, factors predicting variations in surgical technique, elements involved in successful, high pressure decision-making). Data mining approaches, grounded in the behaviour and interactions of both expert practitioners and novice students become very useful in this context.

There are few examples of researchers using data mining techniques in the provision of real-time feedback to students in electronic learning environments. Sewell, Morris, Blevins, Dutta, Agrawal, Barbagli & Salisbury, (2008) used electronic measures collected within an educational surgical simulation as the input for data mining techniques and for the provision of feedback to users of the simulation. The metrics Sewell et al. (2008) used in the first instance, were univariate and reflected surgical behaviour or technique such as percentage of bone removed, use of excessive force and drill velocity. These were used to provide "interactive feedback … in the form of colored dots" (p. 74) and were shown to be effective in improving performance. As the user performed the virtual surgery "Bone that has been removed while maintaining proper technique according to the currently selected metric is colored green, while improperly removed bone is shown in red" (p. 74). In addition to these "raw data" measures, – as Sewell et al. (2008) refer to them – more sophisticated data mining approaches (Hidden Markov Models) were used to classify users' surgical technique as either "novice" or "expert". While these approaches reportedly worked well in summative discrimination, they were not employed as the basis for real-time formative feedback. In this paper we report on a research and development project in which we are seeking to determine how data mining techniques could be used with data generated from an immersive simulation-based learning environment, to provide meaningful, real-time feedback to surgical trainees as they complete an educational task.

Method

Participants

This study involved two groups of participants – an expert group and a novice group – with three participants in each group. The expert group consisted of two qualified ENT surgeons and one surgical trainee, while the novice group consisted of university students with no medical or surgical training.

Materials

Participants performed simulated surgical procedures on a temporal bone simulator. For a number of years we have been involved in a research and development project that has considered how haptically-enabled, 3D immersive environments can be used for the education and training of surgeons (see O'Leary, Hutchins, Stevenson, Gunn, Krumpholz, Kennedy, Tykocinski, Dahm & Pyman, 2008; Zhao, Kennedy & O'Leary, 2011). Zhao, Kennedy, Yukawa, Pyman & O'Leary, 2011; Zhao, Kennedy, Hall, Rathod & O'Leary, 2010). As part of this program of research we have developed a high fidelity surgical simulator for ear surgery procedures. A 3D virtual model of the temporal bone (the bone behind the ear) is created from micro-CT scans and this is rendered and displayed using a 3D monitor. When viewed with 3D glasses an illusion of a 3D operating space is produced. Users interact with the rendered model of a temporal bone using two pen-like haptic devices (a drill and an irrigator) that provide force feedback to the user (e.g. the user can 'feel' differences in bone hardness). In addition to the sensation of touch, the immersive 3D environment provides the user with visual (e.g. bone dust, blood) and sound cues (e.g. drill speed). Figure 1 shows the basic set up of the simulator and Figure 2 shows the rendered model of the temporal bone with the surgical drill.

Procedure

The functions and operation of the simulator were explained to all participants and they were given time to familiarize themselves with it. Participants in the novice group were provided with a video of a single surgical procedure (a cortical mastoidectomy) performed on the simulator by an expert surgeon. The video included a voice-over clearly explaining the aims of each stage of the procedure and how it should be performed. The video was displayed on a second monitor and novices were allowed to refer back to it while they undertook the procedure in the simulator whenever they felt it was necessary. Furthermore, novices were provided with an annotated diagram showing the position of each anatomical structure within the simulator.

Figure 1: The surgical simulator with a single haptic device

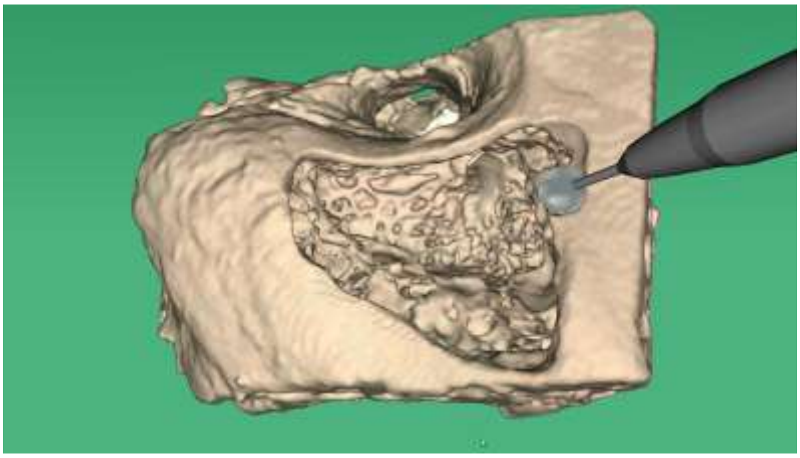

Figure 2: The simulation environment showing the drill and a partially dissected temporal bone

A list of the metrics recorded automatically by the simulator is shown in Table 1, and they are classified as general metrics, metrics associated with tool position, orientation and force used, drill burr metrics (i.e. the size and shape of the drill bit), metrics associated with proximity and force in relation to three key anatomical structures, and finally, metrics associated with the whole temporal bone being virtually operated on. These metrics were recorded at a rate of approximately 15 records per second, resulting in large data sets even for relatively short surgical procedures.

All participants performed their simulated surgical procedures in a research laboratory. Participants were able to complete their simulated surgery at a standard computer workstation, using the equipment described above and shown in Figure 1. The procedure chosen as the basis for this investigation was a cortical mastoidectomy, which is the preparatory step of many otological operations and is the most basic of all mastoid operations (Atlas, 2006). The aim of mastoidectomy is to dissect the temporal bone by removing bone using a high-speed drill while preserving the underlying anatomical structures (referred to as 'skeletonizing' a structure). A mastoidectomy is performed in a series of steps, during which the surgeon identifies a series of anatomical landmarks, which allow him or her to safely remove the surrounding bone. For the purposes of this investigation, the mastoidectomy procedure was divided into five stages. Participants were asked to carry out these stages sequentially and indicate to the researchers whenever they completed a stage. The five stages of the cortical mastoidectomy procedure were (i) perform initial cut into cortical bone; (ii) find the sigmoid sinus and skeletonize it; (iii) find the dura and skeletonize it; (iv) find the antrum; (v) find the incus. Each participant repeated the mastoidectomy procedure ten times, resulting in 60 data sets.

Table 1: A list of 48 metrics that are generated from the 3D immersive environment

Metrics derived from the VR Simulator

- General metrics
    - Timestamp (seconds)
    - Current stage (1 to 5)
- Tool position, orientation and force metrics
    - Current force applied by drill tool (X,Y,Z)
    - Current force applied by suction tool (X,Y,Z)
    - Current position of drill tool in simulator coordinates and haptic device coordinates (X,Y,Z)
    - Current position of suction tool in simulator coordinates and haptic device coordinates (X,Y,Z)
    - Current orientation of drill tool in simulator coordinates and haptic device coordinates (X,Y,Z, Angle)
    - Current orientation of suction tool in simulator coordinates and haptic device coordinates (X,Y,Z, Angle)
- Burr metrics
    - Whether a burr is currently loaded (Yes/No)
    - Whether the burr is currently spinning (Yes/No)
    - Burr ID (1 to 9)
    - Radius of the current burr
    - Sharpness of the current burr
    - Whether the current burr is fluked (Yes/No)
- Anatomical structure metrics (for sigmoid sinus, dura and facial nerve)
    - Whether the drill tool is touching the structure (Yes/No)
    - Whether the suction tool is touching the structure (Yes/No)
    - Force applied by the drill tool to the structure surface (X,Y,Z)
    - Force applied by the suction tool to the structure surface (X,Y,Z)
    - Distance of the drill tip from the closest point of the structure surface
    - Distance of the suction tip from the closest point of the structure surface
- Bone specimen metrics
    - Specimen translation (X,Y,Z)
    - Specimen rotation (X,Y,Z, Angle)
    - Virtual microscope magnification level
    - Whether specimen transparency is on or off
    - Number of voxels eroded up to the current time stamp

Results and Discussion

In this section, we describe the process used to derive the data and algorithms that were used as the basis for the prototype development of a real-time feedback system. From the 48 raw metrics (Table 1), we calculated 65 high level statistical metrics such as mean stroke force magnitude, maximum speed, average hand distance, etc. We applied the *Apriori* algorithm to find association rules between these high level metrics and surgical expertise (novice, expert) in each stage (Agrawal, Mannila, Srikant, Toivonen & Verkamo, 1996). From the vast number of association rules that emerged, we selected the most useful based on a number of criteria. First, the rules needed to show high 'support' and 'confidence', which are standard statistical mechanisms for evaluating the quality of an association rule (Agrawal et al. 1996, Jiawei & Kamber, 2001). Second, we restricted the rules to those that contained metrics that could be computed in real time. Some metrics (e.g. percentage of strokes near the sigmoid sinus) would be difficult if not impossible to compute and use as the basis for feedback in real time, while others did not have this difficulty.

After applying these two filters, we decided to select a single rule to determine whether it was possible to develop a prototype real-time feedback system based on just one rule; with the view that if we could do it for one rule we would be able to do it for many. The association rule selected was: **If mean stroke force is less than 0.23 Newtons, then a novice has performed the surgery.** This rule showed 0.78 confidence and 0.45 support which means that 45% of the virtual surgeries were completed with an average force magnitude of less than 0.23 Newtons and when this was the case 78% of these were performed by novices. This rule was thought to be suitable for further exploration given that 50% of surgeries were performed by novices and we were confident in predicting a surgeon's novice status 78% of the time. The high confidence and support of this rule indicate that using force to predict expertise is promising. Hence, the force magnitude was deemed appropriate input data with which to build a Hidden Markov classification model.

A typical Hidden Markov Model (HMM) has two parts: hidden states and observation metrics, whose values are affected by a given hidden state. In the context of surgical simulation, the surgical "technique" or "gesture" participants showed while they were using the surgical drill reflect hidden states that cannot be directly measured using the simulator (Rabiner & Juang, 1986). However, these surgical techniques are directly related to the force applied by the participant, which can be directly measured using the simulator. After discussion with expert surgeons and reviewing the videos of participants' simulated surgeries, three typical drill techniques were identified as being used by participants during the cortical mastoidectomy simulation: stabbing motion (generally to be avoided), sweeping motion (generally favoured) and stabbing-sweeping combination. These three drilling techniques were defined as three hidden states of a HMM. Since the 'observed' data required for input into a HMM needs to be nominal, the force magnitude values were "discretized" into low and high using the threshold of 0.23 Newtons. When the HMM was applied it performed significantly better than the application of the simple association rule described above. Across the first three stages of the procedure the HMM was 12.9%, 8.1% and 17.6% more accurate in its discrimination than the application of the simple association rule alone.

Using the HMM topology shown in Figure 3, an expert HMM (E-HMM) and a novice HMM (N-HMM) were built from force data sequences, using the Baum-Welch (Baum, Petrie, Soules & Weiss, 1970) algorithm. Once these two models were established they could be used as comparisons with the technique of an individual undertaking a new surgical procedure in the simulator. Put simply, if the technique of the individual carrying out a new surgical procedure is similar to the E-HMM there is no need to provide feedback; however, if the technique is closely aligned with the N-HMM, then feedback should be provided.

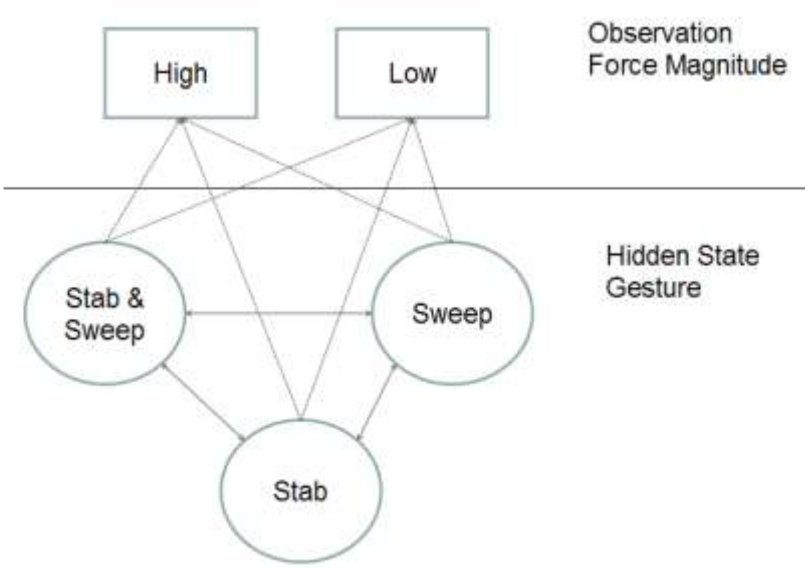

Figure 3: The Hidden Markov Model topology

However, this was not simple. In order to provide real-time feedback, the degree of expertise shown by an individual undertaking a new surgical technique needed to be established in a circumscribed "time window". There is no point in waiting until the end of the procedure to determine whether an individual is showing novice drilling behaviour – any feedback would be summative at that stage. Equally, enough data needed to be collected in a discreet time window to ensure that the predictions about the expertise of the individual operating were reliable. Thus, in response to the critical question of determining the parameter window size we needed to evaluate the trade-off between the window size and the feedback reliability. While we could have opted for a fixed duration for the parameter window size, this has several disadvantages (e.g. it would likely break continuous surgical strokes into arbitrary units and, as each surgeon performs at a different speed, it would be preferable to determine individualised window sizes). Therefore, we used points during the surgery when the surgeon paused – ever so briefly – in the operation to dynamically define the parameter window size. These pauses could be easily identified by automatically determining when the force magnitude of the drill approached zero or the drill head was not spinning (i.e. it was not in use).

Once we had resolved how to determine the size of the parameter window, we were able to dynamically apply the HMMs (E-HMM and N-HMM) to the continuous stream of data emerging from the simulator. By putting HMM and 'surgical pauses' together, we could continuously record the force applied during a surgical procedure and, when a surgical pause happened, we were able to dynamically calculate the similarity of the force data stream with two trained HMMs. If the force data stream was more like the E-HMM, no feedback was provided. If the force data stream across the parameter window accorded with the N-HMM, real-time feedback was provided to the participant. In our prototype system this feedback is textual and screen based, letting the participant know they can adjust the force they are using and that they are being "too tentative" in their approach (see Figure 4). We have begun working on alternative visualisations and audio presentations of feedback.

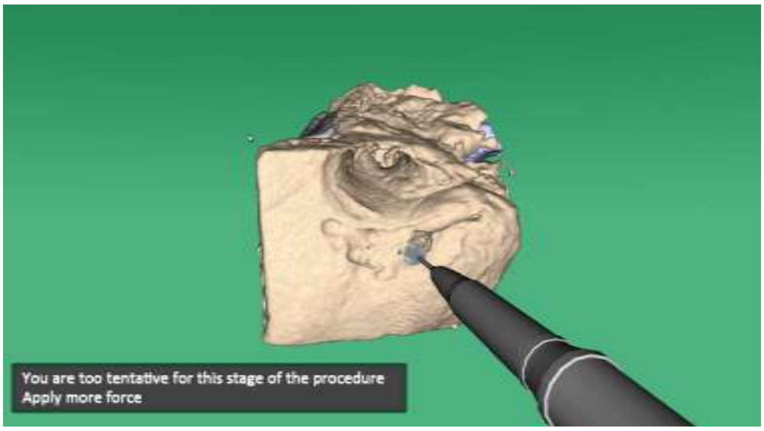

Figure 4: The simulation environment with a display of automated real-time feedback relating to overly tentative surgical technique

Conclusion

In this paper we have described the way in which we were able to develop a prototype system for presenting real time feedback to users in a virtual learning environment based on data mining techniques. While the implementation of the prototype was, on one level, a success – it worked – the research and development work we have been undertaking and presented here has raised many issues. Reimann and Markauskaite (2010) indicate that there are numerous technical, legal and methodological considerations to be dealt with when using educational technology data that are "flowing in streams" (p. 259) and we have encountered some of these in this project.

The three principal challenges we encountered in the development of the prototype were:

- Meaningfulness. As has been noted by others, it is relatively simple to automatically collect data from digital learning environments, but it is more difficult to meaningfully interpret this data and present it to the end user. By using association rules and data mining techniques we were able to build sophisticated expert and novice models of surgical technique. However, being statistically generated, these rules and models were agnostic when it came to meaning, and we constantly needed to draw on the advice of expert surgeons to interpret the models. While the 'bottom-up' statistics could be used to discriminate novice and expert surgical technique, the rule or model was only useful if it could be (i) meaningfully interpreted, 'top down' by an expert surgeon and (ii) be meaningfully displayed as feedback to the end user.
- Temporality. As mentioned above, a critical component of the development of the system was to determine the appropriate window size for recording and analyzing users' data in real time. There was a need, for a specific rule and model, to have a time-window size that allowed enough information to be collected to make a robust diagnostic decision, but at the same time not have a time-window that was so long that it delaying feedback to the user, to the extent that it became summative.
- Openness. There were challenges associated with working within an open educational technology system where users could essentially do whatever they wished as opposed to more constrained procedural educational technology systems that are defined by a sequential, step-wise approach to complex domains. The openness of the system meant that there was considerable noise in the data that may not have been apparent with a more closed system.

In addition to these challenges, the development and implementation of this prototype system raises many questions that will be the subject of future research. A key focus of our future research will be on how multiple surgical technique variables, rules and models can be used – analysed and interpreted – as the basis for meaningful real-time feedback to end users. This will require us to consider the issue of how to most adequately display complex user-performance information to individuals as they are engaged in simulation-based education and training. This is of course, not a new issue, and research in the area of human factors and human-computer interaction will provide some direction in this area.

These represent significant challenges in our future research. However, these challenges are worth striving to overcome, as there would be clear advantages to be gained from determining how the mining of streams of data from complex, virtual learning environments could be used to provide meaningful, real-time feedback to users. In the current context of surgical education and training, an expert surgeon is typically required to provide feedback as tasks are undertaken by novice trainees. The provision of meaningful real-time feedback in simulated training could offer significant savings in terms of expert surgeon time and scarce cadavers. This would allow the immersive simulator described in this project to be employed as a self-directed learning tool in basic training, prior to students receiving more tailored instruction with an expert surgeon on cadavers or in the operating room.

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Distributed Learning Spaces in Higher Education Learning and Teaching

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Intended audience and degree of expertise/past experience required

The workshop will be of interest to all delegates attending ascilite. In particular academic developers, instructional designers, educational designers and staff involved in blended and flexible learning will have an interest in the workshop.

Statement of objectives for the workshop

To provide an overview of distributed learning spaces (physical (formal and informal); blended, virtual (formal and informal); mobile, personal, outdoor, academic and professional practice spaces) and discuss the 'action possibilities' or affordances of these distributed learning spaces. Taking account of these affordances will inform the design of learning and teaching in higher education and inform the choice of technology to assist learners and academics in life-long and life-wide learning.

Detailed description

Justification of the importance/currency/need for the proposed workshop

Distributed learning spaces and their learning affordances are at the core of earning in the 21st century. Too often the importance of distributed learning spaces has been dismissed as being unimportant compared to the formal physical learning spaces of the university institution. 21st Century learning is now typified by personal learning environments where the place of learning is varied and diverse. This workshop will assist participants to consider the personal learning spaces of students whom they teach. In addition the action possibilities of distributed learning spaces needs to be considered in the explicit design of learning and teaching for higher education.

Format of the session

- Introduction (5 mins)
- Overview of distributed learning spaces (15 mins)
- Discussion in groups of three – 'action possibilities' of distributive learning spaces (15 mins)
- Report back and full group discussion about 'action possibilities' (15 mins)
- Where to next? Implications for our practice (10 mins)

Presentation format

Facilitated workshop combining presentation of concepts, group work and discussion, reporting back to entire group.

Ways in which the audience is encouraged to participate

Facilitated workshop as opposed to a presentation. This will include: small group discussion, questioning, determining ‘action possibilities’ for distributed learning spaces. The audience will be encouraged to discuss the relevance of distributed learning spaces and their implications for the learner studying in the 21st century. The group discussions and activities will focus on:

- Sharing knowledge, experiences and expertise about distributed learning spaces.
- How a knowledge of the affordances of distributed learning spaces might be used within participants own institutions or discipline areas and how they might be employed and modified for use in other contexts.
- A further action theme will be discussion and reflection on distributed learning spaces and how these might inform and enhance practice in participants own institutions and discipline areas.

Outcome measures

- This workshop will develop a number of ‘action possibilities’/affordances for a range of distributed learning spaces.
- Participants will develop a knowledge of these ‘action possibilities’ and their implications for the design of learning and teaching for open learning environments.
- It is hoped that participants will more fully consider the personal learning environment of the virtual student after considering the affordances of distributed learning spaces.
- Development of strategies and initiatives for distributed learning spaces within and/or across specific

Exploring the challenges of network leadership in Australasian tertiary associations

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Gordon Suddaby
Associate Professor, Massey University

Gordon has a MEd (Hons) from Massey University as well as a BSc and a Postgraduate Diploma in Science from Otago University. He has a particular interest in the implementation of institutional staff development policies and programmes and the development of a "professional development culture" within an institution. He also has considerable experience in the development and support of tertiary teaching and learning and the development and implementation of E-Learning.

Helen Carter
Associate Professor
Macquarie University (ACODE representative)

Dr Gary Williams
University of Tasmania (ascilite representative)

Professor Denise Chalmers
University of Western Australia (CADAD representative)

Dr Trish Andrews
University of Queensland (ODLAA representative)

Professor Shelda Debowski
University of Western Australia (HERDSA representative)

Marguerite de Sousa and/or Lindy Baker
Office for Learning and Teaching
Department of Education, Employment and Workplace Relations

James Sankar
AARNet

James Sankar is responsible for AARNet's (Australia's Academic and Research Network) Applications and Services division. He has extensive experience of managing a range of online service from middleware, voice and video over IP to mobile/wireless services. His passion is in mixing talent with new technology to deliver solutions and new services that benefit from access to high-speed research and education networks.
James is an active member of the Open Visual Communications Consortium; a global industry led effort aimed making video conferencing work the same way the telephone works today. He has led the creation of AARNet's National Video Conferencing Service, AARNet's Unified Communications and Telepresence Exchange services.

Outline of focus area and summary of ideas to be explored

Social networks and communities of practice in Tertiary Education Associations (e.g. ACODE, ascilite, CADAD, HERDSA, ODLAA) provide value for members through the social learning experiences they provide in terms of "sharing information, tips and documents, learning from each other's experience, helping each other with challenges, creating knowledge together, keeping up with the field, stimulating change, and offering new types of professional development opportunities" (Wenger, Trayner & Maarten de Laat, 2011, p. 7).

Networks and communities blend "individual and collective learning in the development of a shared practice" and are social spaces for learning (Wenger et.al, 2011, p. 10). Networks involve a "set of relationships, personal interactions, and connections among participants who have personal reasons to connect. It is viewed as a set of nodes and links with affordances for learning, such as information flows, helpful linkages, joint problem solving, and knowledge creation" whereas a community "refers to the development of a shared identity around a topic or set of challenges" (Wenger et.al. 2011, p. 9). Owen-Smith (2008) suggested that networks emphasise resource and information channels, status recognition and social influence for members.

Building upon this focus on networks, this symposium specifically examines network leadership. The NNI understands the term network leadership to include the development and maintenance of sustainable social networks and communities of practice; effective communication strategies and technologies; and leadership decisions which provide utility for the organisation, members and Australasian tertiary sector.

The symposium will discuss how the NNI seeks to address the following key foci:

1. Improving network leadership by gathering data on existing practices and perceptions related to member engagement and technologies and strategies that support best practice in network leadership.
2. Using findings and member expertise to better support leaders of established tertiary education associations to encourage collaboration and increase member engagement.
3. Fostering, encouraging and supporting network-based collaborative initiatives into the future.

The research is being conducted in two phases, beginning with a survey of the members of project partners and focus groups with the executives of project partner organisations. Stage 2 involves partner organisations conducting their own small research projects in related areas. This data will then be collected and analysed to assist in the development of a 'tool kit' to network leadership.

Range of views that panel members will represent

The panel members hold a range of views and perspectives due to the variety of organisations that they represent. ACODE, CADAD, ODLAA, HERDSA, OLT and ascilite represent key professional and scholarly bodies, whilst AARNet and NetSpot offer the perspectives of both not-for-profit and commercial technology providers. Additionally, representatives originate from a range of Australasian Universities, ensuring a broad diverse range of views and perspectives are held.

Describe the intended audience

The intended audience has an interest in the Australasian tertiary sector, specifically in the areas of good practice in educational technology and tertiary networks.

Outline of the symposium format, including strategies that will be used to engage the audience

Introduction and overview

Symposium will begin with an introduction to the NNI project by Professor Mike Keppell and Associate Professor Gordon Suddaby who are project co-leaders. This will include an overview of the phase 1 research into network leadership and the initial findings. This introduction will be supported through a demonstration of the project blog and multimedia snippets describing the thoughts of project members.

Partner research summaries by member representatives

Following on from the phase 1 research and its findings, each partner organisation will conduct their own small research project in an area of particular interest to their organisation and circumstances. Whilst these projects will be in their infancy at this stage, each partner representative will summarise the key objectives, foci and methodology of their projects in a 5 minute presentation.

Synthesis

Professor Keppell and Associate Professor Suddaby will provide a synthesis of these projects, how they relate to the objectives of the NNI and phase 1 research findings before examining how the project's findings will contribute to the sector.

Questions

The presenters will take questions from the audience.

Finding a Voice: Learning pronunciation in a second language using a dedicated speech technology

Thomas Kerr
The Learning and Teaching Centre
Macquarie University

This paper reports on a recent experiment that used Wimba Voice Board (WVB), an online asynchronous recording and playback utility, for teaching basic pronunciation rules to a group of novice learners of Spanish. The experimental design used a pre/post-test format with an intervention where participants in the experimental group were given access to a built-for-purpose Blackboard online unit and encouraged to engage with the learning materials in self-directed study (Victori and Lockhart, 1995; Lee, 1997). Participants were also able to voluntarily upload their own attempts at pronunciation to a WVB module accessed by all group members, listen to attempts uploaded by peers, and provide optional feedback. Control group members were taught the same content in a traditional teacher-led classroom setting. Two focus groups were conducted with members of the experimental group. Analysis of the collected data showed that WVB was able to produce results that were equivalent to those achieved by members of the control group.

Keywords: second language learning, speech technologies, Wimba Voice Board

Introduction

Text-based asynchronous discussion boards have been used in second language (L2) learning settings as long as the World Wide Web has existed, at least since the early 1990s (Warschauer, 1996). In teaching approaches that emphasise communicative competence (Hymes, 1967; Canale, 1983; Swain, 1985; Littlemore and Low, 2006), the issue of correct pronunciation becomes critical if the goal of effective communication is to be achieved. Speech technologies such as Wimba Voice Board (WVB), an online asynchronous recording and playback utility (Wimba.com, 2010), offer educators the ability to provide opportunities for groups of learners to exchange recorded attempts at pronunciation, thus promoting peer and self-directed learning.

A recent study at a a metropolitan Australian university attempted to teach a group of novice Spanish learners the basic pronunciation rules that govern correct speech production using a speech technology (WVB), and without explicit instruction by a teacher. Ethics approval was obtained for the study as it involved quantitative analysis of the participant's test scores and qualitative analysis of their opinions about the software used. Participants in an experimental group were given access to a built-for-purpose Blackboard unit containing text-based instructions on the basic rules of Spanish pronunciation. They were also able to access model recordings of all the words and phrases used. Two WVBs were included, allowing personal and group asynchronous practice. An equivalent control group was taught the same rule set by a native Spanish-speaking tutor in a traditional classroom setting.

The research question had two components; first, it asked if a speech technology such as WVB could be used to improve pronunciation in a second language, and second, it asked if the learning was effective when compared to traditional ways of learning the same material. The choice of the learning task was kept deliberately simple, as it was the efficacy of the speech technology itself in a specific learning task that was under investigation, rather than the technology's effectiveness as a language-learning tool. Scanlon and Issroff (2005) argue that basing the evaluation of a learning technology solely on maximised learning outcomes is too limiting in attempting to understand how the technology influences learning, given the complex issues (Oliver and Harvey, 2002) involved (p. 431). They advocate the use of an approach based on an extended version of Activity Theory that accounts, in part, for this complexity. Bearing this in mind, the researcher chose to extend the reach of the study by incorporating a qualitative analysis of the software use based on focus groups conducted with some of the participants exposed to the speech technology.

A primary aim of the research was that the results obtained and their subsequent analysis would inform both the future design of online language courses and those educators seeking to incorporate speech technologies in their teaching. This potentially contributes to the conference theme of 'learning for the future' and would enable L2 courses be delivered in an alternative mode in subsequent offerings.

Experimental study design and deployment

The study design used a mixed methods approach (Johnson and Turner, 2003), where both quantitative and qualitative data were collected and analysed. Quantitative data consisted of results obtained from pre and post-tests administered to two groups. Qualitative data was derived from analysis of two focus groups conducted at the conclusion of the study's experimental phase.

The experimental approach used was based on a comparative pre-test post-test control group design as described by Shadish, Cook and Campbell (2002). Participants were randomly assigned to either an experimental or control group and further randomized for gender. The final makeup of the groups was nine participants in each, with genders approximately equally distributed between groups. Participants were recruited from staff at the author's institution. In order to establish a common baseline for previous language-learning experience, all participants were asked if they had any previous experience in learning Spanish. Only respondents with no previous experience were subsequently chosen as participants in the study.

The pre-test was administered to individual members of both groups in an isolated test space chosen for the purpose. All participants were given a list of 20 words to pronounce in Spanish, each with an accompanying contextual phrase containing the word. The list consisted of previously unseen words and associated contextual phrases in Spanish known to be challenging for new learners of the language ((Diaz-Campos, 2004). Words such as *nicaragüense* (Nicaraguan) and *rehenes* (hostages) are not normally encountered in introductory Spanish courses, but were included to provide a high level of pronunciation contrast in order to test the efficacy of the two teaching methods used. Participants were asked to work through the list making their best guess as to how to pronounce each word and phrase. All attempts were recorded using the Wimba Voice Board technology and coded for subsequent rating by raters who were native speakers of Spanish. In the intervention phase of the study all participants were then either taught in a teacher-led face-to-face traditional classroom or given access to an online unit for self-directed study.

The control group received instruction in the basic rules of Spanish pronunciation in a traditional classroom setting. Two sessions were run, each lasting approximately 45 minutes and attended by groups of 4 and 5 participants. The instructor used a series of slides titled "Basic Spanish Pronunciation" (Fig.1) that included basic rules of pronunciation with example words and sentences, and a list of the same 20 words and contextual phrases used in the pre-test.

Figure 1: Example slide from the Basic Spanish Pronunciation slideshow used with the Control group

The teaching approach used was listen-and-repeat where the instructor provided a model sound and the participants attempted to repeat it. The instructor also provided some additional phrases not included in the slide materials in order to provide additional contextual examples of use. Participants were asked to make both group and individual responses when pronouncing words and phrases from the list. At the conclusion of the session, the participants were offered a printout of the instructional slides and told that they could refer to them if they wished. There was no instruction to either collaborate with their peers or to avoid comparing their learning experience. That is, participants were free to practice their pronunciation as they wished, with or without the support of their co-participants.

The experimental group did not receive any direct instruction apart from basic instruction on how to record, upload and play back personal and peer attempts at pronunciation. All of their learning was conducted online within a dedicated Moodle unit. They were able to access the same set of slides used with the control group, with the difference that all model sounds for the words and phrases were pre-recorded by the instructor and made available through embedded playback consoles on each page. The actual content of the Basic Spanish Pronunciation module was the same for both the control and experimental groups. In addition to the pronunciation module, the experimental group was able to access two dialogue modules. The Private Practice Board gave users the opportunity to record, upload and play back their attempts at pronouncing the word list, knowing that access was restricted to the online moderator and themselves. The Pronunciation Discussion Board was designed to allow opportunities for peer-supported learning. Participants were encouraged to make a minimum of two uploads of to the board over a 48 hour period and to comment on at least one other learner's attempt.

All participants then completed a post-test consisting of recordings of the same list of 20 Spanish words and phrases, but in randomized order in order to avoid the possibility of threats to validity through memory or sequenced learning effects that might arise if the lists were exactly equivalent.

Within one week of the administration of the post-test, two focus groups were run with five volunteer members of the experimental group. Both sessions were recorded and transcribed for further analysis. The focus groups were conducted with two and three volunteer participants from the experimental group only, as the qualitative enquiry related to use of the WVB speech technology used by them for completing the pronunciation task. Prompt questions used by the focus group leader were designed to elicit responses relating to technology use from both cognitive and emotional points of view. Participants were asked pragmatic questions such as whether they thought the use of the WVB software had helped them in the learning task, ("Do you think the VB software helped your pronunciation of some Spanish words? If so, how do you think it helped?"), how useful they thought interacting with other learners was, and how this experience compared with interacting with a tutor. They were also asked to compare use of the software for learning with learning in a classroom or tutorial group.

Findings

The 18 participant recordings from the pre and post-tests were collected and de-identified with a series of code numbers. These were then rated by a native speaker of Spanish (Rater 1) using a rubric sheet with a five-point likert scale. Ratings included: "Needs practice" (1), "Below average" (2), "Average" (3),"Good" (4) and "Excellent" (5). To establish inter-rater reliability, 6 of the pre/post-test scores, randomly selected from both control and experimental groups were also rated by a second native speaker of Spanish (Rater 2) using the same rubric sheet, representing a 33% sample of the total population Statistical analysis of the two rater score sheets for the same six participants indicated that there was no significant difference between the two raters' scores. Rater 1's pre and post-test totals difference scores for all 18 participants were then compiled and ranked in ascending order then compiled in a chart for purposes of comparison (Fig. 2).

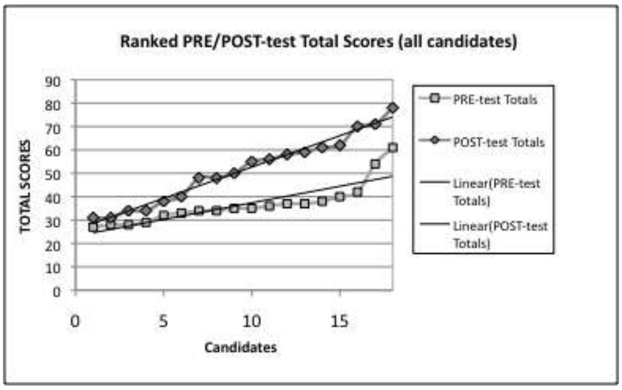

Figure 2: Ranked pre/post–test totals for all 18 candidates with trends indicated

Post-test total scores trend higher than the pre-test scores as would be expected, as all candidates had been exposed to the word list in the pre-test and then again in either the classroom session or in the WVB online unit. A Mean difference score was calculated for all 18 candidates resulting in a score of 14.67. On average, with the exception of a single outlier, all candidates improved their scores on any given word from the word list by an average score of 0.733 (Mean / word count).

The first part of the research question mentioned above suggests a hypothesis that an analysis of the data from the experimental group's pre and post-tests would show a significant improvement in performance indicated by the difference scores achieved; that is, a measurable, positive score difference in the post-test. The second part of the research question suggested a null-hypothesis; that is, that analysis would *not* show a significant difference in pre and post-test difference scores between the experimental and control group participants. Pallant (2005) suggests that non-parametric analysis methods are indicated in small sample populations such as the WVB study, with non-normal distributions. To determine the validity of adopting this approach, a preliminary test series for normality of distribution was first run using Kolmogrov-Smirnov and Shapiro-Wilk tests. Establishing a normal distribution of difference scores requires a significance ('p') value of < 0.05. Both the Kolmogorov-Smirnov and Shapiro-Wilk measures (.200 and .991) were significantly higher, indicating that non-parametric analysis would provide the most authentic results.

Two measures were adopted to determine the significance of the effect of the intervention (the experimental group's use of WVB to complete the learning task);

- a non-parametric test (Related-Samples Wilcoxon Signed-Rank test) was applied to the experimental group's pre and post-test totals to determine the significance of the median of differences between them
- **a** Descriptives Table was produced including Mean, Standard Deviation and Variance measure**s.**

Results from both measures indicated that a significant, positive difference existed between the experimental group's test totals when pre-and post test were compared. That is, the post-test scores were significantly higher, supporting the hypothesis derived from the first part of the research question. In order to test the null-hypothesis derived from the second part of the research question, difference scores from the control and experimental groups were compared using an Exact significance measure for both 1-tailed and 2-tailed outcomes. A significant difference in the experimental and control groups' pre/post-test difference scores would be indicated by a significance level of < 0.05. Results obtained from the Asymptotic Significance 2-tailed score (.185) and the Exact Significance scores (0.190 and 0.197) for both 1 and 2-tailed outcomes all fell substantially above 0.05, indicating no significant difference detected when comparing the two groups' difference scores and supporting the null-hypothesis.

Analysis of the two focus groups showed that a significant level of anxiety was experienced by at least some members of the experimental group when making recordings for uploading to the Blackboard unit. Despite this, all participants reported that they thought that use of the WVB software had assisted them in a positive sense while attempting to learn correct pronunciation in the L2.

Conclusions

Results from the analysis of the pre and post-tests results for the two groups participating in this study indicate that 17 of the 18 participants showed a measurable improvement their ability to pronounce Spanish words correctly. This suggests that, excluding the control group results, use of WVB as the sole means of learning correct pronunciation in Spanish can produce measurable gains in novice learners. Results from the comparison of the experimental group's difference scores with those of the control group indicated no significant difference in the learning gains achieved. The conclusion suggested is that use of speech technologies such as WVB can produce equivalent results to those achieved through traditional forms of teacher-led classroom instruction in an L2. An interesting result of the focus group discussions was that at least two participants thought that, with appropriately designed content, prospective language students could use speech technologies such as WVB to preview a language course by attempting a simple learning task such as the basic rules of pronunciation before committing to an intensive study of the language itself. This suggests that speech technologies have a definite role to play in future language education and that the results of this study could inform the future design of online language courses in sometimes unexpected ways.

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An innovative approach to facilitate critical thinking and reflective learning in prescribing and therapeutics e-learning

Santosh Khanal
NPS: Better choices, Better health

Y. Zuo

A fully online and standardised national curriculum for prescribing education, National Prescribing Curriculum (NPC), is offered to students of multiple health disciplines in Australia. The NPC consists of 28 self-paced one hour modules based on World Health Organisation's Guide to Good Prescribing. Health professional education requires didactic teaching to be blended with interactivity, problem solving, critical thinking and self-reflection. The NPC offers the students flexibility and interactivity and increases their prescribing knowledge to help them solve relevant problems. Going forward, there is a need to enhance the teaching capabilities of the module by facilitating critical thinking and reflective learning. In this paper, we discuss an innovative approach of embedding certainty based multiple choice questions in the NPC modules to facilitate critical thinking and reflective learning in a highly demanding learning environment and present the results of a study to evaluate the usefulness of this approach.

Keywords: Prescribing, therapeutics, national prescribing curriculum, problem based e-learning, health professional students

Introduction

Prescribing is an important part of medical practice but may not necessarily be a strong focus in the training of medical students or other health professionals. There is evidence that e-learning has some effectiveness in prescribing education (Maxwell & Mucklow, 2012). In 2001, the National Prescribing Curriculum (NPC), a nationally standardised curriculum in prescribing, was developed for senior medical students in Australian universities (Smith et al., 2006). The user base of the NPC has diversified to include other health professional student groups such as pharmacy and nurse practitioners and it is also used by an increasing number of hospitals for junior doctors and professional bodies as a continuing professional development resource.

The NPC was based on the World Health Organization's Guide to Good Prescribing (de Vries, Henning, Hogerzeil, & Fresle, 1994). It currently comprises 28 modules covering common therapeutic topics. NPC modules have been designed to offer flexibility to the learner and are self-paced and the modules can be attempted individually or completed as part of small group work. In recent years with the improvement in technology, the focus of the NPC has shifted towards interactive activities. As an example, students can now see de-identified peer answers followed by expert feedback to allow them self-evaluate their performance.

Although the online environment offers unprecedented opportunities for the NPC in terms of accessibility and upkeep, attaining and measuring learning outcomes can be a challenge. Problem based learning (PBL), the primary pedagogical approach in healthcare education, fundamentally requires real-life case scenarios, interactivity and guidance to help learners develop and improve critical thinking, knowledge transfer and problem solving skills (Wood, 2003). The NPC covers the basic elements of PBL with clinical case scenarios and peers' comments which are followed by guidance from experts. To ensure that the NPC continues to meet increased expectations for it to be a one-stop resource for prescribing and therapeutics education in Australia and thereby remain relevant in future as an e-learning resource, innovative approaches are required to incorporate reflective learning and critical thinking into the resource.

Aim

The aim of this paper is to describe the findings from our evaluation of the usefulness of certainty based MCQs as a critical thinking and reflective learning tool in the NPC for students from multiple disciplines of healthcare.

Methods

The study was conducted at universities of Melbourne, Sydney and Tasmania. Ethics approval was obtained from the human research ethics committees of each participating university and written consent was obtained from all participants before their inclusion in the study.

A total of 83 medical, 40 pharmacy and 13 nurse practitioner students from three different universities completed a set of MCQs before and after completing an online module from the NPC using an iframed survey ("http://www.surveygizmo.com///,"). For each MCQ, students were asked to indicate how certain they were of their answer on a three-point certainty scale of low, medium and high (Figure 1). The certainty-based questions (Gardner-Medwin & Curtin, 2007) were used to assess the confidence level of students and to control for any overestimation of knowledge due to correct guesses. The MCQs were scored using a validated certainty-based marking scheme resulting in a composite score. Students were also asked to rate their perception of the usefulness of the MCQs and the certainty based questions as a learning resource. At the end of the post module MCQs, students were asked to provide their email address if they wanted personal feedback emailed to them.

Figure 1: An example showing how the MCQ and the certainty-based question were presented to the students on their computer screen. Students could not proceed to the next question unless they answered the MCQ and indicated the level of certainty for their answer.

For each question the students got correct, they received 3 marks if they were highly certain, 2 marks if the certainty level was medium and 1 mark for low level of certainty. Similarly, if the students got the answer wrong, they lost 6 marks if the students were highly certain that their answer was correct, 2 marks for medium level of certainty and did not lose any marks if they were uncertain of their answer. Students' responses were also grouped into six ordinal categories based on whether the answers were correct or incorrect at the three levels of certainty. The pre and post responses for a student were adjusted using generalised estimating equations. The Kruskal-Wallis test was used to analyse data on students' perceptions of the usefulness of NPC.

Results

In the survey, a significantly higher proportion of pharmacy students perceived the pre-module MCQs to be easy compared to the other students; however, they found the MCQs equally useful as a learning resource as the other groups. Furthermore, the marks obtained by individual pharmacy students were similar to the marks obtained by medical or nurse practitioner students at the pre-module stage. For the pre-module MCQs, there was no significant difference in the marks obtained by students who perceived them to be easy compared with those who did not ($p=0.7$). Almost all students found the post-module MCQs (97.1%, 132/136 students) and the feedback (94.9%, 129/136) to their answers to be useful learning resources. A substantial proportion (91.2%, 122/136) of students also suggested that completing the modules helped them answer the MCQs.

All student cohorts answered more MCQs correctly in the post-module phase compared to the pre-module phase. Significant differences were seen in the certainty levels of the answers for all student groups, with more of the MCQs answered correctly with higher certainty levels and lower levels of certainty in incorrect answers ($p<0.01$ for all groups; Table 1) However, across all groups, 39.4% (37/94) of the MCQs answered incorrectly with high levels of certainty at the pre-module phase did not improve at the post module phase. Only 8 medical students (5.9% of all students) asked for their personal feedbacks to be emailed to them.

Table 1: Student responses to the survey that the students had to complete after completing the post module MCQs

	Medical N (%)	Pharmacy N (%)	Nurse practitioner N (%)
Pre-module MCQs easy	10 (12.0)	16 (40.0)*	0 (0.0)
Pre-module MCQs useful	61 (73.5)	32 (80.0)	11 (84.6)
Completing NPC module helped answer MCQs	81 (97.6)	34 (85.0)*	12 (92.3)
Post-module MCQs useful	81 (97.6)	40 (100.0)	13 (100.0)

* represents statistically significant difference in comparison with the medical students

Discussion

In our study, certainty based MCQs coupled with certainty level helped gauge the level of overconfidence in the different student groups which would have not been possible otherwise. Pharmacy students saw a lesser need for certainty based MCQs and were more confident of their answers compared with medical and nurse practitioner at the pre module phase. However pharmacy students' performance on the pre module MCQs was not any better than the other two groups and the improvements in their knowledge was also similar. From a clinical perspective, it is not surprising that pharmacy students saw lesser relevance for the MCQs given that they would have received more pharmacology and pharmacotherapy training than the other students. Other studies have also found that pharmacy students tend to be overconfident in their self-assessment,(Austin & Gregory, 2007; Valdez, Thompson, Ulrich, Bi, & Paulsen, 2006) whereas medical students are said to be moderately able to self-assess (Danielle, 2011). If e-learning is to be expanded, identifying these types of issues is critical given that well-founded confidence of health practitioners enhances the delivery of health care but their overconfidence can potentially have undesirable consequences.

The embedded survey in the NPC modules allowed us to maintain anonymity of the data and de-link the MCQs from the module for the purpose of this study. However, it also meant that we were unable to provide instantaneous personalised feedback to students. As the survey tool was developed for research purposes, it did not offer the flexibility to combine responses and generate automated feedback. If personalised feedback is provided, overconfident students may have gained sufficient knowledge from the activity to improve their knowledge. Computerised personal feedback, which has been proven to have an impact (Zakay, 1992), would have been useful to incorporate but could not be done in our study due to programming limitations and ethics requirements. Students were offered email feedback within a week but very few took up the offer although previous studies have shown that learners are usually keen to receive feedback on their performance (Hattie & Timperley, 2007). Some students probably did not seek feedback because their performance in the study would not contribute to their university grades. However, if certainty based MCQs are implemented as a learning resource, it is essential to incorporate automated and instantaneous feedback for the MCQs to ensure that all students, including those who remain overconfident of their wrong answers even after completing the modules, learn optimally from the NPC.

In addition enhancing learning, certainty based MCQs can strike a balance between the ease of administering MCQs and the rigor of essay type questions in assessments. Incorporating certainty levels to the MCQs decreases the probability of a student correctly guessing the answer compared with the use of MCQs only from 25% to approximately 8%, thereby increasing the validity of the assessment process. Furthermore, the marking scheme disproportionately penalises wrong answers at higher certainty levels whereas students can guess without losing marks if they admit their uncertainty about the answer. The process of answering MCQs and indicating levels of certainty requires students to use higher level cognition compared with MCQs only as they have to think through the reasons for their answers in context. This adds a level of sophistication and accuracy to the assessment (Nicol, 2007) without losing the advantages MCQs offer in e-learning assessment (Govindasamy, 2001).

A characteristic limitation of certainty based MCQs is that a student who is reserved by nature can indicate a low level of certainty although they may be entirely sure of their answers. This may result in such students being inappropriately penalised with lower marks than they deserve for their knowledge. It is important to explain the grading system to students before using certainty based MCQs as an assessment tool to ensure that none of the learners are disadvantaged. It has been reported that students value this approach of marking if it is explained properly and they have ample time to practice before the assessment (Cook & Jenkins, 2010). Costs and the resource intensive process of developing algorithms for certainty based MCQs can also be a barrier to their usefulness in e-learning environments, particularly at universities where resources are limited. Resource implications can be further exacerbated if immediate personalised feedback is to be provided. Technical failures can also cause huge setbacks and detract learners if support is not readily available. With advances in technology however, it would be expected that computing issues can be resolved as they arise.

Conclusions

With the need for a streamlined prescribing education for multiple health professionals working in the same health system likely to grow in the future, incorporating certainty based questions in online modules increase their utility by encouraging self-reflection. The advantages of incorporating certainty based questions into online modules can also add value to other problem based e-learning courses on offer in university education for health professional students.

As an outcome of the study, pre- and post-module MCQs and the certainty based questions used in the study and another module on diabetes have been made available as an optional learning activity to all students enrolling in the NPC in 2012. Up until this paper was drafted in June 2012, approximately 75% of students who had signed up to the NPC modules had completed the MCQs. In addition to enhancing students' learning experiences, the MCQs will be used as an ongoing quality monitoring tool to ensure that the NPC is meeting the needs of its users. Data collected until the end of 2012 first semester will be analysed to further understand the utility of certainty based MCQs in a self-paced and primarily self-regulated learning environment for health professional students. The role of certainty based MCQs in facilitating critical thinking and reflective learning will also be reassessed on a larger and wider non-experimental sample to help devise more holistic e-learning strategies for health professional students.

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Mobility makes us agile and lean: A new paradigm for institutional projects

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The mLearn Project at Charles Sturt University (CSU) is an attempt to establish a new philosophy for large-scale institutional initiatives that borrows aspects from the technology companies based out of Silicon Valley. This paper will outline the concepts that have been adopted as well as the rationale for this change in tact. The project is running in 2012 and into 2013 over three teaching sessions and it is hoped will foster innovation through trials of technology, mobilising system access and developing mobile enhanced learning resources. Findings and reflections from the project will be published over the next 18 months.

Keywords: mobile, project management, mobile learning, mobile technology, university initiative

Introduction

How universities respond to technology is becoming a greater operational imperative, both financially and strategically. Traditionally universities have faced these challenges by developing large-scale projects that implement technology on an enterprise level. These projects are costly in time and resources and are often too big to react to a rapidly changing environment. Is this practice sustainable in an era where technology changes are rapid and evolving? How can universities act as future makers in a climate of rapid change?

Mobile is the latest technology to pose a significant challenge for higher education (New Media Consortium & EDUCAUSE Learning Initiative, 2012) and at CSU we have sort to meet this challenge through our mobile learning initiative, the mLearn Project. We have used it as an opportunity to invest in a smarter initiative that challenges the paradigm by focussing on achieving institutional goals through small-scale innovation and adapting processes and methodology commonplace in Silicon Valley. The mLearn project operates within a familiar project structure with a clear hierarchy of Sponsor, Steering Committee and Project Team and follows the normal reporting processes. The project philosophy however is shaped by the tech industry and this creates a number of key differences:

- The philosophy of the project aligns in many ways to the model outlined in the Lean Startup (Ries, 2011) and follows the core principle of **Build-Measure-Learn**. The project is Build oriented with a focus on outcomes and actions. It is planned that these outcomes will be used to Measure results, which in turn will allow the university to Learn.
- The project follows an **agile development process** (Beck, et al., 2001) with specific focus on user satisfaction, rapid delivery, tangible use, sustainable development, good design and simplicity. Regular adaptation to changing circumstances is also crucial to the success of the project.
- The project is **multi-threaded** with a number of concurrent areas of work. Rather than a number of small separate projects, these are all bought under the one banner that can make use of the cross over in knowledge and skills required.
- The focus is on encouraging **small-scale innovation** rather than large-scale outcomes. Innovation is seen as an incubator for ideas and a proving ground for new technology. By conducting real world pilots on a small scale it is hoped that they will be easier to support and that will provide lessons as to what works and what doesn't.
- Project involvement runs **across disciplines** and includes representations from most divisions and all the faculties. The aim is for innovation not to be siloed or restricted and allowed to compliment strategic goals throughout the university. Developers will work directly with users and stakeholders creating strong bonds between the needs of the users and the work being undertaken.
- A **new project requires new resources** and the project has setup a core development team with concentrated skills with 100 per cent allocation to the project. The group will work with a wide range of stakeholders in the traditional project team, which it hopes will reduce the drain on divisions. It also provides the capacity to recruit based on the skills required for the project and not those currently available.

Rationale

For many years Silicon Valley has shown that there is a viable alternative to traditional project management. For decades the technology sector has been dealing with the environmental factors that most universities now find themselves in - rapidly changing and financially challenging. These companies, in particular the start-ups like Facebook and Instagram, have employed different methods that encourage change and embrace uncertainty which allowed them to be able to adapt quickly and operate sustainably.

Small-scale innovation informs sustainable future development

This often falls under the banner of Research and Development (R&D) and it is vital to the development and introduction of new technology and developing new business. Google is one of the biggest companies and leading innovators in the world. They have adopted small-scale innovation as a successful incubator for future developments (Wojcicki, 2011). In an educational context it is much easier to support small-scale innovation, as it requires less resources and quicker turnaround times. Traditional projects tend to run over years but small-scale innovations can be run over sessions and they have the ability to change and adapt quickly, even midstream. Their size also allows for small changes in circumstances or unintended problems to be negotiated quickly and because of a narrow scope they can reduce inherent risks.

Support innovators rather than force change

Most technology companies invest their money with in-house research and encourage their staff to be creative and innovative. They incubate innovation from their staff because they know the business; they understand the clients and the available platforms. In universities we need to recognise teachers as future leaders for the same reasons - they know the students, they know the content and they know how to teach the course. What they lack are the support mechanisms. They need technical support to help make decisions and build a solution and they need access to technology. Encouraging teachers as innovators encourages a culture of change leadership and can assist in implementing an integrated and orchestrated top-down, bottom-up and inside-out strategy for change (Uys, 2007).

Implementation

The structure of the project follows traditions and conforms to the existing standard of governance established at the university. The Steering Committee provides leadership and strategic alignment through representation from key business areas. The Project Team contains stakeholders that provide business expertise. The project follows the existing reporting regime that tracks budget, milestones, risk, issues and overall progress.

A new addition to this structure is a small Development Team that consists of new staff who are allocated 100 per cent to the project. They provide the expert knowledge and skills required to carry out work on the project's objectives. Centralising staff allows these skills and knowledge to be shared across the different threads of the project. Technical and business knowledge is combined and provides a solid foundation for the project to work from.

To enhance the project it has also adopted some of the key Agile Development Techniques including:

- Individuals and interactions over processes and tools. The project is taking a user centred approach when delivering a solution. There is an acknowledgement of the importance of staff and students rather than the technology, and support and interaction is key.
- Working solutions over comprehensive documentation. The project definition document forms the central core of the project detailing aims, outcomes and delivery. Functional and business requirements are developed with the focus on getting it done not getting it right. Mistakes are part of the learning process and key to the **Build-Measure-Learn** philosophy.
- Responding to change over following a plan. The mobile space is a rapidly changing and evolving environment and there is a need to embrace these uncertainties and make them an asset to the project. In this manner we will work on delivering iterative solutions - *"You can launch something polished that is driven by assumptions, or you can test something rough that is powered by understanding."* (nickf, 2011).

Methodology

The mLearn Project will operate in the following areas:

- Conducting Device Trials
- Mobilising Key Learning & Teaching systems
- Enhancement of Learning Resources

Pilot Programs

Large-scale adoption of mobile technology is new and has no precedent so the aim of the project to gain knowledge, understanding and real world experience. This will be achieved by conducting real device trials with our students, our staff and our infrastructure. The pilot programs are small and will have a limited scope so multiple programs can be run at the same time. The small size makes it much easier to provide focussed support to staff and students and provides the ability to change and adapt to resolve issues on the fly with the aim of making it easier to manage risks. Shorter timelines dictate that less time is spent planning and more time doing, and with all the pilots there is a sense of exploring the possibilities rather than limiting them because of the risks involved. The project will be conducting pilots with a range of devices and will provide devices and support Bring Your Own Device (BYOD) initiatives.

Mobilising System Access

Mobile technology challenges all desktop-centric institutional systems. The mLearn Project is focusing on mobilising access to key student systems. It is not rewriting systems but ensuring that they are accessible and user friendly on a number of mobile platforms. With a focus on interface design and user experience the project aims to deliver improvements that are available to all students. The project will be working on an iterative model with direction from the Lean Startup project, undertaking a 'functions first, features second' approach. This includes the delivery of a minimum viable product (MVP) (Ries, 2011) to begin the process of learning as quickly as possible which will then be developed further through feedback and features added as required.

Develop Mobile Enhanced Learning Resources

Mobile technology opens up the possibility to change what learning resources are as well as challenge the traditional space they are used in. As a leader in distance education our university has experience in developing learning resources across a range of media. Mobile technology provides us with new opportunities and a viable alternative to print in terms of portability and accessibility. There is also the ability to create unique resources that leverage the capabilities of many mobile devices to play rich media and implement interactive elements. It also provides an opportunity to investigate digital publishing workflows and the concept of Create Once, Publish Everywhere (Jacobson, 2009). The project will develop a range of resources over its duration that explore these elements and provide real working examples.

Outcomes

From this work a number of outcomes are expected:

- The project aims to deliver specific actions to improve access to the learning management system, online evaluations, library services and deliver functional mobile enhanced learning resources. The device trials will hopefully provide an authentic experience of mobile learning practice in a variety of discipline areas with a range of different student cohorts including internal and distance education.
- The project will report on the impact and implications of mobile technology on students, academic staff, infrastructure, systems and support staff involved in the project. It is anticipated to report on some of the issues related to sustainability and access in the regions.
- The project will provide recommendations to senior management about the development and delivery of digital content for mobile devices, strategic direction for mobile technology related to learning and teaching and the general and large-scale deployment and support of mobile devices for learning and teaching.
- The project intends to develop resources and guidelines that can be disseminated to academics, students and the wider community in a number of areas including: good practice guidelines for the provision of learning and teaching using mobile devices in a range of different environments; the training and support materials for the devices and technology used in the project; as well as mobile pedagogies.

It is anticipated that these outcomes will provide clear benefits to the university in terms of improvements to student engagement and satisfaction, increased access to online learning systems, good practice in the use of mobile devices in learning and teaching practice, the development of rich mobile enhanced content and resources and sustainability in practices and production. The project will gather feedback through a number of surveys and focus groups and the experiences of the project team where successes and failures are expected. Analysis will be conducted to determine what worked well and what didn't to how this might be rectified in the future. This should feed through information for the development of clear strategic direction for mobile technology, device deployment models and digital resource development for learning and teaching.

Conclusion

Through the adoption of proven techniques from some of the most successful technology companies in the world, the mLearn project will explore an unconventional approach to the challenges and changes that new technology bring. Through the adoption of two key ideas, Build-Measure-Learn and the iterative approach from the agile development process, it is hoped that the project can respond to the many issues related to implementing technology in a milieu of continuous change. It is hoped that by taking this different approach we can demonstrate a platform for institutions to tackle some of the most important future challenges in a sustainable and timely manner - ensuring the role of Universities as a centre for future makers in a climate of rapid change.

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The peripatetic learner - the role of mobility in the formation collaborative learning spaces

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The earliest notion of a university came from people walking through the streets of Athens thinking about how the world works and trying to understand it. Apple Distinguished Educator Dr. William Rankin from Abilene Christian University (2012) reframes this notion of the peripatetic learner, originating from Aristotelian philosophy, to describe how mobile technologies have brought about a new way of thinking about education. The ability to be mobile has implications in reshaping future learning: to rethink the spatiotemporal structures of formal tertiary education means to understand both the affordances and challenges. The disruption of traditional pedagogies enables new forms of collaborative interactions to occur. This paper considers how to define a learning space that is no longer constrained by the physical classroom. By taking a technological perspective and a mixed methodology, it aims to evaluate practices of harnessing mobility and collaboration through existing or potential applications on the mobile platform.

Keywords: mobile learning, mobility, tertiary, education, collaboration, disruption, technology

Introduction of concepts and literature

This paper introduces the critical concepts underlying the researcher's investigation of the potential applications of mobile devices and the impact of mobility on learning and teaching practice. Increasingly rapid developments in the field of mobile technologies have led to a growing interest in how such devices are being integrating into the field of education. Despite the fact that mobile devices are not designed specifically for use in learning and teaching, they have been embraced at all levels, from early childhood through to tertiary and higher academic study. Within the field of educational technology, the research addresses the implications of appropriating the mobile device in tertiary education, specifically, how to manage the inherent disruptions of establish practice. The objective of this research is to examine the role of the mobility in the formation of collaborative learning spaces, with the aim of evaluating best practices to overcome future challenges.

The area of 'mobile learning' has gained a lot of momentum in recent years and existing research provides current field of knowledge. This paper will use the definition suggested by Manuguerra and Petocz (2011) that refers to the next development of e-learning that has utilised the advantages of mobile phones and tablet computers as means of accessing content. When discussing the learning 'space', it is important to define it as separate from a 'place', which is a physical setting in which activities and experiences of living occur (Relph, 2007). This paper argues that the learning 'space' is no longer confined to any given 'place'.

Not long after its release in 2010, early adopters of the Apple iPad were already hailing the device as the 'game-changer' in education (Brown-Martin, 2010). Mobile technologies are quickly becoming seamlessly integrated in everyday life, and one of the biggest impacts it has had is in facilitating communication and connectivity. As this connectivity is brought into the classroom, it opens up possibilities for more collaborative pedagogies. The key topic of interest is this idea of the collaborative learning space. When referring to the affordances, this paper will use the definition provided by Dr. William Rankin (2012), where the mobile device brings together rich media, connectivity, and full access to the internet. When addressing issues of pedagogy, this paper will use the wide definition as the process through which one can acquire forms of conduct, knowledge and practice (Williamson, 2012). The term 'peripatetic' is used in reference to the teaching methods of Aristotle, teaching as he walked around the Lyceum: learning happen while moving from place to place and engaged in discussion about the world (Squires, 1999). This paper reframes the notion of the peripatetic learner in light of the affordances of modern technology that enables this same style of learning across contexts.

A range of academic papers and relevant texts were selected for this review and will used to examine the role of mobility and its implications. Key concepts to understand are mobility and disruption and the role they play in changing our conceptions of what a learning space is. 'A Theory of Learning for the Mobile Age' (Sharples, Taylor, & Vavoula, 2007) provides an overview of the current technological context that exists and how this context is informing educational practice. 'No Significant Differences Revisited' (Reeves, 2005) addresses the inherent issues that arise when evaluating the effectiveness of 'new' technology enabled teaching. Laurillard

(2008) examines ‘The Pedagogical Challenges to Collaborative Technologies’ seeking to exploit the collaborative potential of technology to enhance learning experiences. The literature will inform the research design and methodology by providing insight as to how these concepts can be applied to the technology to harness the potential of what mobility enables, rather than the negative conception of what is disrupted. This paper proposes that mobility has changed the notion of a 'learning space': it is no longer defined by the physical classroom. The research questions propose that the mobile device enables collaborative learning because their original purpose was to facilitate global digital communication (Sharples, Taylor, & Vavoula, 2007). By looking at this notion that the learner is mobile, the research seeks to best utilise mobile technologies to create these learning spaces and utilise their collaborative potential for more engaging learning experiences. This appropriation of technology ultimately results in a disruption of institutional structures so it is important to consider the effects of disruption and explore its implications.

The questions posed by the research are intentionally broad: the unpredictable nature of technology brings about many new phenomena and it’s course is unforeseen, therefore it is important be open to unexpected results. Sir Ken Robinson (2012) highlights that it can’t be predicted how technology will play against culture and how people will use it. He uses the example of the iPad: Apple opened up the facility for third party applications which has resulted in a vast range of apps for many possible uses. Though it is important to be informed by educational theory, this research offers a technological perspective by utilising the mobile development platform, as it is this platform which has enabled the iPad to be appropriated into the academic context. This paper provides a review of a concise selection literature based on the key themes of the research concerns. The selected authors provide insight to the existing knowledge and provide discussion around the concepts which are central to the research questions. The findings from the literature will be used to highlight the implications for research design and methodology.

Existing knowledge and conceptions

In a society where technological change is becoming exponential, there is growing interest in understanding the relationship between mobile technology and learning. As proposed by Sharples, Taylor and Vavoula (2007), the effectiveness of a new theory of learning depends on understanding this relationship. A Theory of Learning for the Mobile Age (Sharples, Taylor, & Vavoula, 2007) acknowledges that each era of technology informs educational practice. The current technological era is defined by mobility. As portable computers become ubiquitous, so too does knowledge. Learning is no longer constrained within the fixed time and space of the traditional classroom. The proposed criteria for a theory of learning for the mobile age offers relevant discussion into the key themes of the research questions posed by this paper. The authors propose that as we enter the age of global digital communication, the mobility of people and knowledge needs to be the focus of inquiry. In relevance to the research question, they put forward the argument that we can longer be assume that ‘learning’ takes place in the classroom mediated by a teacher. The most significant concept that emerges is that the appropriation of technology leads to new ways of learning and constructing knowledge, . The technology enables us to be more connected and through our communications, we create “impromptu sites of learning” (Sharples, Taylor, & Vavoula, 2007) to share understanding.

Despite the growing interest in the use of ‘new’ technologies in education, it is not a new idea to evaluate their effectiveness by comparing it to the ‘old’ or previous methods of classroom instruction. In a review of these media comparisons studies, Reeves (2005) calls for design research as a way to move past the “no significant differences” phenomenon. The proposal addressed the need to better develop and implement online teaching and learning environments by focusing on the broad problems critical to education achieved through collaboration among researchers and practitioners. The text is key for informing the research design and methodological approach required to avoid falling victim to the ‘no significant differences’ phenomena. Reeves provides insight into the existing field of research and offers a more appropriate framework for conducting research in the field of technology enabled learning. The effectiveness of technology enabled learning is hard to measure as the results are highly qualitative. The most significant concept to emerge from the reading is that the need for pedagogical change to achieve significant educational differences from the technological innovations.

To better exploit the collaborative potential of technology, Laurillard (2008) argues that it needs to be used for more adding logistical value to existing teaching methods. The technology needs to create something new rather than emulating the existing role of the reacher. The article identifies that collaborative technologies weren’t designed for use in learning and teaching so suggests a technology design process to find a better way to utilise them in this context. A human centered approach addresses the needs of the learner and teacher and looks to educational theory to understand the learning process. In relation to the research questions, the article looks to how the given collaborative potential of technology can be better utilised through a redesign of the pedagogical framework. The collaboration becomes more than an exchange of ideas, rather, the construction of a shared understanding of a concept. The most significant concept to emerge from the article is that traditional methods need to be explored in relation to the next context. Theory of online collaboration can be examined in the context of formal learning theory as a way to build a pedagogical framework.

Impact of mobile learning: catalysts for change

The role of mobility

A key focus of the research question is how the ability to be mobile creates opportunities for new kinds of learning spaces by removing the physical constraints of time and space. These constraints are inherently imposed by institutional structures that dictate when and where learning takes place. Sharples, Taylor and Vavoula (2007) argue that learning occurs outside of the classroom as engaging with our surroundings enables the formation of "impromptu sites of learning." They propose that mobility enables us to understand how knowledge and skills are transferred across context. Laurillard (2008) uses the example of a school field trip to highlight how learning activities move from being teacher driven to becoming learner centred. The article proposes that mobile technologies offer a richer learning experience by facilitating collaboration between students in site specific practices, bridging the gap between the physical distances. From a technological perspective, Reeves (2005) argues that in evaluating the effectiveness of educational technologies, the variance of hardware features is a factor often overlooked. That is to say, it also needs to be considered that unlike the physical learning space, the mobile one is subject to limitations of the technology.

In relation to the research question, it is evident from the literature that the notion of a learning 'space' is more ambiguous. As mobile devices blur the boundary between virtual and physical spaces by augmenting the physical with the virtual, our sense of place is altered. Aided by the prevailing medium of communication, electronic media transfers information around the globe in seconds (Relph, 2007); we are able to conceive of a learning space that is defined in broader terms that enables us to interact with remote people and places. With more learning taking place off campus, it becomes difficult to define learning spaces solely in terms of a physical building. It is suggested by the literature that the role of mobility is to form a 'space' that facilitates interactions with people and places beyond our immediate physical proximity.

Social, cultural, technological and pedagogical disruption

The appropriation of the mobile devices into educational can be described as having a 'disruptive' effect. This disruption occurs when the new methods of technology enabled learning create tensions with existing pedagogies. The main issue is the need to restore balance when the physical elements of the classroom and curriculum are taken away. Introducing the notion of a more ambiguous learning space disrupts the conceptions of the traditional classroom and Laurillard (2008) identifies the need to explore traditional learning methods in relation to the new context. As proposed by Sharples, Tayor and Vavoula (2008), this context is a society defined by mobility. The technology only becomes valuable when utilised in light of this new context and the new conceptions of space. This disruption seems unavoidable as ubiquitous use of personal technology leads to new expectations of learning as, like the device, it needs to be personal, user centered, networked and mobile (Sharples, Taylor, & Vavoula, 2008). However, Reeves (2005) argues that there is not enough known about the demands of online learning or how to best execute educational objectives. To address this disruption of pedagogy, it is useful to highlight the interrelationship between technology and society. Bijker (1995) argues that there is a need to analyse technical change as a social process: the mobile device has been appropriated into the educational community, but through this appropriation, the future development of the technology is shaped by this integration.

Conceptions of collaboration

One of the main affordances brought into education with the introduction of the mobile device is the networked capability which inherently brings about a more collaborative approach to learning. Collaboration is a common theme underlying the reviewed literature and provides insight into how it manifests within technology enabled learning. In proposing a theory of learning for the mobile age, Sharples, Taylor and Vavoula (2008) base their criteria on an approach that is centered around the learner, community and knowledge. Collaboration needs to be more than just an exchange of ideas, rather the construction of a shared understanding of a concept (Laurillard, 2008). When exploring mobility as a contributing factor to collaboration, the literature addresses the need for a pedagogical framework to truly utilise mobile technologies for collaborative learning. The collaborative potential of the device is easily lost when the mobile device is simply integrated as a tool for traditional teacher driven instruction. Rather, the spatial environments in which the tools are employed need to be taken into consideration.

Conclusion

This literature review set out to determine the current field of knowledge in the regards to the appropriation of the mobile device in tertiary education. Within the context of the research and in light of the technological perspective, the focus is on the modern 'peripatetic' learner: one who is mobile and gains understanding across contexts and through interactions with people across these spaces. The research aims to examine the role of mobility and the implications of pedagogical disruption brought about by the mobile device. One of the more significant findings to emerge is that though the collaborative potential of the iPad is recognized, the current applications add only logistical value that comes inherently with online learning. Working towards learning for the future, the research aims to go beyond these current applications and harness the power of mobility.

The future challenges of technology enabled learning are in the need for pedagogical change. It is evident that this change doesn't happen overnight and the introduction of technology enabled learning is still very new in comparison to long standing institutional structures. The aim is to be able to support the modern learner beyond the constraints of traditional instruction based pedagogy. To achieve this, it is important to explore that best possible way to utilize the technology in a balance between technology enabled learning and institutional requirements. The literature provides insight to the conceptions and approaches on how to conduct further research.

In light of the work that has been done already, there seems to be an opportunity to develop an interface, system, or software product through practice based research. By taking a technological perspective, the research aims to evaluate methods of harnessing mobility and collaboration, either through existing or potential applications on the mobile platform. The design of the research will address how collaboration can be facilitated through the mobile device. The practice will look at utilizing the Apple iOS platform, this includes related supporting software and hardware, native and third party applications, to be explored in both traditional classroom environments (i.e. lecture halls, studios) and outside of it. Participants should be able to be both physically and remotely present. The highly qualitative nature of learning makes it difficult to define, measure and evaluate the best possible way to utilise the power of mobility. The learning 'space' is becoming more of a conceptual signifier rather than a physical embodiment. It is important to remain informed by educational theory, but as the literature has indicated, to adhere to it doesn't address the affordances of the technological age we live in.

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The creation of a 3D immersive, interactive space for experiential learning: VirtualPREX

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VirtualPREX, or, virtual professional experience, is the term used to describe a 3D virtual world classroom designed for pre-service teachers to practise their teaching skills and use the interactive resources to create immersive experiences to assist their learning. Outlined in this paper is how and why the space was created for the pre-service teachers. Also described and explained are the adjustments made to the space to enable a richer experience for pre-service teachers to role-play and practise their teaching prior to taking the skills to the real classroom.

Keywords: VirtualPREX, Second Life, virtual worlds, professional experience

Introduction

VirtualPREX, virtual professional experience, is a research project that explores this aspect of pre-service teachers' (PSTs) education using Second Life (SL) as their medium. The authors discuss the creation of the VirtualPREX classrooms, avatars and resources as a 3D interactive space for PSTs to practise their teaching through experiential learning. In 2010, the authors, part of a team of eight, received a two-year Office for Learning and Teaching (OLT) grant titled: *VirtualPREX: Innovative assessment using a 3D virtual world with pre-service teachers*. The project's aims are:

> to investigate the design and implementation of a 3D virtual environment to facilitate effective formative assessment of teaching practice, in order to assist pre-service teachers to acquire a better range of professional skills and better confidence in, and more realistic awareness of, their skills before being placed in real life classrooms (Gregory & James, 2011, p. 1).

The focus of this paper is on the construction of the VirtualPREX 3D classroom environment. We provide an overview of the underpinnings of the project, followed by a brief literature review on virtual worlds, Second Life and experiential learning. We then discuss the conceptualisation and design of the classrooms, including their construction and population. We conclude with future uses of the VirtualPREX classrooms. This paper can be used as a resource to enable other educators to use and create a space such as the VirtualPREX classrooms.

Background and overview

Simulations are increasingly being used in education for PSTs to prepare for real life teaching experiences (see Carrington, Kervin, & Ferry, 2011; Foley & McAllister, 2005; Girod & Girod, 2006) and these simulations have been extended to virtual worlds (Cheong, 2010; Mahon, Bryant, Brown, & Kim 2010; Fluck & Fox, 2011). However, these studies have not resulted in the development of a shared space "for use by pre-service teachers in their own time or with peers/educators to practise classroom teaching and management skills" (Gregory & James, 2011, p. 6). Development of such a shared space can be very time-consuming and expensive. The VirtualPREX project has created a sustainable simulation of 3D virtual classrooms that will be freely available from 2013 and beyond.

VirtualPREX is an innovative, forward-looking project that is designed to enable PSTs to "practise their classroom teaching skills through role-play, learning, teaching, evaluation, reflection and self/peer/educator-assessment" (Gregory & James, 2011, p. 1) in a setting which is low risk and can be used repeatedly, synchronously and asynchronously. Teachers can bring all their skills together including theory and practice into the one teaching and learning environment (Carrington et al., 2011). The quality and quantity of available access for PSTs to classroom professional experience has proven difficult (Barbousas & Nicholson, 2009). VirtualPREX aims is to address this problem by providing PSTs with an alternative space to hone their teaching skills prior to embarking on their professional experience.

Literature Review – Second Life and Experiential Learning

SL is one of over 200 virtual worlds available (Gregory et al., 2010). A virtual world is a 3D electronic presence that imitates real life through an avatar (a graphical representation of themselves in the virtual world). SL has had a wide uptake across the educational sector due to its range of features such as the ability to move and interact with others through communication tools that "affords a sense of self and presence which may result in immersion and support socialisation and collaborative learning" (Girvan & Savage, 2010, p. 347). There has been limited research in the areas of interactive simulations using virtual worlds as an educational resource (Graves, 2008). VirtualPREX has been using and researching virtual worlds for simulations through role-plays in an authentic learning environment. VirtualPREX uses a combination of graphics, text and audio communications enabling users to interact with other people and objects in the virtual world and to "experiment with simulated real-life scenarios without real-life consequences" (Gregory & James, 2011, p. 6).

In the VirtualPREX environment PSTs access knowledge through experiential learning. The founders of experiential learning were John Dewey, Kurt Lewin and Jean Piaget, but Kolb described the methodology as "immediate, concrete experiences" (cited in Miettinen, 2000, p. 54). Experiential learning is learning by experiencing or, more simply, learning by doing. It is a holistic method of learning. VirtualPREX has been using the experiential methodology to underpin PSTs learning experiences by giving them an immediate, concrete experience in undertaking their role-play activities.

Conceptualising and designing the VirtualPREX classrooms

In 2009 two members of the project team trialled virtual classroom role-plays in SL (Gregory & Masters, 2012). SL was chosen as the University of New England owned one-third of an island; Australis 4 Learning. When designing VirtualPREX, it was decided to build the classrooms 300 metres in the sky above the existing classroom as there was no space left on the ground level. A teleporter (location mover) was placed for easy access. Considerations in the design of the VirtualPREX classrooms were:

1. The classroom was to be an immersive environment for experiential and authentic learning. Therefore, it should be recognisable to users as a representation of a "normal" primary public school classroom where PSTs could practise or be exposed to real-life scenarios that they might encounter in a real-life classroom. The classroom had to display materials found in a real classroom; bright colours on walls e.g. posters and many resources such as interactive books, chalkboard, reading mats and not be too formal.
2. PSTs were provided with teacher and school children avatars to increase the immersiveness of the experience, and the authenticity of being in a classroom. Child avatars had to be created that appeared authentic i.e. they had to look, act and dress like real children, and animate like real children (see Figure 2). Teacher avatars had to be unique but created in a way so that it was obvious which classroom they belonged to. They had to be made to look casual but professional.
3. The classrooms had to be located in such a way that participants in nearby classrooms could not hear the teaching and/or conversations in another classroom.
4. The size of the desks and chairs had to be proportional in size to child avatars.
5. A variety of interactive tools would be required to use by teachers or students when undertaking role-play activities. These included interactive tools on desks, walls, floors, in the avatar's inventory or through a HUD (Heads Up Display – with clickable toggle switches to activate gestures by the avatars).
6. Each classroom created had to be unique so it was easy for PSTs to establish which one to go to. However, the classrooms also had to be similar so that each PST would have the same experiences.

Classroom Construction

Constructing the classrooms on Australis 4 Learning was comparatively low-cost. One-third of the island cost US$1,180. Several objects were purchased through SL Marketplace, including many free purchases. The classroom purchased for VirtualPREX (US$5.41) was one that could be modified and copied. Four coloured classrooms (red, yellow, blue and green) were created from this purchase. Included in the classroom purchase were furniture, classroom desks and chairs, chalkboard, school bell, clock that could be set to any time zone, customisable corkboard and a pencil giver (that is, when clicked the avatar was given a pencil which was placed in their inventory), modifiable classroom posters and a classroom plant that could be changed. Figure 1 shows the VirtualPREX classrooms. Each classroom was built to accommodate a teacher (the option of male or female was available) and 10 students (five male and five female). The area between the classrooms has potential for further development to incorporate outdoor activities. The classrooms were colour coded to enable ease of use. If someone were to say "meet me in the yellow classroom", one would know immediately which classroom was suggested. The layout of the classroom is as per a typical classroom found in many schools, with two students sitting together and a teacher desk out the front. The current structure is the layout of the classroom as it was purchased with slight modifications. Future classrooms will have the option of differing configurations for the desks and the PST will be able to choose which configuration would be most suitable for their lesson.

In 2011, Phase 1 of the project, a pilot study was conducted to test the efficacy of the VirtualPREX classrooms. Seventy-two on-campus PSTs participated in role-play scenario workshops where one PST presented a 7-minute teaching episode and their peers role-played primary students using teacher and student avatars. PSTs completed a survey answering questions on the role-play and the classroom environment in which it was located. They also participated in a reflection session on the workshop. Results from these two activities showed that PSTs thought that VirtualPREX was a promising environment to prepare them for their professional experience, however, results were mixed and a number of renovations and adjustments were made to the classrooms and the avatars due to their feedback (see Gregory et al., 2011, for further details of this study). Adjustments were made and the environment was retested with 82 on-campus PSTs in 2012, Phase 3 of the project. Phase 2 of the project was the creation of bots (non-player characters) to enable PSTs to asynchronously practise their teaching with pre-programmed child avatars (see Reiners, Gregory, & Knox, forthcoming).

Figure 1: The VirtualPREX classrooms – Phase 1 and Phase 3

The location of the classrooms was changed from Phase 1 to Phase 3 to allow access by large groups of PSTs at the same time and to allow Local Chat to be used instead of Group Chat. In Figure 1 (bottom left) the red classroom is between the green and blue classrooms. The red classroom was moved to the other side of the yellow classroom (bottom right) to provide more distance between all the classrooms. The green classroom was also recoloured so that it was not so dark when inside. From feedback, the classroom table and chairs were resized for better proportionality and increased visibility of the students. More interactive tools were bought for the classroom for Phase 3, including a chalkboard where anyone, teacher, student or visitor, could write on the board. This assisted in teacher roles where they could write the name of the lesson, or their name, on the board. Dice were added to the list of resources available which meant that teachers could have lessons or games based on mathematics. Reading and writing animations were also supplied to the child avatars so they appeared to be actively participating in the lesson. A reading mat was added so that teachers could use this as a reward or as a time-out area. Larger interactive dice were added to the classroom as a place where the students could play games such as “Peas Porridge” or “Facepalms”.

Teacher and student avatars

Forty child avatars were created, ten for each classroom. Each child avatar has a colour-coded school uniform corresponding to their classroom so that PSTs instantly know where their avatar belongs. Initially, in Phase 1 of the Project, the avatars were mostly smaller versions of adults wearing a coloured polo shirt and cargo pants. After the completion of role-plays with on- and off-campus PSTs in 2011, it was decided to update the student avatars’ appearance and uniforms for Phase 3. The original school uniforms came with the classroom. However, these were not copyable or transferable and each avatar had to purchase (for zero dollars) the uniform. The shirt was changed to the colour of the student’s classroom. Figure 2 shows a selection of the child avatars and the four different coloured school shirts. The cost to upgrade the child avatar’s look was around US$2.00 each.

Figure 2: Phase 3 - VirtualPREX child avatars – school uniforms colour coded for their classroom

Preliminary Feedback from the upgraded Phase 3 VirtualPREX role-plays
Feedback from Phase 3 of VirtualPREX was very positive. Some of the PSTs thought the best thing about the activity was "being able to consider unexpected occurrences within the classroom and approaches in how they can be overcome", that they could connect to a group of people in a casual environment where learning still occurred and being "put on the spot" provided a good understanding of professional experience. Most PSTs thought VirtualPREX would be helpful in preparing them for their professional experience and they responded that it enabled them to realise the behavioural issues that may occur within a classroom and that it was good to experience a classroom environment without a classroom. One student responded that they felt the only way to become confident with teaching was through first hand experience and did not think it would be helpful.

Discussion and future uses of the VirtualPREX classrooms

Two important issues with creating spaces for teaching and learning in a virtual world such as SL is expense and time. VirtualPREX was relatively inexpensive although considerable time was taken to create the space. In 2013, VirtualPREX will be open for all educators to use with their students. Therefore, the time and expense to create the learning environment has been eliminated. VirtualPREX, by providing classrooms in the innovative and emerging technology of Second Life, can be used to reinforce and practise fundamental teaching skills. Teacher educators can integrate it into their academic programs as an adjunct to lectures and as a means of supplementing their students' professional experience before entering the real-life classroom. A blueprint for how to use, develop and implement VirtualPREX will ensure resource sustainability. Educators world wide will have access to VirtualPREX which will be available from the website: http://www.virtualprex.com.

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"Wherever, whenever" learning in Medicine: Evaluation of an interactive mobile case-based project

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The increased availability of smartphones[1] with Internet capabilities has led many educators to consider their potential for delivering mobile learning materials to students. In 2009 and 2010 three case-based scenarios were developed for mobile devices by staff at the University of Sydney and The Children's Hospital at Westmead. A trial of the pilot scenario was held with fourteen medical students in late 2009. The students were positive and made recommendations for improving the case scenarios. Their suggested changes were incorporated into phase two scenarios in 2010. Throughout 2011 evaluations were conducted with a total of 171 students and quantitative analysis of the data was performed. Results indicated that whilst students liked the mobile cases, they did not utilise them as mobile resources as anticipated. Some differences were also revealed between the digital immigrants' and digital natives' interactions with the case scenarios, as well as some variations between male and female students.

Keywords: mobile learning, case-based elearning scenarios

Introduction

The first decades of the 21st century herald interesting times for both educators and students. Learning and teaching in tertiary education is shifting from structured learning environments such as lectures and tutorials into a new mode of 24/7 access to learning anytime and anywhere, limited only by the flexibility of resources made available to students by their institution.

Case-based learning is a well-established methodology in medical education (Mostaghimi et al. 2006). It can help students develop critical reasoning skills, the ability to acquire and evaluate information, the capacity to generalise and transfer knowledge, and become lifelong learners (Mostaghimi et al. 2006; Ludmerer 2004). Ultimately, case-based learning enables students to translate what they have learned from the basic sciences to real-life clinical situations (Reese 1996). Information technology can enhance learning by enabling students to rapidly incorporate information into clinical practice (Mostaghimi et al. 2006) and can improve learning through case-based scenarios (Reese 1996).

At Sydney Medical School, case-based learning in the form of Problem-Based Learning (PBL) has been a feature of the teaching curriculum since 1997. Following a review of Sydney Medical Program, in 2009 the

[1] Smartphone: a high-end mobile phone that combines the functions of a personal digital assistant (PDA) and a mobile phone. Source: http://en.wikipedia.org/wiki/Smartphone

number of PBL cases was reduced to make way for additional teaching in foundation anatomy and physiology. Three of the discontinued PBL cases formed an important part of the curriculum of the Discipline of Paediatrics and Child Health and academic staff wanted to continue to provide learning resources based on these cases for students.

In 2005 – 2006, case-based learning was developed for the iPod for medical students at the University of Adelaide by Palmer and Devitt (Palmer & Devitt, 2007). By 2009 global developments in mobile phone and mp3 player technology were hard to ignore. The iPod Touch, the first iPod with wireless connectivity, had been available globally since September 5, 2007[2] and smartphone use in general was increasingly visible among the medical student cohort in tutorials. There was now a generation of students that 'have spent their entire lives surrounded by and using computers, videogames, DVD players, videocams, eBay, cell phones, iPods, and all the other toys and tools of the digital age' (Prensky, 2001, p. 1). With the Palmer and Devitt model in mind and an enthusiastic student cohort, the academics within the Discipline of Paediatrics and Child Health decided to explore the potential benefits of mobile learning for the discontinued course material.

Support was provided by Apple, Sydney eLearning (the University of Sydney's central elearning support unit) and the Manager of Web Development at Sydney Medical School to develop the paediatric case-based learning scenarios as mobile cases. The project goal was to provide these learning materials as a mobile resource to enable students undertaking the Child and Adolescent Health specialty block (CAH) to review and reinforce their learning under the Basic and Clinical Sciences and Patient-Doctor themes, as well as their clinical reasoning skills, when they were away from a desktop computer and the structured learning environment.

This paper reports on research conducted with students who undertook CAH at The Children's Hospital at Westmead Clinical School in 2011. We aimed to discover students' attitudes towards usability, content and access, as well as the perceived benefits.

The Project

The mobile case-based learning scenarios were developed for medical students who each year undertake CAH as part of the Sydney Medical Program. The initial mobile case developed in 2009 mirrored medical students' PBL tutorials. It contained the presentation of an adolescent patient with Anorexia Nervosa, constructed from a slide show with accompanying audio file, and an unfolding case description. It also contained interactive true/false and checkbox-style questions with automatic feedback, designed to engage the students in the associated reading material, lectures, references and web links. The case was developed using HTML, with Hot Potatoes freeware for the questions.

In October-November 2009, a trial of the pilot mobile case was held with 14 medical students with approval from the University of Sydney Human Research Ethics Committee. Students were provided with an iPod Touch, loaned by Apple, with the case pre-loaded. Students were given an orientation to the mobile case and the iPod Touch. The eight students who participated in a follow-up evaluative survey and focus group favoured the mobility of the elearning device. The students were positive about the potential use of the iPod Touch for learning and made useful recommendations for improving the mobile case and developing elearning materials on mobile devices. Students reported that they liked, "just having it all at your fingertips - portable," and the "freedom to do [self-directed study] whenever and wherever."

The project team was keen to address student feedback when developing the phase two mobile cases in 2010. Consequently, student requests for a more structured narrative flow and integrated questions, along with an improved graphical user interface, were incorporated into the second and third mobile cases on Rubella and Phenylketonuria. A 'resume' function, which allowed them to 'bookmark' their place in the case, cumulative scoring of questions and a cleaner interface were included in the new design. The content was written to mirror an authentic clinical reasoning process, as if students were participating in a Clinical Reasoning Session tutorial (CRS tutorial), mirroring real life clinical practice with patients. Questions were all single best answer multiple-choice. A pre-case quiz was developed to engage students in the topic and more references to online publications were incorporated. The case was developed using CSS3 and HTML5. They utilised the HTML5 capabilities of the Safari mobile browser to allow students to 'store' the web pages in their device for later use, or in an offline situation, such as at the patient bedside or whilst on public transport. The multiple-choice questions were built in JavaScript and scores and repeated attempts were recorded. The pilot mobile case on

[2] http://en.wikipedia.org/wiki/IPod_Touch

Anorexia Nervosa was redeveloped in the new style. The download of the mobile case was significantly improved to facilitate access by students with their own devices.

Methodology

In 2011 research was conducted with 175 students who undertook CAH over three of the four eight week terms that were held that year. Students were briefed on how to use the mobile cases during their orientation to CAH. Students worked through the mobile cases during the term on a loaned iPod Touch, their own mobile device or a desktop computer in the hospital or their own homes.

In order to evaluate the mobile case-based learning scenarios, a survey was developed and approved by the University of Sydney Human Research Ethics Committee. It comprised both quantitative Likert-type questions and qualitative items. On completion of CAH, students were asked to complete the paper survey (see Appendix 1).

Ten survey questions were analysed for this paper. They used a five-point Likert-style rating with standard 1= ‘strongly disagree’ to 5 = ‘strongly agree’ (see Table 1). The questions were grouped into four themes for further analysis: usability, content, access and perceived benefits for students.

Table 1: Balanced five point Likert scale with middle category as neutral

Scale	1=	2=	3=	4=	5=
	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree

Methods of analysis using mean and standard deviation based on parametric testing procedures are often used for analysis of Likert scale data. However, non-parametric procedures based on the rank, median or mode are appropriate along with distribution free methods (Allen, 2007), and these were used.

Results

Of the 175 students who undertook CAH, 171 students participated in the survey, providing a 98% response rate. We present an overall analysis of the responses, then more detailed analysis based on reported student gender and age, and the type of web-enabled device used by students.

Scale items 1 and 2 (‘strongly disagree’ and ‘disagree’) and 4 and 5 (‘agree’ and ‘strongly agree’) were combined for analysis. A summary of responses to survey questions 1 – 10 is presented in Table 2. The median and mode for each question is presented as a measure of central tendency.

Survey respondents did not complete all questions. While 136 of the 175 students answered question 1, there was a greater response for other questions, such as question 3 – question 9, with 142 student responses. Regarding demographic details, 171 students gave their age and 169 their gender.

Shapiro-Wilk test results (between 0.762 to 0.876) suggest the data is not based on a normal distribution for each of the samples grouped by usability, content, access and perceived benefits to students (with p-values < 0.05). Also, approximately 74% of the group are 28 years of age or less, meaning the size of the sample for the digital immigrants is smaller than that for the digital natives. The sample size for the digital immigrants is less than 10 for questions 2 and 3, in which significant differences were found between the two groups. However, sample size issues do not arise for other tests based on digital natives or those tests based on gender and type of mobile device.

The Mann-Whitney U test was used as a non-parametric measure of central tendency. It is suitable for comparing small groups, with ordinal variables and when the distribution is asymmetrical (Nachar, 2008).

Table 2: Measures of central tendency and percentage agree for sample

	N (Valid)	Median	Mode	Percentage strongly agree or agree	Neither agree nor disagree	Percentage disagree or strongly disagree	N=
Q1 - The case-based scenarios for mobile devices were easy to use.	136	4.00	4	57.4%	32.4%	10.3%	136
Q2 - I found the structure of the CRS tutorials easy to follow.	141	4.00	4	83.0%	14.9%	2.1%	141
Q3 - I had no technical difficulties working through the cases.	142	4.00	4	69.7%	9.2%	21.1%	142
Q4 - I answered all the questions in the cases and read the explanations.	142	4.00	4	66.9%	16.2%	16.9%	142
Q5 - I read through all the learning topics.	142	4.00	4	56.3%	13.4%	30.3%	142
Q6 - I viewed all the lectures.	142	4.00	4	53.5%	6.3%	40.1%	142
Q7 - I worked through the cases during free time while on clinical attachments.	142	4.00	4	57.0%	10.6%	32.4%	142
Q8 - I worked through the cases while travelling to and from clinical attachments.	142	2.00	2	33.8%	11.3%	54.9%	142
Q9 - I revised my knowledge by working through the cases.	142	4.00	4	73.2%	12.7%	14.1%	142
Q10 - I learnt new information from the cases.	140	4.00	4	82.1%	9.3%	8.6%	140

The ten questions were grouped into four areas for overall analysis:

1. Usability (questions 1 – 3)
2. Content (questions 4 – 6)
3. Access (questions 7 – 8)
4. Perceived benefits for students (questions 9 – 10)

With regard to usability, the students' responses were mixed, with 57.4% strongly agreeing or agreeing with question 1 that the mobile cases were easy to use, 83% strongly agreeing or agreeing with question 2 that the tutorials were easy to follow and 69.7% strongly agreeing or agreeing with question 3 that they had no technical difficulties working through the mobile cases. On the questions related to content (questions 4 – 6), students were more positive about the quizzes (66.9%) than the learning topics (56.3%) and lectures (53.5%).

In terms of accessing the materials, just one-third (33.8%) of students used the mobile cases while travelling and 57% of the students reported using the mobile cases in their free time (questions 7 – 8).

In the final two questions (9 – 10) on the perceived benefits, students were positive about the benefits of the mobile cases for knowledge revision, with 73.2% strongly agreeing or agreeing with this question. In terms of learning new information, the students rated the mobile cases highly, with 82.1% strongly agreeing or agreeing with this question.

Gender Difference

Of the participants, there were 89 males (52% of total students), and 80 females (46.8%). Two respondents did not identify their gender. Table 3 summarises the responses for each question by gender.

Table 3: Summary of results by gender

Q1 -5	Q1		Q2		Q3		Q4		Q5	
Gender	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
Mode	4	4	4	4	4	4	4	4	4	4
Median	4	4	4	4	4	4	4	4	4	4
St Deviation	0.80	0.91	0.57	0.65	0.98	0.99	0.94	1.02	1.16	1.05
Agree or Strongly Agree (%)	58.0%	56.7%	77.0%	89.6%	66.7%	73.1%	68.0%	65.7%	53.3%	59.7%
Disagree or Strongly Disagree (%)	5.8%	14.9%	0.0%	4.5%	20.0%	22.4%	13.3%	20.9%	29.3%	31.3%
Neutral (%)	36.2%	28.4%	23.0%	6.0%	13.3%	4.5%	18.7%	13.4%	17.3%	9.0%
Q6 - 10	**Q6**		**Q7**		**Q8**		**Q9**		**Q10**	
Gender	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
Mode	4	4	2	4	2	2	4	4	4	4
Median	4	4	3	4	2	2	4	4	4	4
St Deviation	1.35	1.44	1.21	1.16	1.20	1.23	0.84	0.93	0.83	0.81
Agree or Strongly Agree (%)	52.0%	55.2%	46.7%	68.7%	37.3%	29.9%	74.7%	71.6%	82.4%	81.8%
Disagree or Strongly Disagree (%)	38.7%	41.8%	40.0%	23.9%	50.7%	59.7%	12.0%	16.4%	9.5%	7.6%
Neutral (%)	9.3%	3.0%	13.3%	7.5%	12.0%	10.4%	13.3%	11.9%	8.1%	10.6%

Analysis using the Mann-Whitney U test is presented in Table 4.

Table 4: Mann-Whitney U test for gender

Test Statistics										
	Q1	**Q2**	**Q3**	**Q4**	**Q5**	**Q6**	**Q7**	**Q8**	**Q9**	**Q10**
Mann-Whitney U	2185.5	2092	2448	2372	2461.5	2419.5	2055	2167.5	2397	2309.5
Wilcoxon W	4463.5	4867	5298	4650	5311.5	5269.5	4905	4445.5	4675	4520.5
Z	-0.584	-1.954	-0.296	-0.62	-0.221	-0.393	-1.971	-1.475	-0.537	-0.638
Asymp. Sig. (2-tailed)	0.559	0.051	0.767	0.535	0.825	0.694	0.049	0.14	0.591	0.523
a Grouping Variable: gender (1=male 0=female)										

We observe a difference between the two groups for question 2 at the 10% level of significance, with a p-value = 0.051. Approximately 89% of females agreed that the structure of the CRS tutorials was easy to follow, compared to only 77% of males. Question 7 also demonstrated a significant difference, with a p-value = 0.049 at the 5% level of significance, where approximately 68% of females agreed that they worked through the mobile cases during free time while on clinical attachments, compared to only approximately 46% of males.

Age

The age range of the sample group was 21to 51 years and the mean age 27 years, with 90% of the sample aged 30 or below. Approximately 75% of the sample were aged 28 or below. The median age was 26 years, with a mode of 25 years. The age profile in the sample therefore follows a non-normal distribution, however, it is to be expected as Sydney Medical Program is graduate entry.

In order to test for a ‘digital native’ distinction, we separated the sample into two groups based on Prensky’s classification of ‘digital immigrant’ and ‘digital native’, with ‘digital immigrants’ being those born before 1980 (aged 32 years and above) and ‘digital natives’ born after 1980 (aged 31 or below) (Helsper & Eynon, 2009). We then tested for differences between these groups for questions 1 – 10 and have reported p-values (Sig 2-

tailed). As the beginning of the digital native generation is not clearly defined, sometimes starting in 1980 and sometimes 1982 or 1983, the test is repeated for generations born 1980 to 1984 (age range 28 to 32).

Analysis using the Mann-Whitney test showed that for those aged 28 years or below, there is a statistically significant difference in relation to question 8, with p-value < 0.019 (see Table 5). At the 10% level of significance, there is also a difference for question 1. Digital immigrants scored the higher mean rank in the Mann-Whitney U test for those aged 29 years or higher in relation to questions 1 and 8. This suggests the digital immigrants were more likely to have found the mobile cases easy to use and were more likely to have worked through the mobile cases while travelling compared to the digital natives.

Table 5: Mann-Whitney Test: Digital natives vs. digital immigrants

0 =28 or below 1=29 or above		**N**	**Mean Rank**	**Sum of Ranks**
Q1 - The case-based scenarios for mobile devices were easy to use.	0	99	64.80	6415.50
	1	37	78.39	2900.50
	Total	136		
Q8 - I worked through the cases while travelling to and from clinical attachments.	0	104	66.83	6950.00
	1	38	84.29	3203.00
	Total	142		

Another significant difference was found for the group aged 32 and above (see Table 6). The ‘digital natives’ scored the higher mean rank and were more likely to find the structure of the CRS tutorials easy to follow and to have answered all the questions and read the explanations. These results are significant at the 5% level of significance, with p-values = 0.034 and 0.028 respectively for question 2 and question 4. For the group aged 30 years or below, a significant difference was also found on question 4. This was also significant at the 5% level of significance, with p-value < 0.047.

Table 6: Mann-Whitney Test: Digital natives vs. digital immigrants

0=31 or below 1=32 and above		**N**	**Mean Rank**	**Sum of Ranks**
Q2 - I found the structure of the CRS tutorials easy to follow.	0	131	72.65	9517.00
	1	10	49.40	494.00
	Total	141		
Q4 - I answered all the questions in the cases and read the explanations.	0	132	73.43	9693.00
	1	10	46.00	460.00
	Total	142		

The groups aged 32 years or below and 33 years and above were also statistically significant for questions 2 and 6 (see Table 7). Digital natives scored a higher mean rank for both questions. Both were statistically significant at the 5% level of significance, with a p-value < 0.010 for question 2 and p-value < 0.049 for question 6.

Table 7: Mann-Whitney Test: Digital natives vs. digital immigrants

0=32 or below 1=33 or above		**N**	**Mean Rank**	**Sum of Ranks**
Q2 - I found the structure of the CRS tutorials easy to follow.	0	134	72.66	9736.00
	1	7	39.29	275.00
	Total	141		
Q6- I viewed all the lectures.	0	135	70.01	9451.00
	1	7	100.29	702.00
	Total	142		

Based on these results, we observe again that digital natives were more likely to have found the structure of the CRS tutorials easy to follow. Based on question 6, digital immigrants were more likely to have viewed all the lectures. These results are at the lower limits for sample size when this partition is applied to results.

Type of web-enabled device

Results show that 87 students were accessing cases on an Apple device (iPhone, iPad, iPod Touch), while 30 students were using other brands. Usability experience is highlighted by question 1 (whether the scenarios for mobile devices were easy to use) and question 3 (any technical difficulties working through the cases). Figure 1 shows the types of mobile devices used by students for the case studies:

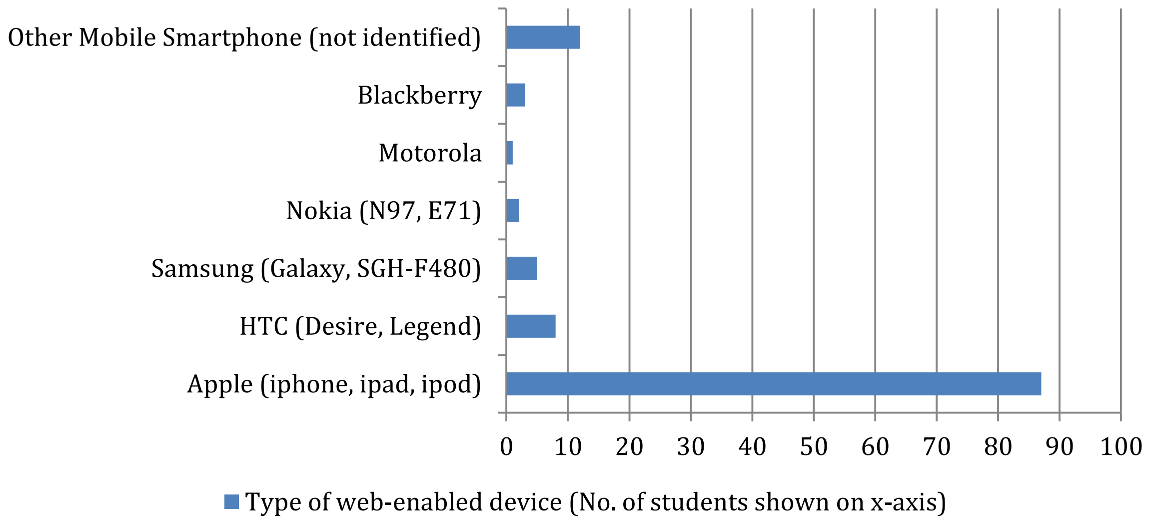

Figure 1: Type of web-enabled device

Attitudes on usability were mixed, with 57.4% strongly agreeing or agreeing with question 1 and 69.7% strongly agreeing or agreeing with question 3 (see Table 2). One reason for this may have been that the experience of the student was different based on the type of device they used. For example, students using Android/Google-based smartphones may have had difficulty as the mobile cases were designed to run using the Safari browser on an Apple device. To test for this, we examined whether the experience differed depending on whether the user had an Apple device or other handheld device or smartphone. The Mann-Whitney U test findings suggest there is no real difference between the experience of Apple and non-Apple users (see Table 8).

Table 8: Mann-Whitney U test based on type of device: Apple users versus other device

Dummy variable by type of device (where 0=Apple and 1=not Apple)	**Mann-Whitney U**	**Wilcoxon W**	**Z**	**Asymp. Sig. (2-tailed)**
Q1 - The case-based scenarios for mobile devices were easy to use.	816	3517	-0.538	0.591
Q2 - I found the structure of the CRS tutorials easy to follow.	793.5	3643.5	-1.735	0.083
Q3 - I had no technical difficulties working through the cases.	866.5	3792.5	-1.067	0.286
Q4 - I answered all the questions in the cases and read the explanations.	978.5	1329.5	-0.079	0.937
Q5 - I read through all the learning topics.	979	1330	-0.075	0.941
Q6- I viewed all the lectures.	772.5	1123.5	-1.717	0.086
Q7 - I worked through the cases during free time while on clinical attachments.	812.5	3738.5	-1.449	0.147
Q8 - I worked through the cases while travelling to and from clinical attachments.	884.5	1235.5	-0.832	0.406
Q9 - I revised my knowledge by working through the cases.	966.5	1317.5	-0.188	0.851
Q10 - I learnt new information from the cases.	944	1295	-0.281	0.779

a. Grouping Variable: type of device 2 (0=apple 1=other handheld)

The only significant differences between Apple and non-Apple users was for question 2 (in relation to the structure of the CRS tutorials) and question 6 (I viewed all the lectures). This was significant at the 10% level of significance. The result for question 6 may be explained by the delivery of lectures via iTunesU and the difficulty in accessing this on non-Apple devices. There is no difference between groups in relation to ease of use or technical difficulties. This is an unexpectedly positive outcome, given that the design and development of the cases was solely focused on the Apple iOS.

Discussion

The results revealed some interesting insights into where the mobile case-based learning scenarios were used, the students' preferred structure and the generational differences in approaching the mobile cases. These factors may assist educators in their design of similar learning materials in the future.

One of the goals of this project was to provide these mobile cases to students on mobile devices so that they could review and reinforce their learning while away from the structured learning environment. Despite this, just one-third of students used them while travelling. The geographical location of The Children's Hospital in Westmead (a suburb about 45 minutes by train from the Sydney CBD) may be a factor as students may drive rather than take public transport. It may not have been as practical for students to use the mobile cases in transit as we had anticipated. In terms of using the cases in 'free time', over half (57%) of the students agreed or strongly agreed with this. This concurs with Sutton-Brady et al's analysis that students have a preference for studying in a familiar home setting '…in reach of other learning related tools and resources...' (Sutton-Brady, 2009). From anecdotal evidence and the qualitative findings from this survey, not presented here, the students' low ratings for this question may be due to issues they encountered when using the mobile cases on hospital computers with Internet Explorer or Firefox browsers. Since the mobile cases were not designed for web browsing on a computer, these students would have had a less than optimal experience.

Students showed a strong preference for the clinical content (as represented by cases and quiz questions) versus the science-based content (contained in the lectures and learning topics). We attribute this preference to two things: 1) the structure used for the mobile cases followed the structure of the clinical reasoning process and it is likely that this was familiar to students and they found it easy to follow. Two-thirds of students answered all the questions in the mobile cases and read the explanations, which supports our previous studies with elearning in which students highly rated the value of answering questions and reading the feedback as a learning strategy (MacLean, Scott, Marshall, & Asperen, 2011); 2) some of the material provided in the learning topics and lectures was quite detailed scientific knowledge, such as immunology, which the students had covered earlier in the curriculum.

With regard to gender, a significant proportion of females found the clinical reasoning tutorials easier to follow and reported using the mobile cases in 'free time'. The results do not support a 'digital native' distinction but are consistent with the literature on the topic (e.g. Bennett, Maton, & Kervin, 2008; see also Margaryan, Littlejohn, Vojit, 2011). 'Digital natives' were less likely to have viewed all the lectures, to have worked through mobile cases while travelling and less likely to have found the mobile cases easy to use. However, 'digital natives' were more likely to have answered all the questions in the mobile cases, read all the explanations and found the structure of the CRS tutorials easy to follow. By contrast, 'digital immigrants' were more likely to have viewed all the lectures, worked through the mobile cases while travelling and were more likely to have found the mobile cases easy to use. However, digital immigrants were less likely to have answered all questions in the mobile cases and read the explanations, and were less likely to have found the structure of the CRS tutorials easy to follow. The lack of conclusive evidence of a digital native distinction concurs with views expressed by Bennett et al '…that a proportion of young people are highly adept with technology and rely on it for a range of information gathering and communication activities. However, there also appears to be a significant proportion of young people who do not have the levels of access or technology skills predicted by proponents of the digital native idea' (Bennett, Maton, & Kervin, 2008, pp. 778-779).

Conclusion

This project was conceived to provide students with flexible access to learning materials, with the expectation that making these materials available on mobile devices would give students the opportunity to consolidate their learning while travelling or on free time whilst on their clinical rotation. Most students reported the mobile cases enabled them to learn new information and revise previous learning, and that the tutorials were easy to follow. However, the survey results showed that students did not engage with them as intended, with only one third of students reportedly using these resources while travelling and just over half using them during free time while on clinical placement. We also found that more females used them in their free time on placement than males and that the digital immigrants made more use of the mobile cases while travelling than their younger counterparts. The type of device students used also did not affect their experience, which is surprising given that the cases were designed for the Apple iOS. Future research will explore the influence of educational background (first degree qualifications) and other factors on how students perceived the mobile case-based learning scenarios. These findings will assist with future mobile learning design for this and other groups of students.

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Appendix 1

Child and Adolescent Health Specialty Block
Sydney Medical School, The University of Sydney

Evaluation of case-based scenarios on mobile devices

Part 1
1. What is your age? ………

2. What is your gender? (Please circle) Female / Male

3. What is your nationality?
…………………………………………………………………………………………………

4. What is the name of your undergraduate/postgraduate qualifications?
…………………………………………….

5. Do you own a web-enabled mobile device? Yes/ No
If yes, what type? …………………………………........

Part 2
Please choose one of the terms on the right that best describes your response to the statements below:

	strongly agree	**agree**	**neither agree nor disagree**	**disagree**	**strongly disagree**
1. The case-based scenarios for mobile devices were easy to use.					
2. I found the structure of the CRS tutorials easy to follow.					
3. I had no technical difficulties working through the cases.					
Comments:					
4. I answered all the questions in the cases and read the explanations.					
5. I read through all the learning topics.					
6. I viewed all the lectures.					
Comments:					
7. I worked through the cases during free time while on clinical attachments.					
8. I worked through the cases while travelling to and from clinical attachments.					
Comments:					
9. I revised my knowledge by working through the cases.					
10. I learnt new information from the cases.					
Comments:					

Part 3
What was the **best** feature of the cases?
………
………
………
What was the **worst** feature of the cases?
………
………
………

How could the cases be improved?
………
………
………

A design-based research approach implementing a palette of educational technologies to foster 21st century skills

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This paper discusses how a design-based research approach will be used to design and implement a palette of learning technologies as part of a multi-mode approach in open distance learning. A conceptual-theoretical framework is proposed consisting of the interrelationship between pedagogy and technology and content, design principles, criteria for excellence and higher level outcomes. The intention is to outline guidelines for supporting teacher-students in an open distance learning environment, not only to master knowledge relating to a specific subject area, but also to acquire skills such as self-regulated learning, critical thinking and lifelong learning. Supplementing teacher-students' knowledge and skills will enable them to prepare their twenty-first-century learners for the increasingly interconnected global society they will work and live in.

Keywords: Design-based research, authentic learning, 21st century skills, open distance learning.

Introduction

After eighteen years of freedom from the apartheid era, South Africa still faces a dysfunctional educational system. We need to recognise the effect of inequalities of the past on teaching and learning. For the sustainable future of education in South Africa, the South African government need to look at the prospects of our learners (Jansen, 2011). With tens of thousands of learners failing examinations on a regular basis, schools in South Africa need leadership and enthusiastic teachers. Teachers hold the future of their learners in their hands and for many of our learners, "a solid school education represents the only means for ending the cycle of family poverty" (Jansen, 2011, p. 41).

South African universities offering open distance learning (ODL) provide flexible learning opportunities to students. Many teacher-students teach in remote rural areas and ODL removes barriers such as time, geographical, social and economic constraints. With the growing availability of new educational technologies higher education institutions are in a position to address the changing expectations of students relating to the quality of the learning experiences that will ensure that teaching and learning are relevant to their needs (Garrison & Vaughan, 2008). Unqualified and under-qualified teachers in South African schools have the opportunity to improve their qualifications and teaching skills through ODL.

In addition to mastering knowledge in a specific subject area, these teacher-students have to attain skills needed to creatively navigate the twenty-first-century. Within the South African context many teachers attended dysfunctional schools and it is important to supplement these teacher-students' knowledge and skills so that they will be able to prepare their twenty-first-century learners for the increasingly interconnected global society they will work and live in. Contemporary literature on pedagogy recommends pedagogical practices involving interactive, authentic, technology enriched teaching and learning practices in order to enhance the learning experience of students (Herrington, 2009; Moore, Fowler, & Watson, 2007).

This paper discusses how a design-based research approach can be used to design and implement a palette of educational technologies such as paper-based guidelines, interactive white board sessions, screencasts, videos on DVDs, audio recordings; Mobi-site downloads, as well as content learning management systems as part of a multi-mode approach. The intention is to outline certain guidelines for supporting teacher-students not only to master knowledge relating to research methodologies, but also to acquire skills such as self-regulated learning, critical thinking and lifelong learning.

The next section contains an overview of the background to the project. This is followed by the conceptual framework and an outline of design-based research. These sections will be followed by a discussion of how the four phases of design-based research can be implemented in a programme to enhance the learning experience of students, as well as supplement the teacher-students' knowledge and skills.

Background

Learning inequalities remain problematic in South Africa. These comprise the diversity of students in terms of age, gender, language use, culture, insufficient Internet access and living in remote rural areas. The introduction of e-learning in ODL may offer a solution in the South African context, but insufficient internet access is seen as one of the major factors hampering the realization of e-learning potential in open distance education in the African context (Ololube, Ubogu, & Egbezor, 2007). Mobile learning (m-learning) may provide a solution to the challenge of access to the internet, as the scale and ubiquity of mobile networks often provide the only infrastructure in rural areas (GSMA, 2010).

Teacher-students in open distance education require more and diverse support and scaffolding to acquire skills and competencies often far removed from their daily existence and environments. With the use of the palette of learning technologies teacher-students will have the choice to opt for learning activities best suited to their requirements and needs. Spector (2001, p. 8) notes that the "big lesson about technology and learning from the 20th century is that less is known about how people learn than many educational researchers are inclined to admit". Irrespective of the type of learning experience, learning with technology offers the advantage of allowing students the freedom of choosing *when*, *what*, *where* and *how* they want to study. A structured approach to combining pedagogy and technology may contribute towards addressing learning inequalities effectively, and may also foster 21st century skills in an open distance learning environment.

The School of Continuing Teacher Education (SCTE) of the Faculty of Education Sciences at one of the largest distance learning universities in South Africa offers open distance learning through an 'off-campus' mode of education to unqualified and under-qualified teachers. The SCTE offers three in-service programmes: the National Professional Diploma in Education (NPDE, 3 years, NQF level 5), the Advanced Certificate in Education (ACE, 1 year, NQF level 6), and the B Ed Honours (B Ed Hons, 2 years, NQF level 7). Currently there are approximately 27,000 distance students enrolled (NWU, 2012). These students live in South Africa and Namibia, mostly in remote and deep rural communities. There are 35 study centres all over South Africa and Namibia. Contact sessions during weekends form the core of the student support system at these centres. Facilitators are employed and trained to tutor the different modules at the centres. For each module, three contact sessions and one vacation school per semester are presented, comprising an introduction to the module, content coverage and preparation for the examination. At present lecturers use interactive white board sessions as a synchronous approach of contact with the students. Learning materials are mainly paper-based, consisting of study guides, text books and a DVD containing additional information such as PowerPoint™ presentations and video footage. In line with current trends in the field of open distance learning, the SCTE has started to implement the use of ICTs such as Moodle, a learning management system (LMS), interactive white boards (IWB) and mobile learning (m-learning) to supplement paper-based learning materials.

The project reported on in this paper relates to the Bed Hons programme where research facilitation is oriented as a preparation to read master's level. The author is responsible for the research methodology modules in the Bed Hons programme. The assignments for these modules consist of a theoretical assignment and a proposal for the initial module, and a research report in the second module. In an effort to assist facilitators and students, the author compiled comprehensive guidelines on the writing of a proposal and research report, but realized that more and varied support is needed to assist the teacher-students. More importantly, they need a set of skills such as lifelong learning, self-directed learning and critical thinking skills in order to creatively navigate the twenty-first-century. A combination of design-based research and design principles may be the answer to utilize a palette of learning technologies to address learning inequalities in an open distance learning environment. Teachers in South Africa need all the support they can get in the role as future makers to realise a sustainable future for education in South Africa.

Conceptual-theoretical framework

Conceptual distinctions

Researchers use several conceptual frameworks to underpin research on new technologies in teaching and learning. Stoner (1996) adapted the systems analysis and design life cycle approach for the integration of learning technology in teaching. The adapted version consists of nine phases in the cycle: initiation, analysis and evaluation, selection of learning technologies, design integration, implementation, monitoring, adapting and evaluation of implementation. It is similar to a cycle followed in design-based research, but lacks the application of design principles and the different iterations for refining the design principles and hence not suitable for the implementation of this project.

Mishra and Koehler (2006) developed the Technological Pedagogical Content Knowledge (TPACK) that builds on the formulation of 'pedagogical content knowledge' of Shulman (1986), extending it to the 'phenomenon of teachers integrating technology into their pedagogy' (Mishra & Koehler, 2006). In this conceptual framework the primary issue is the knowledge a teacher should have to integrate technology in teaching and learning, and therefore also does not meet the needs of this project.

The conceptual model of Ossiannilsson and Landgren (2012) addresses quality in e-learning based on the benchmarking initiatives of European Union (EU) in collaboration with The European Association for Quality Assurance in Higher Education and the United Nations Educational, Scientific, and Cultural Organization, with emphasis on a holistic approach requiring change management from an organizational and pedagogical perspective.

Henderikx's (2011) advice is to incorporate the criteria of the European Association of Distance Teaching Universities' (EADTU) E-xellence programme into the conceptual framework of the project (Ubachs, 2009). The conceptual-theoretical framework for the implementation of a palette of educational technologies proposed in this paper comprises the following aspects:

- The interconnection and interrelation between technology, pedagogy and content, focused on the student.
- Design principles elemental in conducting design-based research and design principles as suggested by Herrington and colleagues (Herrington, 2006; Herrington & Kervin, 2007; Herrington & Oliver, 2000; Herrington, Reeves, Oliver, & Woo, 2004; Herrington & Standon, 2000).
- Criteria for excellence as expressed by the EADTU through the E-excellence project (Ubachs, 2009).
- Higher level outcomes aimed to be reached through the implementation of design principles and criteria for excellence.

Figure 1 illustrates the conceptual-theoretical framework proposed for the implementation of a palette of learning technologies in an ODL programme.

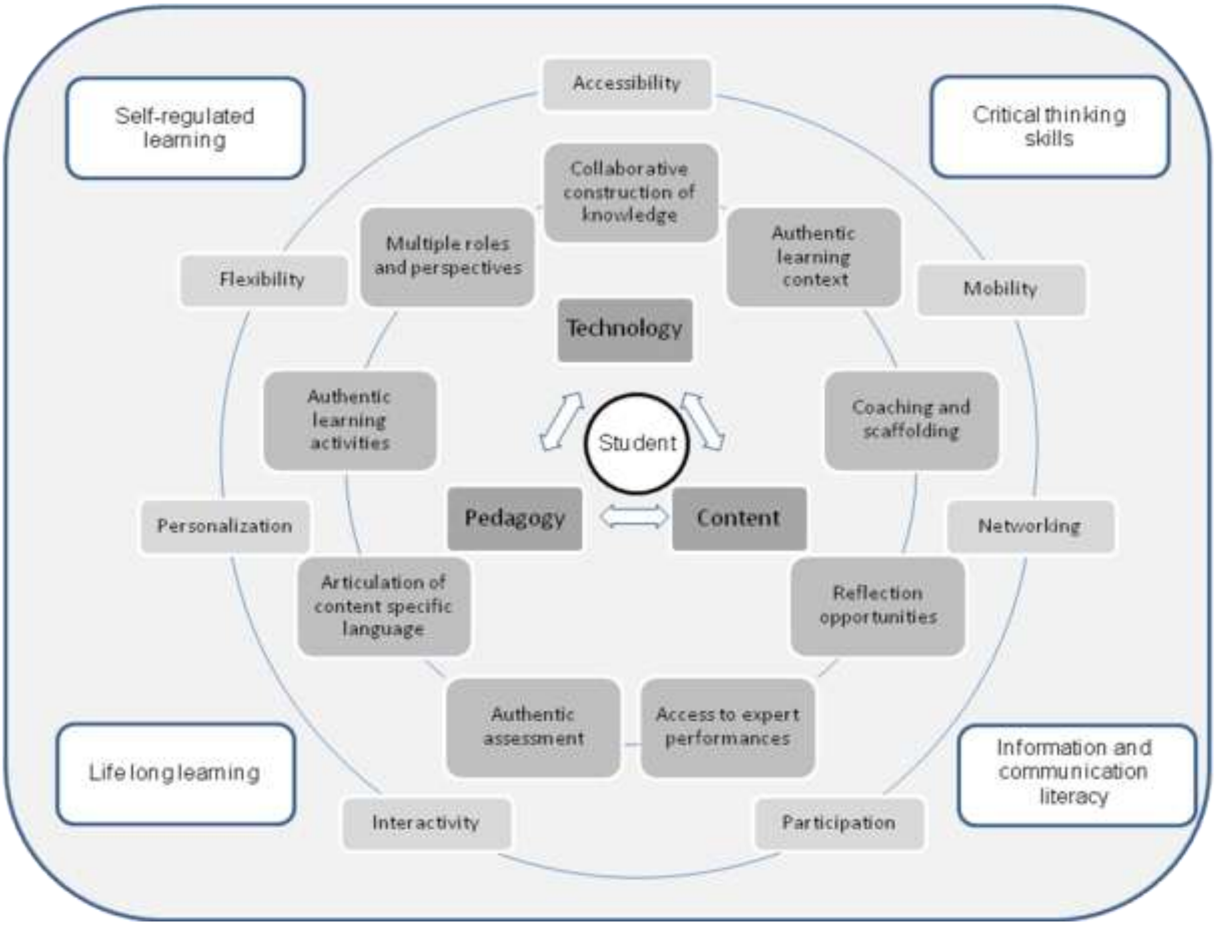

Figure 1: A conceptual-theoretical framework for implementing educational technologies in an ODL programme

The interconnection and interrelation between technology, pedagogy and content

Universities frequently use ICTs to deliver knowledge "where students learn *from* the technologies rather than *with* them as cognitive tools" (Herrington, 2009, p. 2). With the implementation of a palette of learning technologies, the intent is not to use information and communication technologies (ICTs) merely to disseminate content, but to **embrace the use of technology as cognitive tools to encourage thinking and understanding** (Herrington, 2009).

A student-centred approach to technology is proposed in this framework, with the emphasis on sound pedagogy to enable the student to interact with the content in a constructivist way. As learning with technology is a combination of "electronic"(*e),* and *"*learning", the emphasis is placed on the pedagogy that directs the technology (Nichols, 2007a). For best practice in e-learning the ideal seems to be effective and sound pedagogy combined with reliable, user-friendly technology. Therefore, "e-learning is *dependent* on the pedagogy", which, in turn, implies that the technology will be ineffective if the pedagogy is not sound (Nichols, 2007a, p. 2). Similarly, if the technology is neither easy to use nor reliable, "e-learning will be an exercise in frustration" (Nichols, 2007a, p. 3). Learning with technology has vast potential and offers challenges and opportunities for developing effective educational applications. In terms of the relationship between m-learning, life-long learning and open distance education in an African context, Traxler (2011) advises:

> Areas that must be explored also include the balance between top-down and bottom up approaches, progressive versus traditional values in education, the need for educational technologies that enable some Africans to compete in a global knowledge economy and for educational technologies that enable others to subsist and survive, the relationships between mobile learning, lifelong learning, distance education and classroom teaching, the ethical and cultural aspects of educational interventions and the boundaries and differences between various research communities and their methodologies for example between participative design and anthropology.

Constructivist learning theories are based on the premise that people construct their own knowledge and understanding through experience and reflecting on the experiences (Jonassen, Davidson, Collins, Campbell, & Bannan Haag, 1995). Students learn best when they are actively involved in the learning process and learning is reinforced when the process is social, relevant and offers multiple ways of learning (Huang, 2002).

The characteristics of learners in our schools are constantly changed by the rapid advancement of information technology. This puts pressure on teachers to develop capabilities in co-design, co-instruction, guided social constructivist and situated learning pedagogies and assessment beyond tests and papers, in order to stay abreast of the ever-changing learning styles of their learners. Teacher-students need to develop "neomillenial" learning styles to maintain effective teaching as the nature of their learners changes (Dede, 2004). Consequently there is a need for professional development which focuses on teacher-students' approaches to learning, their beliefs, attitudes and meta-cognitive understandings. In other words, it is necessary to facilitate teacher-students "to engage in self directed and lifelong computer learning" (Phelps, Graham, & Kerr, 2004, p. 50).

Design principles of the multimodal palette of educational technologies

Herrington and Oliver (2000) suggest nine design principles. These design principles underpin the design and development of the multimodal palette of educational technologies, as well as the collection of formative and summative data. A discussion of how these design principles will be implemented within the palette of learning technologies follows.

- *An authentic context that reflects how the acquired knowledge will be used in real life*
  Scenarios of typical educational research practice form part of explanations on the DVD, IWB sessions and screencasts in formats across different platforms, downloadable from Moodle.

- *Authentic learning activities*
  Scenarios of typical educational research practice form part of assignments and exercises in the study guide.

- *Access to expert performances and the modelling of processes and examples of outstanding completed research projects, reports and documents*
  Examples of proposals and research reports are available on Moodle.

- *Multiple roles and perspectives to enable students to gain perspectives on topics from various points of view*
  Links to videos on YouTube available on Moodle, e.g. a discussion between a qualitative and a quantitative researcher with regards to the application, advantages and disadvantages of the different research designs.

- *Reflection opportunities for students to reflect on their learning, the program and the learning experience*
  Within the collaborative learning groups the teacher-students will have the opportunity to reflect on their learning, the module and their experience with the use of the palette of learning technologies.

- *Collaborative construction of knowledge relating to opportunities for students to collaborate in small groups to problem-solve together*
  Facilitators will use Facebook as an educational tool to enhance peer group collaborative learning within a community of enquiry framework for online learning

- *Articulation of content specific language to encourage the students to discuss their newly acquired understanding of research methodology*
  Within the collaborative learning groups teacher-students will have the chance to articulate their newly acquired knowledge of educational research methodology.

- *Coaching and scaffolding for decreasing instructor involvement over time*
  Screencasts in five indigenous languages will be available on Moodle, to provide scaffolding and support for students in acquiring the necessary skills and understanding of research methodology.

- *Authentic assessment of real-life research scenarios*
  Scenarios of typical educational research practice form part of assignments and examination questions. and explanations on the DVD, with the IWB and screencasts.

Criteria for excellence

To successfully implement educational technologies, certain criteria for excellence such as those expressed by the EADTU through the E-excellence project (Ubachs, 2009) need to be adhered to. These are mobility, participation, personalization, networking, accessibility, flexibility and interactivity. A brief discussion of these criteria follows.

Mobility
Mobile learning (m-learning) optimizes communication between lecturers, facilitators and learners as it offers learning opportunities to rural or remote learners where the infrastructure for access to the internet is lacking (Evans, 2008). As communication and interaction are of pivotal importance in the learning process, m-learning can contribute towards the quality of education. M-learning has all the advantages of e-learning, with the added benefit of portability in the form of devices such as iPods, tablet PCs and smart phones (Evans, 2008). Lecturers should endeavour to embrace the strengths of mobile devices and design learning materials that utilize the convenience, connectivity and personalization that such a platform offers. Tablet computing presents affordable learning opportunities and are ideal for r one-to-one learning. The Zimbabwean government in partnership with Apple are planning solar-powered iPad devices for rural institutions without electricity. (Johnson & Brown, 2012). Other institutions could learn from this example and invest in the use of tablets to address the connectivity challenges of their students. This implies that, with the increased use of mobile and wireless technologies, “the time and place for learning, working, and socialising will blur even more” (Bonk, Kim, & Zeng, 2006b, p. 561). An important implication for this project is that mobile and wireless technologies may be more accessible to a wider range of individuals, thus creating greater opportunities for lifelong learning.

Participation
Bonk *et al.* predicted in 2006 that learning would become more individualized, hands-on and visual with added mobility. Their survey data show that blended learning will support a bigger range of learning styles and individual differences in future. Brown and Adler support this prediction, stating that the latest evolution of the Internet, Web 2.0, “is creating a new kind of participatory medium that is ideal for supporting multiple modes of learning” (2008, p. 18).

Personalization
As learning is a personal and individual experience, personalization and individualization of instruction is paramount to effective instructional practice. Consistent with authentic learning, instruction can be personalized by providing a palette of learning technologies in order for teacher-students to opt for learning activities best

suited to their needs. Allowing students to choose from various ways to interact with learning materials, using different instruction approaches and providing self-assessment tasks to verify their progress will empower them to make decisions and reflect on their learning (Rule, 2006).

Networking
Blended learning offers opportunity to connect people, activities and events. With increased individualization, blended learning promotes collaboration, and contributes to greater connectedness. With the palette of learning technologies our teacher-students will have the opportunity to collaborate, share and create knowledge.(Van 't Hooft and Vahey,2007). In confirmation of this, the findings of the study done by Laird and Kuh (2005, p. 232) suggest that the investments in making information technology available to students are paying off as students engage in educational practices actively and collaboratively.

Moore *et al*. (2007) discuss the possibilities of using tablet PCs for sharing information among students, as well as for problem-solving and problem-posing exercises in large or small group settings. Downes (2006) describes how the web changed from "being a medium, in which information was transmitted and consumed, into being a platform, in which content is created, shared, remixed, repurposed, and passed along" by the "newly empowered learner.". With the advent of Web 2.0 come E-learning 2.0 which, according to Downes, are "not a single application, but a collection of interoperating applications – an environment rather than a system". He argues that E-learning 2.0 has the potential to empower students in a completely new way. Brown and Adler (2008, p. 18) concur and argue that "the most profound impact of the Internet, an impact that has yet to be fully realized, is the ability to support and expand the various aspects of social learning".

Accessibility
With the fast-changing job requirements and expectations, Bonk *et al.* predict that on-demand learning will become a requirement of a global workforce(2006b). The web will be used to provide timely, authentic information for the solving of case problems. The present trend towards problem-based learning, scenario learning and online case-learning will continue, with the pedagogy employed and the learning results as the most important aspects rather than the actual technology used (Bonk et al., 2006b). Brown and Adler (2008, p. 18) argue that "the most visible impact of the Internet on education to date has been the Open Educational Resources (OER) movement which ensures free access to an extensive range of learning materials. Use of the internet has enabled students to access powerful instruments and simulation models (Brown & Adler, 2008, p. 18).

Flexibility
Using a palette of educational technologies, including e-learning, is "a way to increase flexibility in and improve access to postsecondary education" (Oblinger & Hawkins, 2005). With the growing population of adult learners having to balance their work, family life and studying, open distance learning enhanced by e-learning is a workable option and offers the advantage of allowing students the choice of when, where and how they want to study (Evans, 2008; Oblinger & Hawkins, 2005).

Interactivity
"Learning-by-doing is generally considered the most effective way to learn" (Lombardi, 2007). As with personalization, interactivity is an important aspect of a successful learning environment (Oblinger & Hawkins, 2005).

Higher level outcomes

Life-long learning
Our teacher-students need to keep abreast in a world where technology is changing on a daily basis and new training courses are continually introduced in the workplace and in higher education institutions. Lifelong learning is no longer a dream, but has become an essential requirement in the striving towards professional development. In order to meet this requirement of lifelong learning, technology-enhanced learning environments, such as blended learning and e-learning, are utilised increasingly in higher education. These technology-enhanced learning environments make use of the swiftly growing and expanding potential of technology (Beller & Or, 1998; Bonk et al., 2006b; Moore et al., 2007; Oliver, Herrington, & Reeves, 2006; Souleles, 2004; Surry, Ensminger, & Jones, 2005).

Self-regulated learning
An important objective of the implementation of the palette of learning technologies is to help our teacher-students to acquire the cognitive skills and inclinations to become self-directed learners. With the advantage of

m-learning the teacher students will be able to study the way Sharples (2000) quotes the UK Government's Green Paper on lifelong learning:

> In future, learners need not be tied to particular locations. They will be able to study at home, at work, or in a local library or shopping centre, as well as colleges and universities. People will be able to study at a distance using broadcast media and on-line access. Our aim should be to help people learn wherever they choose and support them in accessing how they are doing and where they want to go next.

Critical thinking skills
As future makers, our teacher-students need to develop key competencies for sustainable development within the South African education sector Barth et al. (2007) report that, with regard to the acquisition of key competencies, data from their research proved reflection to be one of the significant learning processes. Taking a critical stance with regard to one's actions and having the ability to reflect on them seems to be a decisive prerequisite in the learning process. On an individual level, reflecting on one's personal method of learning, questioning and examining tried and tested routines are necessary steps in the learning process. These authors contend that, in group context, "reflecting on the collaboration leads to identifying possible solutions which could take new, as yet, untried directions" (Barth et al., 2007, p. 425).

Information and communication literacy
For a sustainable future within the South African context, teacher-students need to develop relevant competencies such as information and communication literacy as they must be able to prepare their twenty-first-century learners for the increasingly interconnected global society they will work and live in. In their article on the development of key competencies for sustainable development in higher education, Barth *et al.* (2007, p. 416) state that, seen against the backdrop of globalisation, "acquiring relevant competencies within and by academic work cannot be a private concern of faculty, staff or administration. Absolutely essential is a new learning culture which does not confirm academic tradition, but examines its potential for a sustainable future, in an open-minded and participative process".

Institutions should create a supportive organisational climate for e-learning as a support for face-to face training programmes in skills development. Providing programme facilitators trained in coaching participants, focusing on the accomplishment of self-directed learning, assisting participants in the attainment of goals, modelling positive emotive skills, and encouraging the practice of new skills may help to realise the promise of blended learning (Kruger, 2008).

Design-based research

Design-based research will explore how to design and develop authentic learning experiences with a palette of learning technologies addressing learning inequalities in an open distance learning environment.

Phase 1: Analysis and exploration of the problem

Phase one addresses the problem: the analysis and exploration of practical problems by the researcher, practitioner and designer and a literature review. With an instructional design background, the author will fulfil the roles as practitioner, researcher and designer. During this phase the researcher will articulate the problem, have discussions with practitioners and carry out a literature review on work that has been done in the field. At the end of phase one the researcher will formulate the research questions (T C Reeves, 2006).

Up to date two studies have been done as part of phase one. The author adapted the Charles Sturt University Student Educational Technology Survey to determine the teacher-students' use of educational technology, their skills in using these technologies and how they expect these technologies to help them with their learning. In the second study the author explored the views of facilitators regarding the use of screencasts to augment learning materials in open distance learning (Kruger, 2010).

Phase 2: Development of a possible solution to the problem

During phase two solutions will be developed, informed by existing design principles and technological innovations. Design principles as suggested by experienced researchers in the field will be applied to design authentic learning activities to address the problem (Herrington, 2009; Herrington & Kervin, 2007; Herrington et al., 2004). Technologies to be used are interactive whiteboard sessions, screencasts, DVD with videos and interactive learning activities on Moodle.

Phase 3: Implementation and evaluation

For the duration of phase three the solutions developed in phase two will be implemented and evaluated in iterative cycles. During this phase data will be collected and analysed in order to answer the research questions. The researcher will modify the learning environment pending the attainment of the pedagogical outcomes.

Phase 4: Reflection and reporting

In phase four the researcher will reflect on the process followed to refine the design principles implemented. These refined principles could inform other researchers in similar situations (Thomas C Reeves, Herrington, & Oliver, 2005).

Conclusion

With a design-based research approach, the author proposes to implement a palette of educational technologies to outline guidelines for supporting teacher-students not only to master knowledge relating to research methodologies, but also to acquire skills such as self-regulated learning, critical thinking and lifelong learning. Reeves *et al.* (2005, p. 110) state unequivocally:

> Certainly, the need for a more socially responsible research agenda in instructional technology has never been greater. Instead of continuing to tinker around the edges of teaching and learning challenges by conducting quasi-experimental studies focused on small changes in learning environments or even conducting one-off qualitative studies of esoteric cases, instructional technology researchers and their colleagues in other academic disciplines must begin to tackle the huge problems we face in the first quarter of the 21st century. Design research offers a positive step in that incredibly important quest.

Research emanating from the implementation of the palette of educational technologies, will hopefully contribute towards a better understanding of the pedagogical practices involving interactive, authentic, technology enriched teaching and learning practices. This will not only enhance the learning experience of teacher-students, but also foster the attainment of 21st century skills. These are crucial to supplement our teacher-students' knowledge and skills, since they are future makers, responsible for creating a sustainable future for education in South Africa.

> "Education is the most powerful weapon you can use to change the world." Nelson Mandela

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Teaching Aboriginal Culture Online: sustaining traditions of knowledge sharing[1]

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This paper is an account of a research project being undertaken for an Australian Learning and Teaching Council grant to develop *Indigenous On-Line Cultural Teaching & Sharing*. The project is built on an existing face-to-face interactive presentation based on the theme of Australian Aboriginal Kinship systems, which has been designed for teaching university and school students and their teachers and describes the process used to develop web services that aim to provide more interactive and exploratory learning environments.

We are collecting knowledge of the Aboriginal culture in relation to a theme and presenting this in a teaching framework that can be continually updated with community stories. We are consulting with Aboriginal and non-Aboriginal students and community members who attended interactive presentations to gather ideas for transferring the model to online format and presenting it with stories relevant to the specific professional areas of our students, such as sociology, law, education and social work. We present here the teaching framework developed in this project for Aboriginal cultural teaching online.

Keywords: Aboriginal, Indigenous Culture Online, Teaching Framework, Action Research

Introduction

The online course has been developed to increase the access to a highly successful Kinship presentation developed by Riley (Riley and Genner, 2011) by placing it online. Riley is a Wiradjuri and Gamilaroi woman with over 30 years experience as an educator in NSW. The course is now an online workshop comprised of videos of the face-to-face Kinship presentation, interleaved with short role-play games for students to gain some understanding of the different sections and levels of relationships involved in Aboriginal Kinship. These games require a simple selection by students to put their icon in the correct relationship with others on the screen.

A second part of the online system is being developed to provide a repository of community narratives that are related to themes and concepts in the workshop and which will be available for future generations to both hear and update. We have designed a set of interactive scenario-based games where the narratives are being inserted for teachers and their students to listen. Using innovative web services, teachers will select the narratives that are relevant to their course, and link these within the range of scenarios. The stories assist students to relate their future work to situations described by the narratives. In the scenarios students are to choose the way they relate to the characters, listen to their narratives, and become aware of their own role in communities in relation to services provided with and for Aboriginal people.

While the project aims to extend to multiplayer systems in future, at present we are working with single-player

[1] *The Australian Government Office for Learning and Teaching has provided support for this project. The views in this project do not necessarily reflect the views of the Office.*

simulation games. The work we describe here fit the definition of simulations (Wills, 2012), although it involves one person role-plays with computer-generated models or agents. It is similar in learning design to PRessure Point! as described by Demetrious (2007) where models use the pre-recorded voice of people to provide the main narrative learning material. For our project, these stories will be collected from Aboriginal students, staff and Aboriginal community members as well as some non-Aboriginal professionals, to provide a wide variety of experiences from which undergraduate students can construct their own understanding of the cultural conflicts that can arise from colonizing and ethnocentric world-views.

The learning system is designed to reflect where possible Aboriginal knowledge sharing processes. This is traditionally through interwoven stories, song and dance at a community ceremony or corroboree (Langton, 1997). These ceremonies or performances provide for re-enactment and are an environment for experiential learning of the subject matter. While web services provide a form of mediation that is representational and more static than previous methods of knowledge sharing (Verran & Christie, 2007), this medium does provide for greater user adaption and generation of material by many distantly located authors.

Figure 1a Introduction with comments and panel to upload narratives
1b Narrative browser

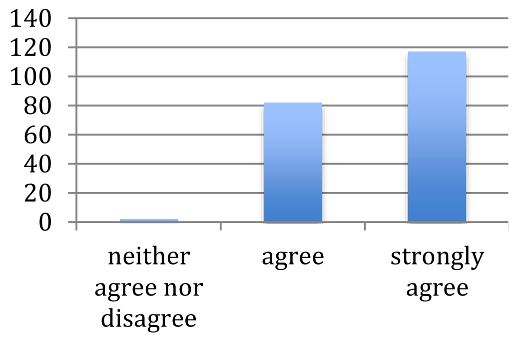
In selecting to move the presentation online, we considered work such at that by Donovan (2007) who notes there are overlapping commonalities between Information Communication Technologies and Aboriginal pedagogical systems, which include the experiential nature of learning; the ability to create an immersive space that is flexible to the specific learners and their context; and the ability to combine material from many informants. Furthermore we wish to utilise the notion of performance, and develop the individual narratives into a coherent story, in this case using simulation environments.

Evaluation of Interactive Presentation

A reflective critique of the interactive presentation pre-dates the project and has been ongoing since the original interactive presentation, developed in 1987, which has since been presented in many educational, organisational and community settings since this time. In the last six years the interactive Kinship presentation has been made available to various groups of students and staff at public schools and Universities across Sydney. It was the success of this presentation that provided the impetus to develop an online version that would enable more people to benefit from learning these concepts, and allow more aboriginal people to contribute to the experiential stories used in the teaching.

Feedback from interactive Kinship presentation to under-graduate Education students

In 2009 the interactive Kinship presentations were provided to all first year educational students at Sydney University. At the end of each interactive presentation, students are asked for comments on what they found useful and what could have been explained better, for instance issues that were hard to understand when presented in this format. This was for the presenter to evaluate what concepts she may be assuming too much prior knowledge from the students and so allow her to adapt her presentation to their needs.



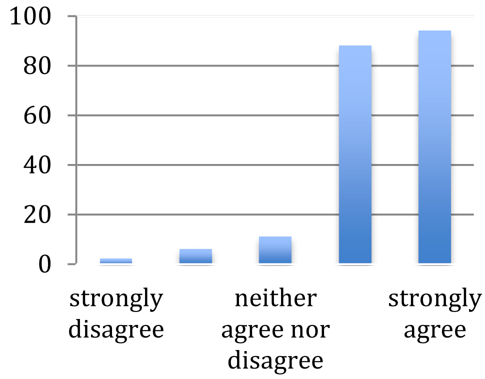


Figure 2a Survey Results – The activity helped me understand the nature of Indigenous relations in contemporary Australia
Figure 2b Survey Results - I could see the relevance of the activity to my work as a teacher

The presenter ran eight sessions with up to 64 students per session over a week. After interactive presentations, several cohorts of students were asked about their experience, and of 430 attendees, 201 returned the questionnaires that asked students about their experience. This is a response rate of nearly 50%.

What has been most interesting is the nearly unanimous response from teaching staff involved in organising the workshop for their students, and other school staff who attended workshops at the Regional Education Department Office. It was clear that, while they responded well to the first presentations, those who attended more than once were more able to reflect on the general concepts portrayed in the presentation. The main concept is how the Aboriginal world view focuses on relationships within a society and 'contrasts to the colonial power's liberal world view based on individual responsibility'. These contrasting world views can be seen at the core of most of the legal issues that affect Indigenous Australians' (Mitchell, 2011).

Further comments were collected from students both at these presentations and later. We provide some examples below from the under-graduate Education students. We have also collected comments from Social Policy students, law professionals and Aboriginal students to help develop the teaching in the online system, which we discuss next.

Table 2 Sample comments from 2009 Education students

Survey	Comment
2	Effective education is dependent on an understanding of culture and the implications of that culture on an individual's learning
20	As I may have Aboriginal students in my class and if I were to call upon a wrongdoing of one of the students and his parents did not turn up, I would comprehend why other members would come instead.
31	As a teacher understanding these different communities and different people's background
35	It is important to understand why some children behave differently and how we can learn to understand and help them.
38	Helps understand the relationship between kids and adults in schools in regard to parents/guardians
50	To avoid misconception and to teach children and help them understand the truth and why the indigenous community is the way it is today.
64	Promotes a better understanding of a student Aboriginal background, historically, politically, culturally, etc.
75	Indigenous Australians may have certain belief/cultural systems that may affect their development. Nonetheless teachers are required to respect that.
83	Definitely. Helps me understand the culture better and have more cultural sensitivity.
93	This was very relevant because it helps educators understand why parents (biological) were not always involved in their Childs education, that aunts or uncles may be more involved because of the skills they have.

Learning Design

To enable us to replicate this work online we needed for formalise the learning process and develop evaluation strategies. We have chosen to use a learning environment where we can focus on the themes of relationships and interactions through games, and where both a narrative teaching style and a social constructivist approach to teaching and learning are used. Both respect and are in keeping with Aboriginal pedagogical and knowledge sharing approaches. Understanding relationships is the first priority in teaching Aboriginal culture and narratives is the process used by Aboriginal teachers for sharing their knowledge. The web service will furthermore allow us to enhance the learning by incorporating narratives from Aboriginal students, staff and community members to convey a variety of perspective on Aboriginal knowledge to non-Aboriginal teachers and students.

A narrative teaching style is beneficial for other reasons too. Aboriginal students, staff and communities will get a chance to tell their stories to be presented in a learning context that reflects the knowledge system of the Aboriginal contributors. In fact the teaching of culture would be invalid without Aboriginal contributors translating their experiences into the new context (Ramsey and Walker, 2010). Similar to other work on community narratives (Kutay & Mundine 2010; Daniel et al., 2003; Rodriguez et al., 2010), the project facilitates Aboriginal knowledge sharing in an online environment. The use of narrative content forms has proven to be an effective way to teach non-Aboriginal students (Egan, 1998; Blakesley, 2010 and Andrews et al, 2010) and respect traditional Aboriginal storytelling methods (Bradley, 2010).

As well as sharing many aspects of Aboriginal pedagogical and knowledge sharing approaches, narrative teaching styles have emerged within higher education more generally through questioning whether conventional pedagogies prepare students for real life situations. In this context, narrative pedagogy is a phenomenological pedagogy that focuses on the lived experience. While phenomenology emerges out of sociology, in health related disciplines, such as nursing, narrative pedagogy in the higher education context emerges from listening to shared stories, the sharing of knowledge and lived experience (Diekelmann & Diekelmann, 2009). A narrative pedagogy allows '…for a richer array of listening (interpreting) than that allowed by the usual application and presentation of disciplinary epistemologies' (Diekelmann & Diekelmann, 2009: xv).

Also, the narrative teaching style complements a social constructivist approach, and this research is based on developing teaching and learning platforms where students learn through active formation of their own knowledge rather than by memorising or absorbing ideas from presentations by a single teacher (Vygotsky 1978). This approach suggests learning through experimentation or experiential learning and providing opportunities for students to create their own 'worlds'.

These worlds are being developed in Unity, a game engine and open platform for programming animations and simulated gaming paths. By creating practical scenarios that can be tailored to the student's specific professional interests (such as law, education, social work or health) we enable the broad sharing of the audio resources within a learning environment suitable for use within existing University courses, and so illustrate:

1. The importance of Aboriginal people's experiences in explaining the significance of policies and practices that have impacted on their lives and the inherent cultural differences, thus validating this knowledge.
2. The value of a repository of resources for Aboriginal people to share with non-Aboriginal people on different approaches to culture within communities, and the need for a regular update of the repository.
3. The wide range of issues that exist as cultural variations, and the opportunity provided by the web to provide tools to support course development through linking some of the variations into a learning repository.
4. The need for culturally relevant online resources to include Aboriginal perspectives in online knowledge sharing.

The web services used are similar to YouTube, providing the tools to upload videos for sharing within the learning context, but it also provides a strong context for the material, so that it can be re-used appropriately in game scenarios.

Themes

There are six themes connected to Kinship relationships that are covered in the online workshop. The six themes are sequential allowing the student to move successively from one level of knowledge to the next. The student learns about Moiety first, as it is the foundation of Aboriginal Kinship structures and they progressively move through to learning about Aboriginal Nations and language groups. This also enables students to gain an understanding of the complexities of Kinship relationships and the effect on such a cultural system of removals, forced co-settlement and the enforced use of pidgin English as a common language. The six themes are listed in Table 1 below, with the role-play used to assist in student's experiential learning.

Table 1: Workshop themes and role-plays

Theme	Role Play
1.Welcome and Moiety	Dividing into Moieties and introduce concepts and foundations of Kinship structure.
2.Totem and Relationships	Divide Totem groups and see how Totems are divided between Moieties, plus environmental links and establishment of reciprocal responsibilities.
3. Skin Names	Divide into Skin Names, note generational relations, family connections, structures and marriage rules.
4. Language and Affiliations	Divide into Nations aligned to language groups and note relations within Nations.
5. Lines of Communication	Put down lines to link Nation and language groups and discuss relationships between Nations that affect conservation, survival, religious and Kinship connections.
6. Disconnected Lines	Connection lines are removed. Discuss effect of forced break between Nations, removals, forced co-settlement and use of pidgin English as common language.

The role-plays are short flash videos allowing some interaction from students. They are required to move their icon according to their relationship to others on the screen, and so deals with themes being taught in the online workshop. At present guidance is presented as audio commentary from the original interactive presentation. They allow students to change from the role of observer to one where they are acting within the culture they are learning about in that they are assigned a Moiety, Totem group, Skin Name and a Nation. As the second part of the workshop is developed, more sophisticated games and a variety of narratives will provide a more immersive experience of these themes and concepts.

Levels of learning

The introductory online workshop provides information for the students on how Aboriginal Kinship systems work, and how this affects reciprocal responsibilities and relationships within the cultures. Students are then presented in scenario based games with situations experienced by Aboriginal people after invasion through the narratives, where Kinship systems were ignored and their culture denigrated. Students will then be asked to consider the various effects of European culture and the introduced language on Aboriginal systems and cultures. These scenarios are more highly guided experiences than the research and journal style of role-play discussed in Genat, Naidu and Fong (2008). and are based on the idea of reusable labs developed in Ben-Naim and Prusty (2010).

There are two main methods used in the workshop and scenario designs to provide for immersive learning. The first is to abstract, where the workshop presents Aboriginal views and explains what is being done within the culture to preserve their specific society and the environment in which they live; and presents how this varies from non-Aboriginal culture. For example, ‘Kinship’ is used in all cultures to establish the responsibilities you have for those closest to you. In Aboriginal societies Kinship obligations have to work across Family, Clan and Nation groups spread across Australia. This has led to a complex system of rules, such as restricting marriage to distant relations. In larger societies, such as British, the family obligations are restricted to immediate biological relations and often not linked to marriage rules.

The second is by analogy from known experience, where aspects of culture are selected, and then students are asked how this would affect relations, responsibilities or survival within another cultural context. Two examples of this strategy are to:

1. Imagine you are welcoming someone to your Country or Nation. What would you explain to them so they are aware of the basic rules and obligations within your society?
5. Remember the place you grew up and all its features. Then imagine if your parents, their parents, and so on also lived on the same land, and could tell you how the land changed over millennia of time, the geography of the land and where and how all the animals on this land lived; how to care for the land and its inhabitants; and through this how to respect the Land. What would your connections and relation to the land be?

Out of these two approaches has arisen a third mode of learning, which is primarily done through narratives. This we call the historical context, where a lack of ability by the invaders to ‘walk in the shoes of Aboriginal people’ has led to the imposition of the rules of one culture on another. The aim of the workshop and gaming system is to enable students to understand that this has happened, and the ongoing effects this has on the people who will be their clients and with whom they may work when they graduate as lawyers, social workers, teachers, etc.

We have used the Action Research methodology to develop and evaluate the learning system, both to verify its success in light of the original presentation, and to analyse the benefits or losses from moving the teaching online.

Action Research

While the project involves developing an innovative learning context and tools for teachers, the focus is on how teachers will design the learning sequence for specific learning outcomes (Wills, 2012). The approach taken for this development is Action Research (Kemmis & McTaggart, 1998), being a process that is self-correcting (cyclical); able to adapt to innovative situations (dynamic); and involving all stake holders (collaborative). This approach is also known to incorporate practical action in the pursuit of theoretical understanding in a manner that removes the research from the colonising framework of previous studies (Smith, 1999) and 'opens a space where colleagues were able to create a new community of engagement' (Everett, 2008, p.1).

At the same time we had to consider the appropriateness of IT for Indigenous knowledge sharing. While we place the Indigenous students in the role of peer-teachers, we were encouraged by some previous research into Aboriginal use of IT (Kutay & Ho, 2011; Reedy, 2011) and note the concerns raised by Reedy (2011):

> 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 (p.1063).

Action Research is a complementary methodology that allows us to facilitate a reflective pedagogical project that will lead to educational transformation (Somekh & Zeichner, 2009, p.6). The use of the term action research in this context signifies the collaborative, productive and reforming characteristics of the project. That is, one of the overarching objectives of the project is to contribute to pedagogical reform by engaging a range of stakeholders (Brydon-Miller & Maguire 2009. p.79) in the project development in a way that endeavours to support strategic change in higher education by embedding Aboriginal knowledge in mainstream courses, through web services. Also this research involves different phases of an interactive action-reflection cycle.

The project development and stakeholder engagement is being conducted over three stages. For each stage, there is a cycle or series of steps undertaken to ensure that all stakeholders are actively engaged in the development of resources forming the basis of the web services that provide exploratory learning environments. Details of the completed first and second stage of stakeholder engagement and evaluation are presented below. The third stage of stakeholder engagement and evaluation will be with Aboriginal users uploading narratives and students using the final simulation role-plays.

Stage One

In stage one the project team ran a series of evaluative sessions with non-Aboriginal students and Aboriginal students and communities. The first cycle of evaluation involved non-Aboriginal students engaging with the material content of the interactive workshop and commenting on the ability of the online version to explain Kinship concepts. An evaluation survey was done of the original interactive presentation, which was conducted in 2009. The findings from this feedback are presented later.

In 2011, face-to-face discussions have been held with participants following their participation in a presentation. These sessions were run with both Aboriginal and Non-Aboriginal students who had participated in the face-to-face interactive presentation as part of their course attendance.

Non-Aboriginal students were asked:

- What did you like about the Kinship presentation. What was new to you?
- What was hard to understand?
- What would you like more information on?
- Would you use this understanding in your profession?

- How was this relative to your course work?

The feedback from these sessions was found to focus on enhancing the presentation of the material. As the creator and presenter, Riley used the feedback from these questions to improve the delivery of the material ensuring that students' level of comprehension improved. Since the presenter is Aboriginal, at times she assumes some knowledge and ideas when explaining the concepts to students, so feedback from the surveys and face-to-face discussions has helped refine the presentation. Once the initial presentation was refined, the video material was edited into thematic modules.

The next cycle in this stage involved consultation with Aboriginal community members and students which focused more on suggesting additional material we can use online, to provide further resources and perspectives for students who are using the workshop in their courses. Aboriginal students who were enrolled in years 2-4 of the Bachelor Education Secondary Aboriginal Studies course, which is run in Block Mode through the Koori Centre, University of Sydney, were asked:

- What stories would relate to the Kinship presentation in an on-line version?
- What would need to go onto an on-line presentation?
- What Kinship issues are needed to be mentioned and explored?

From these sessions a series of ideas were gathered and collated under the workshop themes. This material is being collected and linked to the workshop videos as time-selected locations, according to relevancy. For example these sessions were used to expand on the sub-topics to be included under the main themes and has been published (Kutay et al. 2012). This expanded table will be further developed to provide the topics to collate narratives added to the workshop.

Through this process, Aboriginal students who will be future Aboriginal Studies teachers are involved in knowledge transmission, and non-Aboriginal students who may work with Aboriginal clients and colleagues are involved in shaping the material content of what they learn and what knowledge gaps exist. This has important pedagogical implications for providing student-centred learning, which involves students being consulted about their learning. In this context, students are agents in the development of their own knowledge resources (Stenhouse 1978) and the process of transformative learning (Fielding 2001). There is a growing body of evidence demonstrating the benefits of student involvement in the development of pedagogical resources (see Bovill et al., 2010). In this case, consulting Aboriginal and non-Aboriginal students in the development of the e-learning environment will ensure that the web-based resources align with the knowledge base for other students.

Before the videos were made publically available online, the presenter reviewed them to verify that the material was handled correctly in the editing. This final cycle of evaluation lead to the collection of further audio material from an interactive face-to-face presentation, which was interleaved into the videos to form the online version of the presentation, now called 'the workshop'.

Stage Two

The second stage dealt specifically with the web based workshop and drew on the expertise of practitioners and specialists within Aboriginal Education and those with expertise in the development of online learning environments.

The first cycle of evaluation involved reflecting on the usability of the web based workshops and the services that will be needed as the project develops. The videos were placed online in an interface developed for the project, which allowed uploading of the material, and clipping and commenting of videos. To allow us to update and refine online material, we provided a facility where people can link to audio, video and text based comments online. There are always new resources being developed online in the area of Aboriginal knowledge and cultural expression, and the online workshop provides an option for linking these into a coherent knowledge system. A reference team of IT specialists and those involved in similar teaching projects evaluated the workshop interface and these changes were incorporated. Aboriginal and Non-Aboriginal students' will do further evaluation as users of the interface in the third stage.

The second cycle of evaluation involved a brainstorming and discussion amongst the extended research team and representatives of an Aboriginal Cultural Reference Team (ACRT) about the learning needs of students viewing the workshop. The ACRT is made up of Aboriginal people who are also long-time educators, who have been invited to be involved in assessing the material and providing feedback on the teaching framework.

This first session with the ACRT also took into account the fact that the physical interaction of the face-to-face workshop would be missing in the online environment and as such we needed to identify and provide more learning tools to compensate for this. For example in moving from a face-to-face interactive workshop to an online environment, it was identified that:

- The workshop would lack the simple role-play exercises that are used by Riley in the face-to-face interactive presentation, which are vital for students to feel cultural connections. Therefore these were developed in flash and inserted in the workshop stream.
- The workshop should be viewed without the distraction of comments in the first run through and then in subsequent reviews the students can see the inserted comments.
- The separate components of the workshop should be accessible to students together in a single screen view to retain the topic order, however this sequence of topics can be stepped through to find points they wish to review.

The presenter and the research team then reviewed the changes to the workshop. Further amendments are being considered, and these will be tested with Aboriginal students and community members when they add their narratives in the next stage.

The final cycle at this stage was the development of a more structured teaching framework as described in the next section. This review was carried out with discussions with community members at public forums and private discussions. This included presenting the project and discussing its aims at the NSW Aboriginal Education Consultative Group Conference. Also the presenter visited her own community and talked with Aboriginal Education workers, who had been involved in previous face-to-face interactive Kinship presentations, about their suggestions to developing the workshop into an interactive online simulation.

To continue this process, we will meet regularly with the ACRT to access their expert knowledge and obtain feedback on the cultural content, ensuring we avoid mis-representation. They will also advise on educational delivery and resource development to support the on-line workshop.

Teaching Framework

In adopting a reflective approach that incorporated stakeholder feedback, the teaching framework was developed from the interactive Kinship presentation and the online interface was edited to include the extra material that had been collected as relevant to each theme of the workshop. The details of this process have been published previously (Kutay, et al, 2012). The next stage was to take the feedback from the stakeholder consultations and develop the teaching goals and strategies to be implemented in the online workshop and simulations.

From engaging with various stakeholders, the first cycle collected information that enabled us to identify the following set of requirements:

1. The project needs to ensure the learning is not too confrontational, and reduce the guilt effect, and focus on enabling understanding of the issues (themes).
2. The simulation should provide a flow from the information provided in the interactive presentation (or its online format) to Aboriginal people's experience of the cultures in conflict. The stories need to be linked to this original information to reinforce the concepts.
3. The simulations need to be immersive, where the environment is encoded with rules and attributes that guide feedback on actions.
4. The online workshop needs to provide tag categories that will automatically generate relations between stories when they are uploaded and can be used to automatically link stories into learning paths in the simulation. The links will help:
   a. modeling stories the user should hear next based on what they have heard before; as well as
   b. select questions to ask after each scenario.
5. Users need to be able to click on an object for more information (these are the interactive presentation comments already collected).
6. The online workshop needs to include different types of scenarios which students may be placed in. These include:
   a. becoming professionals working with Aboriginal communities;
   b. working along-side of members of the Aboriginal community.
7. A series of multiple choice or open-ended questions needed to be added after each scenario.

For the next stage we need to develop the game simulations in line with the teaching framework. The simulations are to be based on generic scenario templates that can be edited by the teacher to suit the professional area of the student; location: such as urban or rural; and immersion: whether in role as Aboriginal or non-Aboriginal. The teacher will also select the stories that are relevant within the scenario, and the tagging of stories will assist in placing them within the scenario's learning path.

To carry out the story collection we treated them as comments on the initial video material, which the contributors load to the website and tag with the related section of the workshop. After the stories are collected and used to design the simulation, they will form the voice (and image, if in video format) of the computer simulated models in the game.

To collect narratives we are running the interactive presentation, and using the online workshop to present the themes and then ask Aboriginal students and community members to comment. The first stage will be conducted via forms of focus groups where Aboriginal people will be asked to discuss the online workshop's content, and then suggest the sort of narratives and stories Aboriginal people may wish to add to this. The focus groups will be designed to ensure that this method is consistent with Aboriginal knowledge sharing practices. We will then arrange a suitable time to collect the narratives in face-to-face interviews and in a manner consistent with Aboriginal protocols. There will also be an option for the contributor to directly record their story and upload it to the site for moderation, so we also will assess the usability of this uploading system.

Conclusion

This paper presents a snapshot of the *Indigenous On-Line Cultural Teaching & Sharing* project. We have shown a new approach to transmitting Aboriginal cultural knowledge from a one-person interactive presentation to an on-line experience, which will provide a sustainable way to continue this teaching program and benefit a greater number of students and teachers. This will additionally provide a portal for an increased number of Aboriginal people to add their narratives and so increase the depth of learning in the areas of historical and imposed structures and their effect on Aboriginal people, retaining this knowledge for future generations. This learning will assist professional practitioners to gain insight and provide improved services in working with Aboriginal people, both as clients and colleagues.

Whilst our project is focused specifically on Aboriginal Kinship, we are also developing online teaching resources, in consultation with Edith Cowan University, who have developed similar material relating to the Nyungar (Aboriginal) experience of Health in Western Australia. We therefore present this work, including the online sharing tools and the process for developing a teaching framework, as having applicability to and across other teaching projects.

In keeping with the reflective and adaptive learning and teaching philosophy underpinning it, this project is developing the simulation games using a modeling approach that provides flexible links to both the particular narratives used in a context, and the questions to be asked that relate to these stories. As the narratives can be continually added to the repository, we ensure that new stories will be available to be selected and used by teachers, and the choice of simulations continually updated.

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Web 2.0 as a Catalyst for Rethinking Teaching & Learning in Tertiary Education: A Case Study of KDU University-College (Malaysia)

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Web 2.0 signals a move away from the Internet as a passive collection of computers sharing information to the Web as an active network of people who collaboratively shape and create new realities. This paper outlines five trends impacting education as a result of the Web 2.0 phenomenon (connectivism, digital creation, collaboration, divergent assessment and open courseware) then shares the research performed on facultt and students of KDU University-College, the first college in Malaysia to implement an e-forum for the Malaysian Ministry of Higher Education's compulsory subjects.The research asks questions about the benefits and/or challenges which Web 2.0 have brought to teaching and learning, the extent to which the five characteristics have impacted the students, lecturers and management and other issues. It will highlight key findings and recommend broad action-steps forward, both in the national and global context.

Keywords: Web 2.0, e-learning, open learning, assessment, connectivism, education, collaboration.

Web 2.0 (An Introduction)

Web 2.0 is the wave of Internet usage characterized by collaborative sharing, blogging, real-time journaling and other media applications broadly lumped under the heading of 'social networking media'. These applications would include the popular tools and websites like Facebook, MySpace, Linked-In and Bebo, all of which are (understandably fuzzy) expressions of the move towards the creation of online communities and networks which harness the collective intelligence (O'Reilly, 2006).

Web 1.0, being the first 'wave' of Internet familiarity and usage, focused on what individuals can do online qua individuals. These common tasks would include downloading files, creating a (usually static) Web presence in the form of personal websites, viewing and listing information and browsing in general. Web 2.0 signals a move away from the Internet as a mere collection of computers passively sharing information to seeing the Web as an active emergent network of people who are enabled to not only interact more closely but to collaboratively shape and create new realities. From the initial emphasis of consuming what was 'out there', now surfers are acting as 'pro-sumers' who use and share objects and cyber-goods for their own use and satisfaction.

Drumgoole (2006), in true intuitive Web 2.0 fashion, writes in his blog that: "Web 1.0 was about *companies*, Web 2.0 is about *communities*…Web 1.0 was about *wires*, Web 2.0 is about *wireless*…Web 1.0 was about *owning*, Web 2.0 is about *sharing*… Web 1.0 is about web *forms*, Web 2.0 is about web *applications*… Web 1.0 was about *hardware* costs, Web 2.0 is about *bandwidth* costs."

In a word, Web 2.0 is a new *state of mind* (Heuer, 2006) on how to be, behave and engage with the global Web community.

Web 2.0 in education is a sub-component of the more generic term, e-learning, in that the latter involves any and every use of the World Wide Web for educational purposes. Bates (2004) notes that since 1995 when the World Wide Web emerged, online universities have bloomed ranging from public and private partnerships to national and international consortia to the creation of virtual schools.

However, e-learning prior to Web 2.0 involves primarily *supplementing* traditional pedagogical modes with an online component (e.g. clicking on the correct answers, obtaining educational materials online) whereas social networking encourages a more constructivist approach which makes deeper use of reflection and discussion, and in which educational design is reconsidered (e.g. e-forums, collaborative learning, problem-based learning, etc.).

Five Trends in Web 2.0 & Education (A Literature Review)

This essay will first outline five trends impacting education as a result of the Web 2.0 phenomenon. It will argue that Web 2.0 has and will continue to transform e-learning such that educational institutions (and pedagogical thinking) will be unable to ignore the emergence of the below characteristics

Connectivism

This is a theory of learning which acknowledges to the extent to which the learner has connected (digitally) with learners (incl. non-human ones) with divergent views. Developed by George Siemens (2005), connectivism pulls together our understanding of learning with and 'into' the Web, making the former inseparable from a continually productive use of the latter.

Often contrasted with other learning theories like behaviourism, cognitivism and constructivism, connectivism is the latest (re)definition of what learning *is*. This question is undeniably significant in a world where computers and the Internet have become ubiquitous and whole economies rely on them. No longer, argues writers like Siemens, can learning be understood as the mere replication of observable behaviour (i.e. behaviourism), the coding, manipulation and re-presentation of information (i.e. cognitivism) or even the creative design and building of new objects or meaning (i.e. constructivism).

Learning cannot be fully understood apart from the phenomenon of forming connections. Too much complexity has emerged in the world such that *competence* and *mastery* must be seen as a function of being linked to divergent networks, non-human sources and interactive nodes; of being able to 'see' new connections and to distinguish significant from non-significant ones; of making sound decisions about one's learning (as an act of learning itself); even, especially in the context of Web 2.0, of being able to "store one's knowledge in one's friends" i.e. the understanding that one's learning grows together with one's number of contacts/friends (see Stephenson).

The principles of connectivism are summarized (Siemens, 2005) as per below (emphasis added):

- Learning and knowledge rests in *diversity* of opinions and is a process of connecting specialized nodes or information sources; nurturing and maintaining connections is needed to facilitate continual learning; the ability to *see* connections between fields, ideas, and concepts is a core skill.
- Learning may reside in *non-human* appliances and *currency* (accurate, up-to-date knowledge) is the intent of all connectivist learning activities.
- *Capacity to know more* is more critical than what is currently known
- *Decision-making* is itself a learning process. Choosing what to learn and the meaning of incoming information is seen through the lens of a shifting reality. While there is a right answer now, it may be wrong tomorrow due to alterations in the information climate affecting the decision.

It is easy to see how the theory forms and is formed by Web 2.0 trends. More and more students are using the Internet as part of their everyday lives, and more and more of them are less and less satisfied with being passive users. Real-time connection, autonomy, total flexibility, continual creation and instant updating are the norms of Web life. Flew (2004) has noted the ways the Internet has evolved from the 1990s' onwards, one of which is how the Web is much more, "integrated into the everyday activities of individuals, the conduct of organizations, and the pursuit of commercial activity."

If the act of being alive is becoming virtually (pun intended) synonymous with being connected (in more vigorous and creative ways), then the act of learning cannot be grasped as if connections were of low importance. This follows on the idea that the act of *working* can no longer remain the same, having been transformed by what Manuel Castells terms the 'network society' which has begotten a new economy which depends, "on innovation as the source of productivity growth, on computer-networked global financial markets, whose criteria for valuation are influenced by information turbulences, on the networking of production and management, internally and externally, locally and globally, and on labor that is flexible and adaptable in all cases." (Castells, 2004)

If this is right, then problems will abound for educators and educational institutions who have not yet made the shift to a connectivist mind-set; lecturers and colleges still promoting rote-learning or failing to incorporate cyber-oriented concepts as a central feature of their teaching are certain to encounter student problems such as boredom, inattention, non-enthusiasm and difficulties linked to differences in a central understanding of what it means to learn.

Digital Creation, Collaboration & Divergent Assessment

A strong corollary of connectivism is that learning outcomes must include a digital-cyber component i.e. digital literacy in the form of technological constructivism and creation becomes a non-negotiable and students (and, most importantly, lecturers!) must be taught to build digital objects *as part of* their learning.

If we are to avoid the destructive disjuncture between students who navigate informally in Web 2.0 contexts but are required to undergo formal instruction in Web 1.0 environments (Lankshear & Knobel, 2005), schools and colleges must build encourage both students and educators to move *higher up* along Bloom's digital taxonomy (Churches, 2009), itself based on the revision to Bloom's taxonomy (Anderson & Krathwohl, 2001).

Again, this is not about just switching from traditional media to cyber-media; it's about redesigning what learning involves and is all about. Educational syllabi, 'task-sheets', homework and other learning activities – to be consistent with the tenets of connectivism – must be tied in and inseparable from the goal of nurturing Web 2.0 literacy. Digital-literacy skills (e.g. blogging, podcasting, etc.) ought to be considered as important (if not more so) than information-literacy skills (e.g. referencing, citation, etc.), without rejecting the latter.

Bloom's (or Churches') *digital* taxonomy (see Figure 1) also exposes a potentially gaping divide between the higher-order digital skills that the younger generation of students possess and the lower-order ones which the older generation of educators are as yet struggling with(!).

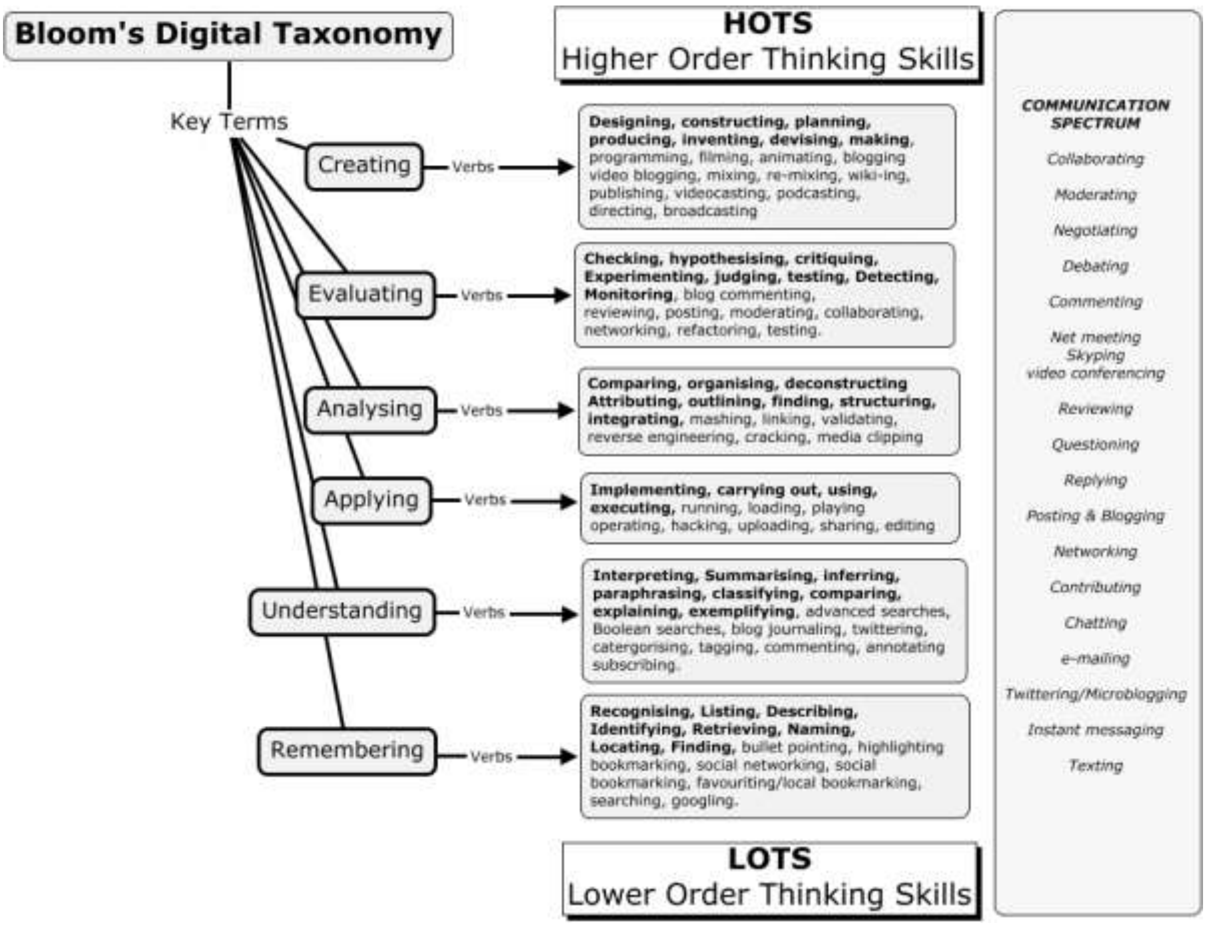

Figure 1: Bloom's Digital Taxonomy (Churches, 2009)

Given this divide, it becomes imperative for educators to ensure that skills like animating, broadcasting, media-clipping and so on are not confined to I.T.- or media-related courses but included even into Business and Social Science courses like Literature, History and Management. Not least also educational institutions would have to begin inserting digital literacy (and even mastery?) as a key criteria for faculty selection, appraisal and promotion.

Lecturer training and induction programs (both in-house and externally sourced) must include the Web 2.0 component. KDU College, in fact, began introducing '21st century learning' as part of its 3-month long faculty induction program and also its delivery of the Cambridge International Diploma for Teachers & Trainers (CIDTT) program; many of the participants of this research are ex-students in these two courses.

Next, if Web 2.0, digital literacy and the new learning network paradigms (Albors, Ramos & Hervas 2008) are to be embedded into education, this would render virtually obsolete the idea of the lone learner. Thus, another effect of Web 2.0 is that learning outcomes must include teamwork and collaborative projects, a not entirely unfamiliar trajectory given the rise of multiple-intelligence paradigms emphasizing inter-personal kinds of smart (Gardner, 1993), studies (e.g. by Ward, 2009) which suggests that students' motivation (at least in the case of classroom writing) may *increase* if they're writing to be reviewed by peers or even external professionals and even calls to prioritize collaboration for the sake of human survival (Goerner, 2007).

Collaboration, simply put, is 'two or more' learners working together on a project, assignment or piece of course material with the objective of producing results they couldn't yield alone. It has reaped profound rewards and opened up previously unimaginable opportunities for businesses and for the redrawing of value-boundaries and knowledge objects (Tapscott & Williams, 2006).

Social networking media then is essentially one huge collaborative phenomenon and – risks of 'bad collaboration' (which is worse than no collaboration) aside (see Hansen, 2009) – if learning is to keep in step with Web-based progress, educators and students alike will have to learn how to connect, work and even 'play' well with others, especially in an age where face-to-face meetings are increasingly rare (despite their benefits, see Young 2008) and team members are ad-hoc, impermanent and relate *only* online. Collaboration as a learning (and assessment) activity promotes the all-too-necessary interpersonal element in personal development and knowledge construction, an often neglected element in academia, as reflected in the continued rejection of Wikipedia as an accepted academic reference despite (or because of) its reflection of 'social knowing' i.e. the idea that knowledge is best shaped through a collaborative conversation and not in an ivory tower (Weinberger, 2007).

It was in the spirit of collaborative learning that KDU College, on the suggestion of this writer, became the first educational institution in Malaysia to launch an e-forum for the Ministry of Higher Education (MOHE)'s compulsory subjects or, in Malay, *Mata Pelajaran Wajib* (MPW). The forum enables students reading Malaysian Studies, Moral Studies and Islamic Studies – the three MPW subjects – to experience 8 weeks (more than half of the 14-weeks allocated per subject) of interactive learning.

Given the changes to learning activities and even the priorities of education, it is only natural to question the means and methods of assessment. Web 2.0 should pave the way for more peer-to-peer assessments, real-world problem-based work and cyber-oriented tests of student performance (not to mention lecturer-appraisals). Furthermore, if learning will take place more and more outside traditional classrooms and will involve establishing rich connections to diverse resources and other people (Lankshear & Knobel, 2006) it is only logical that assessments follow suit.

Open CourseWare

From an institutional perspective, the uploading of free educational material by colleges and universities appears to be imminent and is already made popular by universities like Massachusetts Institute of Technology (M.I.T.) (Thomas, 2007), University of Queensland, etc. In Malaysia, however, open courseware remains a rarity and thus a strong marketing innovation option.

The growing availability of open courseware would, however, be simply a matter of time in a century which has seen shifts in the value of knowledge from its relative *scarcity* to the speed and creativity with which people *share* and *use* knowledge which is free. Nowadays, amateur investigators in almost any field enjoy better facilities for free research and analysis than full-time professionals could buy in previous decades." (Coffee, 2001).

The phenomenon of academic material given free of charge to anyone who can get connected to the Internet is but one more expression of a shift to a culture where value resides in and is created by sharing, networking and collaboration. In this new world, educational institutions who insist of remaining closely protective of and obsessed with ‘intellectual property rights’ (manifested in, say, a great fear that competitors might steal their work) would not be merely missing the point but also missing out on the competitive edge(s) afforded by Web 2.0

Interestingly enough, at the time of writing, no educational institution in Malaysia has carved out a marketing or strategic position via the use of open courseware.

Research on KDU College

Structure, Strategy and Limitations

Qualitative research was performed on selected faculty (incl. management) and students of KDU College (based in Petaling Jaya, Selangor, Malaysia), which has recently had the honour of being the first college in Malaysia to implement an e-forum for the Malaysian Ministry of Higher Education’s (MOHE) *Mata Pelajaran Wajib* (MPW) i.e. mandatory subjects for all pre-university students. The college has also gradually been introduced, via the author’s role in its Teaching & Learning Center, to blogging as a learning and assessment tool, not to mention Web 2.0 as a whole.

Questionnaires were used to compile data in an attempt to answer the following questions related to KDU College:

- What benefits and/or challenges have been encountered as a result of the introduction of Web 2.0 applications into teaching and learning?
- To what extent has the e-forum changed the teaching and learning of the MOHE’s compulsory subjects?
- To what extent has blogging and other Web 2.0 applications transformed the way lecturers facilitate classes and the way students learn?
- To what extent are the (above) five characteristics of Web 2.0 evident in the college and what issues (strategic, executional, etc.) are being faced or anticipated?
- How should the college as an educational institution in Malaysia act with respect to Web 2.0? What are some future steps foreseen?

The sample participants consisted of 30 staff members of KDU College and 23 students. The questions posed were generally simple with at most four distinctions in attitudes. The limited flexibility is necessary to obtain a more definite, if rather broad, categorization of results. I have also designed the questionnaire in such a way as to ‘force’ either a positive or negative response (i.e. all contained an *even* number of alternatives) so as to avoid the fence-sitting I feel is very common among Malaysian respondents.

This research was limited in scope by the following factors:

1. The focus is only on tertiary education
2. The focus is only on one educational institution in Malaysia: KDU College, a private institution offering pre-university diplomas, certificates and external programs with institutions from Australia, United Kingdom, Switzerland, etc.
3. Departments within the college vary in size (e.g. less than half a dozen lecturers for Law but about twenty for Hotel) hence the relevance and applicability of the data could be uneven (both across departments and certainly in any attempt to generalize to the Malaysian industry as a whole).

Highlights of Key Findings

Generally, it is unsurprising that overall students were more familiar with Web 2.0 applications than staff. Among faculty, the Mass Communication and Business departments were clearly the more frequent and familiar uses of Web technology and Bloom’s digital taxonomy (both scored the highest in the first two categories). Remarkably, the Engineering department scored the lowest overall and is clearly the least responsive to Web 2.0 initiatives and potential.

Interestingly enough, one of the items the students ranked highest – fresh applications for learning – is also the item the staff ranked lowest(!). Could this reflect a greater eagerness of the younger generation of learners for novelty in learning and/or a reluctance on the part of academics to change how they teach? Quite strikingly, the staff too did *not* attach overtly huge relevance/importance to the Web as a source of rethinking learning(!).

It could be said that all the departments are positive about the implications of Web for tertiary education. Notable low-scores were the Hotel school regarding the Web *as a source of fresh learning* applications and the Engineering school on the Web *as a tracking/assessment instrument*.

With the Hotel school this may be expected given the very experience-oriented nature of the hotel and tourism industry – as yet there is no such thing as taking a vacation online. As for why Engineering faculty may not be keen on Web-tracking students' work, one explanation could be the nature of the assessments which usually involves working with electronic equipment, machines, their circuitry, etc.

The results of the management mirror tended to mirror those of the Hotel school (and the Staff's response), in that they were relatively unenthusiastic about new online learning applications. This is a rich item to explore as it raises many questions, e.g.:

- Why a low score *here* when the other categories scored relatively high?
- Were the high scores in the other areas due to the subjective, vague and abstract nature of the issues (e.g. 'rethinking learning', 'participatory learning'), whereas online applications have a definite (albeit virtual) element to it i.e. if the program hasn't been seen yet, then it's best not to be welcoming of it?

The staff was most positive about *collaboration* as a key factor in education, suggesting an openness to non-individualistic forms of learning. This resonates well with the above-par interest in rethinking assessments and the use of the Web in encouraging participatory learning. It is disappointing, however, to note that the overall staff response to *blogging* as a means of facilitating learning isn't enthusiastic.

Among the departments, some notable disinterest included the Pre-University department's take on global connectedness as a definition of learning. The Law department also appeared less than fully interested with embedding a cyber-component into the syllabus and providing free materials online.

Analysis & Recommendations

It needs to be stated from the start that, regardless of occasional concerns and lack of interest, overall both students and staff of KDU College have demonstrated a clearly *positive* attitude towards the Web and Web 2.0 as an instrument for the processing and performance of teaching and learning. If the college is at all representative of the Malaysian tertiary education, then the results would indicate much potential in this direction.

The results at least on the surface suggest that those who have a *higher* propensity to view Web 2.0 as an educationally-transforming phenomenon are also:

- those who spend more time online
- those who are more familiar with social media applications
- those with a *lower* academic qualification (in this case, Bachelor's degree and below)
- those who've worked for *fewer* years in education (in this case, less than 10 years)

Without extrapolating too strongly, based on the survey we could make the following recommendations to better nurture Web 2.0 into the spirit and operations of learning institutions in Malaysia:

i) The *Media & Mass Communication* departments should **lead the way in embracing Web 2.0** given the greater openness of the faculty to innovative forms of learning and the constant engagement with new media (which is almost by definition what Web 2.0 is). Given the culturally introspective nature of this area of studies and how difficult it is to draw the line between new media as syllabus, as learning activity and as cultural environment, the departments' students and faculty could be perfectly poised to spear-head projects and events which inform, instruct and infuse Web 2.0 into the consciousness of the organization. At this point, it is important to note that a kind of organizational 'action learning' (Rogers, 2007) may be required before productive implementation of Web 2.0 is witnessed.

ii) The *Pre-University* departments, should educational institutions have one, are also a community well-suited to **support experimentation and development in integrating higher learning with the latest in online social media and technology**. The comparatively less complex and more flexible syllabus may allow greater fluidity in using Web 2.0 applications (although the lesser-trained and generally less exposed students could work against this idea). Nevertheless, the relatively 'shocking' lack of change stimulated by blogging is a key area to address and if nothing else highlights the critical nature of implementation i.e. people may *say* they have a strong interest in something but unless their eventual (and on-going) experience with the item is productive, positive change might be slow in forthcoming.

iii) Disciplines which are skill-based, hands-on and which conventionally are *not* drawn towards emerging media (e.g. *Engineering, Hotel and Languages*) will need **longer preparation cum 'incubation' time before Web 2.0 is fully accepted**; and whilst it'd be certainly unwise to focus Web 2.0-related path-breaking efforts here, it may help to construct ways in which Web 2.0 applications may be embedded as part of the syllabus. This is to say that, given (what could be) a natural disinclination towards Web 2.0, students and faculty may have to experience its full-blown benefits before being willing to take further steps.

iv) From the perspective of specific faculty members, without at all alienating the more senior lecturers and professors, the results imply that revitalizing education with Web 2.0 may be an **endeavour best led by the junior members of staff and/or those with fewer years in education**.

v) From the perspective of the *students*, it may be prudent to **not introduce overly unfamiliar assessment techniques until a later phase.** This is to avoid the anxiety normally associated with passing and excelling in examinations and/or to help ease the transition to new forms of *testing* by first ensuring that students are accustomed to new forms of *learning*.

It must be duly noted that should an educational institution seriously embark on a Web 2.0 mega-project, there will be a need to manage the potential political backlash resulting from various departments and even 'classes' of faculty taking the front-seat. Nobody ever said change was easy.

*

Bill Gates, founder of Microsoft, once said that the Internet is the town square of the global village that is our world of tomorrow. If education is to play a key role in shaping the thinking and direction of this global village, this entails that schools and colleges have to do serious business with the Web and all that it offers and represents.

The phenomenon of Web 2.0 is an advent promising transformation for educational institutions willing and able to take bold steps to devise empowering faculty- and student- combinations of experience and experimentation to take their repertoire, *modus operandi* and service-offerings forward in to the future - both real and virtual.

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Title: Computer-mediated collaborative learning in large first-year STEM classes facilitating interdisciplinary scenario-inquiry tasks

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Intended audience and degree of expertise/past experience required

Lecturers, course coordinators and secondary teachers who have an interest in assessment of collaborative learning environments, particularly in large classes/sections, will find this session of great interest. Strategies for managing collaborative groupwork while evidencing individual contribution are shared including effective peer assessment. Participants who are interested in promoting interdisciplinary thinking in their STEM classes are also encouraged to attend. No past experience is necessary to engage in this workshop.

Statement of objectives for the workshop

Interdisciplinary scenario-inquiry tasks (IS-ITs) have been developed to both enhance engagement and address the diversity of abilities and interests common to large, undergraduate first year chemistry cohorts at UQ. Facilitation and assessment of these slef-directed tasks in large-enrolment courses is too complex and time-consuming for a single academic course coordinator to manage manually; hence, **i**nteractive **C**ollaborative **A**ssessment **S**ystem (iCAS – a computer-mediated task-management and assessment system) has been developed to achieve these processes. iCAS facilitates flexible group formation enabling promotion of student investment in both the process and outcomes of the task. Interdependency within groups has been generated by combining an individual research quest, which requires students to generate information files, with a collaborative challenge which relies on integration of all the individual sets of information to generate a collective product. The objectives of the workshop are to:

- engage participants in the pedagogical challenges of implementing tasks of this nature to maximize and measure learning outcomes.
- share strategies for group formation and interdependence.
- consider assessment of collective written products for evidence of interdisciplinary thinking and higher level learning outcomes.
- manage effective peer assessment and feedback through a task management technology.

Facilitators will lead collaborative activities and discussions to demonstrate the multiple factors that integrate to make these tasks viable including. Outcomes of this workshop will be provision of a model and resources that can be translated to other STEM disciplines and any class size

Detailed description

Implementation of group work in large classes (>500) presents challenges around task design, implementation, management and assessment. Computer-mediation enables group formation and function: student investment in both the process and outcomes of the task is promoted by allowing them to choose their preferred scenario topic and by providing the option for them to self-select into/or from their preferred groups. Interdependency within groups of four is generated by requiring each student to complete separate individual research quests to generate information files required by the whole group for the collective product. Individual quests have been constructed so that the collective outcome would be of lower quality if one of the four sets of information was missing. Once the collective product is submitted, the iCAS task management and assessment system directs students through two separate peer assessment domains: evaluation of the contributions of their own team members; and individual assessment of other group's products within the same scenario promoting reflective processes.
This workshop is structured to enable participants to explore and assemble the components of the task and gain insights into the factors that influence the learning processes and products. The sequence of workshop is proposed to be:

Introduction: engagement and orientation into workshop

Activity 1: Interdependency & Communication

- Participants will be engaged in an activity that generates evidence and demonstrates the role of interdependency in collaborative tasks.
- Facilitators will share common misconceptions of how students work collaboratively outside the classroom. Strategies for promoting interdependency in activities that progress outside the classroom will be presented.
- Discussion question: What are the inherent challenges in engaging students in formative assessment?

Activity 2: Interdisciplinary Thinking & Creativity

- This activity helps participants explore how individuals bring prior experiences and perspectives that combine to generate shared understanding and an interdisciplinary product. This activity is set in the context of 'Infinity'.
- Facilitators will introduce participants to assessment of the collective products of group tasks in terms of integrated ideas and higher order thinking (including exemplars of a range of student products).
- Discussion question: What options are available for assessing collective products of inquiry-based group work?

Activity 3: Web-Based Management of Collaborative Group Work

- Participants will be introduced to the characteristics of a successful collaborative student group through case studies and how to use related indicators to monitor group function.
- This brief activity includes a hands-on practical challenge that will engage participants in teamwork themselves.
- Participants will be introduced to the online peer assessment management tool that promote students' reflections on their own participation and develop their skills in professionally reviewing peer products.
- Discussion question: How can collaborative group work be sustained and evidence of individual outcomes within a group logged?

Conclusion

Brief reflection on the session, feedback and evaluation. Distribution of resources to participants including Interdisciplinary Scenario Inquiry Task Resource Handbook developed as part of the 2009 ALTC project 'IS-IT learning? Online interdisciplinary scenario-inquiry tasks for active learning in large, first year STEM courses' (CG9-1112).

An e-portfolio theoretical approach for Provisionally Registered Teachers

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Electronic portfolios offer an option for early childhood provisionally registered teachers (PRTs) to attest to the Registered Teacher Criteria (New Zealand Teachers Council, 2010) through the purposeful selection and reflection of significant artifacts about their practice. Central to the use of e-portfolios is the theoretical framework developed to support the learning process for the PRTs. This paper outlines an e-portfolio project for a group of early childhood PRTs and their mentors, from a cohort of five Early Childhood Centres in the Auckland region. The project drew upon key principles from the early childhood curriculum Te Whāriki (Ministry of Education, 1996), pedagogical documentation, and e-portfolio best practice. The project's intention was to create a more effective approach for teachers to engage in the provisionally registered teachers programme, enabling a rich narrative of the teacher's pedagogical research to be profiled rather than being a repository of evidence.

Keywords: e-portfolios, provisionally registered teachers, early childhood education**,** pedagogical documentation

Background

While e-portfolios existed as early as the 1990's, only in the last decade have they have become significantly widespread within educational settings, both in New Zealand and internationally (Fox, Britain & Hall 2009; JISC 2008). This recent and rapid evolution of e-portfolios has enabled educational institutions to adopt the technology for a range of purposes. E-portfolios are often positioned as either a *product* whereby focus is placed on the final presentation or completion of the e-portfolio, or as a *process,* which shifts the focus to the designing and building of an e-portfolio (Barrett, 2011). Tensions exist between the two approaches: the first often seen as an institutional tool for accountability purposes, and the tracking of student's progress; and the latter drawing attention to the learning journey, that supports a more learner centered approach of learner autonomy and reflection.

The challenge for many educational institutions is balancing external motivators, such as grades and required learning standards with the more pedagogically focused framework that promotes greater learner ownership and autonomy (Stefani, Mason & Pegler, 2007). Learners need clear guidance around the learning intentions and assessment expectations, and at the same time be given agency of their e-portfolios. Rather than a *tick box* compliance model, e-portfolios must support a holistic approach that is meaningful and authentic. This is essential in enabling learners to engage in life long learning, and to continue to incorporate their e-portfolios in future learning opportunities that are embedded and integrated in their professional practice.

For many educators, authentic learning takes place for students when greater emphasis is on the "rich and complex processes of planning, synthesizing, sharing, discussing, reflecting, giving, receiving and responding to feedback" (JISC, 2008, p. 6). On this premise many Teacher Education programmes have adopted the use of e-portfolios as a learning approach to promote students' inquiry and reflection (Shepherd & Skrabut, 2011). For example, in recent years at the Faculty of Education, The University of Auckland, e-portfolios have been used as both a place for students to engage in critical reflection in their course work and practicum placements, and as a receptacle of evidence that they attest to the *Graduating Teacher Standards*. Through the use of e-portfolios graduating students have the ability to demonstrate their learning by drawing on a range of significant artifacts that they can continue to use and reflect upon as practicing teachers.

E-portfolios are also becoming more widely explored as a learning tool for New Zealand registering teachers to meet their registration criteria. This paper describes an e-portfolio project that brought together a cohort of centres to implement the use of e-portfolio to 20 PRTs, who were all at varying stages of the registration process. The intention was to create an integrated e-portfolio approach that enabled teachers to authentically investigate their areas of learning, as well as attest to the *Registered Teachers Criteria* laid out by the Teachers Council (NZTC, 2010). An e-portfolio theoretical framework and approach was developed that aligned e-portfolio best practice and drew from the underpinning principles of *Te Whāriki* (MoE, 1996). It also included the notion of pedagogical documentation that provokes teachers to reflect on their practice through the documentation of children's learning experiences in relation to the *Registered Teacher Criteria* (NZTC, 2010).

The e-portfolio platform chosen for this project was MyPortfolio, which was established by the Mahara project as a collaborative venture funded by New Zealand's Tertiary Education Commission's e-learning Collaborative Development Fund in 2006 (Mahara, 2012). MyPortfolio provides a learner centred environment that is both flexible and easy to navigate, and promotes the integration of digital media and online learning tools. The collaborative features within MyPortfolio supports strong engagement for an online community of learners. A critical component of the software is the ability to easily share e-portfolio pages to selected audiences and to receive feedback within a variety of forums. The MyPortfolio technology enabled the PRTs to develop autonomy and agency of their e-portfolios and aligned closely with the aims of the project.

Literature Review

Pedagogical Documentation

Pedagogical documentation and assessment of children's learning is a core component of teaching and learning in early childhood education (Felstiner, Kocher & Pelo, 2006; MoE, 1996). Pedagogical documentation is considered as a way of making learning (and teaching) processes visible to children, their families, teachers, and the broader teaching and learning community. This documentation of children's learning includes artifacts such as photographs and narratives that illustrate a particular experience, exemplars of children's work, video clips or transcripts of engagement. The inclusion of the teachers' reflective commentary and voice moves the documentation into a more purposeful and meaningful process. Rinaldi (1998) proposes that "[pedagogical] documentation makes it possible for teachers to sustain children's learning while they also learn (to teach) from the children's own learning" (p.120).

The focus on pedagogical documentation in early childhood education in New Zealand, has in part, been influenced by the pedagogy of the Reggio Emilia early childhood centres in Italy (Carr & Lee, 2012), alongside the early childhood assessment for learning exemplars *Kei Tua o te Pae* (MoE, 2004). Rinaldi (2006) emphasises the value of pedagogical documentation "as a tool for recalling; that is, as a possibility for reflection" (p.63). Millikan (2003) also claims that pedagogical documentation provides for many inherent possibilities such as "leading an inquiry forward, being a tool for children's own reflections, enabling parents to view and contribute to the process of children's learning, for teachers' professional development, and as an advocacy for children" (p. 102). The multifaceted nature of pedagogical documentation helps teachers to understand how young children learn and how they can respond in an intellectually engaged way. As part of this process teachers must ask themselves what image of the child is being portrayed through the documentation and what theories of teaching and learning the documentation may be implicitly reflecting. When pedagogical documentation is viewed in this way, it can cause teachers to more critically review their practice and the opportunities for enriching children's learning (and teachers' teaching).

A significant component of pedagogical documentation is the teacher's own reflective text or commentary. Gandini and Goldhaber (2001) believe the process of documentation can be catalyst for change causing early childhood teachers to see themselves differently thus, "expanding their identity from nurturer and caregiver to include theoretician and researcher" (p. 143-4). That said, without the addition of the teacher's "reflective commentary" the artifacts on their own, only tell some of the story (Felstiner, Kocher & Pelo, 2006, p.57). The documentation therefore serves the purpose of not only highlighting children's learning experiences but the underlying work of teachers. Rinaldi (2006), sums up, “When you take a picture, or you make a document, in reality you don’t document the child but *your* knowledge, *your* concept, *your* idea (p.196).

E-portfolios

Throughout the literature there are numerous definitions and descriptions of an educational e-portfolio. Themes about learner autonomy, reflection, and online collaboration are among the key benefits identified in the use of e-portfolios (Fox et al 2009). According to Banks (2004), e-portfolios are a place for students to reflect on their learning as well as a place to record and celebrate their achievements and goals. He advocates the potential for e-portfolios to re-purpose information so that it can be presented and shared to different audiences and transferred across different systems. Barrett (2011) promotes e-portfolios as a space to authentically voice stories, enabling learners to reflect on their personal learning journey, and to share their insights with chosen learning communities. JISC (2008) also describe the e-portfolio as learner driven in a space where students’ learning and achievements are demonstrated by a collection of artifacts. JISC (2008) acknowledge the learning journey that accompanies the creation of the product and highlight the importance of engagement and reflection as integral to the learning process.

An e-portfolio process enables learners to reflect at each stage of their learning. In particular learners must reflect carefully about their selection of individual artifacts, as well as on their e-portfolio learning journey (Barrett, 2011). A key component throughout the e-portfolio process is the sharing and engagement with others, whereby formative feedback from peers and mentors can take place within online communities of learners. DiBiase (2002) outlines an e-portfolio process that can be described in five key stages. Each stage is intertwined with the other and provides a framework for learners to progress through their e-portfolio journey. The stages include;

- Collection: teachers and students save artifacts that represent achievements in their learning and practice (i.e. reflections and assignments).
- Selection: teachers and students review and evaluate materials that are significant to their learning goal.
- Reflection: teachers and students provide reflective commentary on their selection of artifacts.
- Projection (or Direction): teachers and students review their current achievements or learning outcomes with key criteria.
- Presentation: teachers and students share their portfolios with teachers and peers to celebrate their learning.

The scope of e-portfolios in tertiary institutions has been more recently extended by the development of Web 2.0 technologies (Roder & Brown 2009). Tools such as blogs, discussions, wikis and RSS feeds have fuelled a significant increase in online social networking over the last five years. Strong collaboration and engagement amongst social networks spaces enable users to engage in creative and collective authorship (Shepherd & Skrabut 2011). Barrett (2011) explores the boundaries between e-portfolio development and social networking and acknowledges the large impact it is having both on our social and political world. She advocates the use of social networking with e-portfolios to increase students’ intrinsic motivation. Social networking tools are similar to e-portfolios in that they promote interactivity and collaboration through “connecting or “friending”, listening or reading posts, responding or commenting and sharing through linking or tagging” (p. 7).

E-portfolio Project

This section provides a descriptive overview of the theoretical framework and e-portfolio approach that was developed for a cohort of early childhood provisionally registered teachers (PRTs). The approach and processes described have been drawn directly from the documentation provided for the implementation of the PRTs e-portfolio project. A research study will follow to capture the teacher’s experiences and depth of e-portfolio engagement throughout the registration process.

Theoretical Framework

The development of a theoretical framework prior to the implementation of the e-portfolio was an essential component to the e-portfolio approach. In the absence of a clear understanding of this framework by teachers, the e-portfolio risked becoming a repository of information, rather than a rich narrative of the teacher’s pedagogical research. Orland-Barak’s (2005), e-portfolio research, cautions against the popular view that, “the mere construction of a portfolio automatically yields critical levels of reflection on action" (p.41). Therefore, a strong framework was needed to equip teachers to investigate their learning with a greater sense of purpose and value in the e-portfolio reflective process.

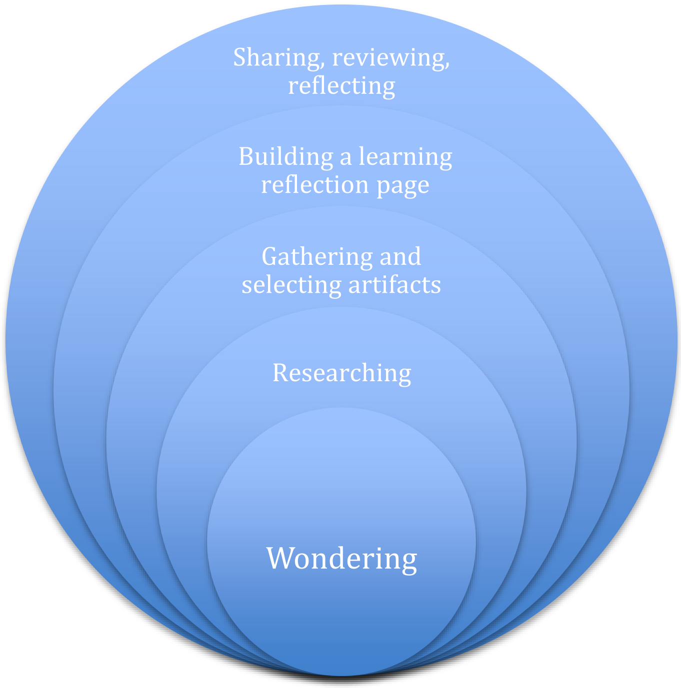
Underpinning the framework is the early childhood curriculum *Te Whāriki* (MoE, 1996). There are four foundation principles within *Te Whāriki* (MoE, 1996) that provide valuable reference points for teachers when engaging in the e-portfolio process. The interwoven nature of these principles is likened as a whāriki, or mat, whereby each early childhood context weaves their own distinct patterns of curriculum creating a unique and contextualised interpretation. *Empowerment-Whakamana* advocates for early childhood education services that enable young children to develop a sense of self-worth and identity. *Holistic Development-Kotahitanga* provides a model of learning that brings together all aspects of the child and their experiences. *Family and Community -Whanāu Tangata* emphasises the importance of the integral role that family and community play in early childhood education and in young children's learning. *Relationships-Ngā Hononga* promotes learning environments where responsive and reciprocal relationships with people, places, and things are established (MoE, 1996).

A critical goal of the *Registered Teacher Criteria* (NZTC, 2010) for all teachers regardless of the sector, is to provide an "aspirational framework of continued professional learning and development that will impact on the learning outcomes of children" (p. 2). The criteria outlines, four overarching statements that guide and inform the criteria themselves and underpin the professional dimensions and indicators. This document is designed as a description of the criteria and to provoke professional dialogue between teachers and mentors.

Central to the theoretical framework was the notion of pedagogical documentation that enabled teachers to reflect on their own practice through the documentation of children's learning experiences (Rinaldi, 2006). Although the primary purpose of the documentation is the child's learning, inextricably intertwined within this process is the ability of the same documentation to reflect the quality and nature of the teaching and learning relationship. Rinaldi (1998) proposes that "[Pedagogical] Documentation makes it possible for teachers to sustain children's learning while they also learn (to teach) from the children's own learning" (p.120). Teachers may ask themselves questions such as; what image of the child is being portrayed through their e-portfolio? What do the artifacts selected say about their values and beliefs about teaching and learning? How might their e-portfolios inform them to more critically review their practice? Through this process of developing and reflecting on the their e-portfolio the teacher's documentation can be a catalyst for change causing early childhood teachers to see themselves differently thus, "expanding their identity from nurturer and caregiver to include theoretician and researcher" (Gandini and Goldhaber, 2001, p. 143-4).

A Cyclical Approach

A cyclical approach was required to ensure an active and dynamic, reciprocal process that was responsive and reflective, provoking further opportunities (and wonderings) for teaching and learning. Positioning teachers as researchers was a critical component to the cyclical approach. Teachers were encouraged to employ principles of action research that supported a collaborative approach to learning, through actively enquiring, reflecting and co-constructing new knowledge in a cyclical nature (Milton-Brkich, Shumbera & Beran, 2010). This process allows teachers to research in an iterative way, engendering a spiral approach of new learning and new action generation. Punch (2005) considers that "the spiral of cycles of self-reflection, involving planning, acting and observing, reflecting, re-planning and so on, has become a dominant feature of action research as an approach" (p 162). The processes outlined below support teachers to define and refine their evolving understandings rather than as a linear formular to follow.



Cyclical Approach

Figure 1: Processes to developing an e-portfolio through a cyclical approach

Wondering
Developing a wondering is the first critical stage in articulating an interest for further action research (Dana and Yendol-Hoppey, 2009). The concept of a wondering aligns with the early childhood education assessment for learning process of "noticing, recognising and responding", whereby teachers search, in collaboration with children for possible directions and opportunities for teaching and learning, in response to children's interests (Ministry of Education, 2004, p. 6). In this initial stage, teachers are encouraged to notice, recognise and respond to a teaching and learning moment(s) that has captured or provoked their thinking. The wondering provides a guide for the PRTs to focus their research on a particular area of intrinsic interest. It is carried out in collaboration with a mentor and in the context of their early childhood centre. An exemplar of a wondering description called Making Learning Visible through Visual Art was provided to PRTs as outlined below.

> My wondering began when my conversations with a child were significantly enriched through her visual artwork. I began to realise that through visual arts children could articulate their own stories and working theories more deeply - making their learning visible. I wondered how often as teachers we in avertedly privilege the verbal and pay lip service to other forms of communication, missing or not hearing the many languages children use to communicate with. In this learning reflection page I am seeking ways to understand how in my practice I can incorporate visual arts more effectively as a means for children to tell their stories and express and represent their own understandings of their worlds, enabling me to listen more closely through these different visual mediums.

Researching
A key component for teachers researching their area of interest is the analysis of documentation of children's learning experiences in order to capture their own pedagogical understandings in their research. The creation and examination of documents allows teachers to investigate in greater depth, promoting meaningful reflection and evaluation of authentic learning experiences. Through the lens of their wondering, teachers undertake critical conversations with their peers and mentors, seek professional learning opportunities and source literature to inform their research. The documentation from their research becomes artifacts that can be selected for the teachers'

learning reflection page. Examples of artifacts may include;

- Critique of significant literature
- Learning stories (individual or group)
- Reflection or journal entry (i.e. a parent or whanau meeting, professional learning events, mentor meeting)
- Sequence of photos showing children's learning experiences
- Links to relevant websites and resources
- Photos of a resource identified at another centre
- An audio recording of a dialogue between children / teachers
- A video of children's engagement with the environment (i.e. a nature walk)
- Parents feedback on their child's portfolio

Gathering and selecting artifacts
When early childhood teachers make decisions about what to include or highlight in a learning story, they use their own pedagogical understandings to inform their selections. The same premise applies for teachers selecting artifacts for their e-portfolios - deliberate decisions about selection are based on teaching understandings and reflection on individual learning journeys. Teachers must carefully reflect on their chosen artifacts to critically review their practice, and enrich the opportunities for children's learning (and teachers' teaching). Throughout the process of selection, teachers may ask themselves the following questions;

- What concept or idea does this artifact reflect?
- What is the purpose or significance of this artifact for my (and children's) teaching and learning?
- How does this artifact reflect a competent and confident image of children?
- Does this artifact reflect a critically reflective teacher?
- In what way does this artifact develop my understandings in relation to my wondering?

Building a learning reflection page
An e-portfolio is made up of a number of learning reflection pages that are developed throughout the registration period. Each learning reflection page is built over time and involves drawing upon significant learning experiences to illustrate a deeper and more developed pedagogical understanding. The building process enables teachers to continually critique and refine the content and understand the overarching sense and meaning the page may reflect. It also engenders opportunities for the teachers to revisit their professional practice and engage in deeper meaning making of these significant experiences.

The building stage is both a creative and reflective conceptual process that requires the learner to draw their individual artifacts and reflective commentaries together as a cohesive entity through the lens of their wondering. While teachers continue to make careful decisions around their selection and placement of their artifacts, a pivotal component of their page, are the *reflective commentaries* that are written to accompany their artifacts. These personal reflections provide a further layer for teachers to make their learning (and teaching) processes visible and through their own *voice* demonstrate both the complexities and depth of their learning, in relation to the *Registered Teacher Criteria* (NZTC, 2010). Without the addition of the teacher's reflective commentary, the significance and purpose of the artifacts are often lost. The following example of a reflective commentary was provided to the PRTs.

> I selected these artifacts [teachers observation, sequence of photos, parents voice], as they show my deepening understanding of what it means to 'listen' more closely to children. Previously I thought I was listening to children but was I really 'hearing' what children were saying? Did my own underlying or hidden agenda channel the children's ideas and perspectives into directions I valued and preferred, rather than being open to the different views and ways of being and seeing, children present? Listening involves hearing and responding to the "hundred languages" children use to communicate and express themselves as they engage with people, places and things (Rinaldi, 2006, p.60). I have a professional responsibility to understand the complex social and cultural influences that impact on teaching and learning thereby being able to interpret the unique ways children make their thinking visible (NZTC, 2010). This is an ongoing area of practice that I need to continue to strengthen and explore as I continue my professional journey.

Figure 2*: Example of a Learning Reflection Page showing a variety of artifacts and reflective commentaries*

Sharing, Reviewing and Reflecting

Peer formative feedback occurs throughout the e-portfolio process and is a critical component in promoting greater collaboration, reflection and co-construction amongst a community of learners. Collectively through their inquiry process and engaging with each other, teachers become "active participants in making meaning, and to see learning as initiated by understanding" (Aulls & Shore, 2008, p. 93). New perspectives offer renewed knowledge and can help teachers see what is sometimes familiar and obvious, from a different slant (Filippini, 1998).

A final presentation before a chosen audience is encouraged as a way to celebrate the teachers learning journey and accomplishments within their wondering. Teachers draw upon their e-portfolios to demonstrate their learning by providing authentic learning examples that have developed from their professional practice. Barrett (2011) describes the importance of the presentation as a public commitment, not only to receive meaningful feedback from colleagues, but also to provide motivation for learners to carry out their portfolios.

Mentors also work alongside the PRTs to provide support and guidance throughout the process. At the completion of each learning reflection page the mentor reviews the selected artifacts and reflective commentaries with the teacher. Teachers must be able to articulate and demonstrate, through selected artifacts, the links between their learning and the *Registered Teacher Criteria.* Critical conversations are required to ensure that the registering teacher receives formal and documented feedback on their professional practice, which also enables valuable feed forward for planning the next learning reflection page and further directions for practice.

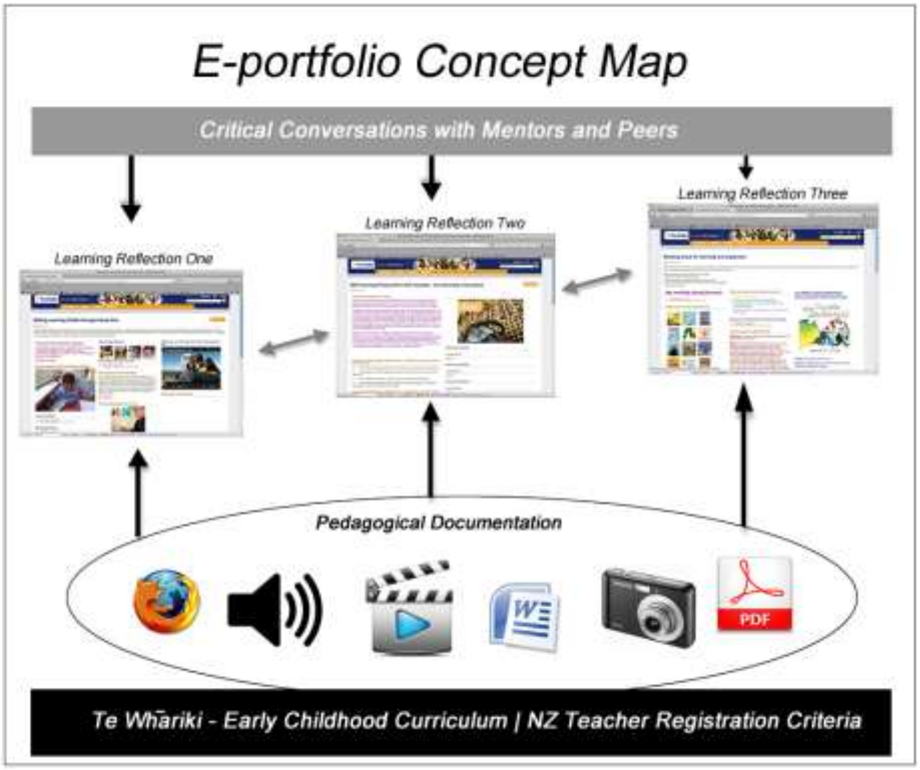


Figure 3: A concept map illustrating the components in developing an e-portfolio

Conclusion

The use of e-portfolios is an effective tool to enhance teachers' professional learning and to attest to the requirements of the NZ *Registered Teacher Criteria*. This project drew upon key principles from the early childhood curriculum *Te Whāriki* (Ministry of Education, 1996), pedagogical documentation, and e-portfolio best practice. It sought to foreground an e-portfolio theoretical framework and approach created for a group of early childhood PRTs. The approach was developed to promote the use of e-portfolios in a more sustained and meaningful way, enabling teachers to continue its use for their future professional practice beyond the registration process. This was critical in supporting teachers to reflect and critique on their professional practice, and to develop greater learning connections and pedagogical understandings over time.

The e-portfolio approach outlined in this paper has placed greater emphasis on the *process* of creating an e-portfolio rather than the final *product.* However, it is the learning process that enables teachers to demonstrate a deeper level of thinking and learning in their product. Through the careful selection of significant artifacts, the reflective commentaries and critical conversations, links to the *Registered Teacher Criteria* (NZTC, 2010) become inherent in the e-portfolio product. Teachers engage in a journey to further their professional growth and gain new understandings about teaching and learning, rather than centering on a compliance model to meet specific standards.

To conclude, e-portfolios offer teachers the opportunity to take their learning into the future. When teachers engage in experiences that have meaning, and provoke further inquiry, they are more likely to sustain that engagement long term. The ultimate aim for teachers, when engaging in the e-portfolio process, is to improve professional practice and the educational experiences and outcomes for children. The creation of thoughtfully constructed e-portfolios provide PRTs a unique opportunity to "listen again, to see again, and therefore to re-visit the experiences of children" (Filippini, 1998, p.132).

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Pigeon pecks and mouse clicks: Putting the learning back into learning analytics

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Learning in higher education can be described as a series of complex tasks and stages of development requiring a range of multifaceted behaviours and ways-of-being. Understanding what contributes to teaching for quality learning and achieving quality learning outcomes in higher education has been the topic of much debate over many decades. The current paper intends to situate and contextualise learning analytics (LA) within a broader debate on quality and student experience, outlining the affordances and constraints of this data-driven approach to quality. Firstly, we acknowledge the current use of LA within higher education and early research outcomes reported within the literature. Secondly, drawing on our combined disciplinary knowledge within experimental psychology, health informatics and health science education, as well as our current roles within quality and student experience at our respective universities, we pose some directions for enhancing and building on current approaches to understanding and using LA in the higher education context.

Keywords: learning analytics, quality, student experience

Introduction

What is the purpose of higher education? Is it to train the next generation of professionals to be job-ready? Is it to contribute to public debate? Is it to contribute to the private good of graduates by increasing their earning potential or is it to produce morally and intellectually capable citizens with a capacity for critical thinking and solving the problems facing humanity in the 21st century? We argue that it is a mixture of all of these aims. What then are we to make of the current approaches to ensuring that, as institutions, we continue to achieve or at least aspire to these ends? In this paper, we intend to situate new approaches to understanding and tracking student development within these wider aims. Our intention in doing so is not to heap empty criticism onto learning analytics but to present for consideration a way forward in realizing the potential of analytics in the context of developing students as human beings.

Devlin, Brockett and Nichols (2009) suggest that the best way to ensure that universities are meeting their aims is to examine the quality of the learning experiences of students as they engage with their studies. Despite substantial advances in technology and methods for understanding learning in the higher education setting, there remains conjecture as to how quality learning occurs and how best to measure it (Krause, 2012). From a cognitive science and educational psychology perspective, classroom learning is an illusive and difficult to accurately operationalise phenomenon (Richardson, 1987). The approach to understanding learning in this context usually adopted by educational research, on the other hand, has been criticised for being less than rigorous (Slavin, 2008). Although there is substantial distance between the approaches and epistemology underlying these disciplines, there is general agreement that reductionist approaches to assessing quality learning are limited in their potential for explaining the value-add of higher education (e.g. Hussey & Smith, 2010). When viewed holistically therefore current evidence-based approaches to learning and teaching are lacking with neither laboratory research or classroom studies able to explain the process of learning from curriculum to neuron. Projected from the individual to the institutional level, understanding whether universities are indeed providing quality learning experiences across the gamut of disciplines becomes increasingly problematic.

The complexity associated with attempting to understand quality learning is thus problematic enough without the added complication of increased use of technology in this context. While technology introduces clear benefits and risks, the potential for tracking online engagement, integrating previously separate datasets containing information about students, is a trend that appears to be growing unabated (Seimens, 2012). The use of these approaches raises some concerns within the broader range of factors that serve as indicators of quality learning. The reductionist approach to what is a complex phenomenon is akin to behaviourist approaches used to understand learning in the 20th Century. Are we at risk of treating learning in a higher education context as being analogous to a rat pressing a lever? Yes as we can 'measure' it, or no, as it does not make meaning out of complex notions such as learning in adulthood, learning for professional preparation, learning as research training, learning as development and growth, learning as being-in-the-world? What we are suggesting here is that current data-driven models under evidence-based approaches offer decontextualised data from a range of sources, primarily tracking data from online platforms and systems. What may this add to our understanding of the student learning journey as well as predicting student learning outcomes? Where is the personification and profiling of the individual within aggregated clumps of digitally derived data? We must take the complexity of student learning into account just as the reductionist approach to learning encapsulated in behaviourism was brought to account. The real power and potential of learning analytics is not just to save 'at risk' students but also to lead to tangible improvements in the quality of the student learning experience.

Learning analytics: tracking for quality or quantity?

While the use of learning analytics to track and predict student success in higher education is rapidly becoming mainstream practice in higher education institutions, it is predominantly being used to predict and prevent student attrition. For example, Macfadyen and Dawson (2010) report on an 'early warning system' that utilises a tool for tracking interaction with a learning management system (LMS) to determine which students are not engaging with online material and with each other within the virtual learning space (VLS). Macfadyen and Dawson present a study conducted at the University of British Columbia (UBC) where student interactions within the BlackBoard Vista LMS were tracked and modelled. Student interaction is tracked on a number of dimensions including time online, number of mail messages sent and received, files viewed and visits to the gradebook etc. Within the context of LA, although this kind of tracking is not new, the authors argue that using this data to model/analyse online relationships is new and allows for a more complete picture of student engagement. Macfadyen and Dawson further claim that the resulting model is a powerful predictive tool able to explain 30% of variance in overall grade and can identify with 81% accuracy students who will fail (2011, p 588).

Although there is some face validity to the claims being made by Macfadyen and Dawson (2010) and the model proposed in their paper looks to be useful in assisting students through early intervention, there are a number of issues with the approach. The tools themselves have evolved from analytics used in management and marketing (Baepler & Murdoch, 2010). Common uses of analytics in the commercial world are to predict consumer behaviour and decision-making in order to virtually influence purchasing behaviour, a behaviour less complex than those associated with student learning and attrition from university (e.g. Yorke & Longden, 2004). In rationalising the use of marketing tools in education, Macfadyen and Dawson concede the argument made by Goldstein (2005) that the usefulness of LA in learning and teaching practice has received little attention but there is no suggestion as to why. They argue instead that the increasingly diverse mix of students and underutilisation of these tools justify the presented research. However, a critique of their justification alludes to reasons why LA has not been more broadly embraced. This justification is supposedly based on social constructivism as the theoretical foundation for the research. They suggest that their approach can accurately gauge the engagement of students in a 'learning community' and that this places the framework within the social constructivist literature.

The research on learning communities and student engagement both suggest a complex interaction of factors including the physical, virtual and practical contribute to student success (Zhao & Kuh, 2004). Laird and Kuh (2005) have conducted extensive research based on the National Survey of Student Engagement (Kuh, 2001) and found that tracking student interaction with information technology adds little to existing measures of student engagement. Holley and Oliver (2010) also suggest that even the best designed and most well intentioned e-learning environment cannot effectively address the diverse issues students have as they attempt to progress through university. By the same logic, it is not possible to use a measure of interaction with these environments as an all-encompassing way to predict which students are likely to have problems and which students are effectively engaged with their studies.

In addition to the broader issues around student engagement, LA is limited in terms of the capacity to capture the important distinction between deep and surface learning (Buckingham Shum & Deakin, 2012). Although more time on the learning management system may correlate with higher grades, this may reflect a strategic rather than a deep, lasting engagement with the content and body of knowledge and that is reliant on the contested idea that learning can be categorised cleanly into one of three categories: deep, surface or strategic. Regardless of whether these categories are useful in understanding student behaviour or not, Biggs (1999) argues, in what has become all but a cliché, that the focus for higher education should be on what the student does rather than what the teacher does. Although it is evident that LA is indeed assessing what the student does online, these tools are simply too blunt to be able to separate those students taking an approach that will maximise their chances in the assessment, from those who genuinely engage with the material in a deep and critical way. Although the distinction between surface and deep learning is itself limited for understanding student approaches to learning and that the sum of student learning experiences are far more complex, there is sufficient evidence that deeper approaches to learning lead to better student outcomes (Prosser & Trigwell, 1999). LA is unable to elucidate the student approach to learning, relationships between apparent levels of engagement online and overall student experiences, and is therefore limited as a measure of the process and pathways students may undertake to complete their learning, let alone for higher cognitive processes or ways of being.

The approach currently being adopted in the implementation of LA, with some notable exceptions (e.g. Leece, 2012) is more akin to a behavioural theory of learning than any within the social constructivist realm. Bates and Poole (2003) suggest that, although there is some use for a behavioural approach to learning and much was clearly gained through the work of Skinner (e.g. 1948) and other behaviourists, these approaches to learning do not provide a complete account of what happens in higher education and through technology-mediated, networked learning environments. Laurillard (2002) also points out that a constructivist approach relies on understanding how students interact with the world and with knowledge. The emphasis here is on ‘how’ and not ‘how much’ as appears to be the nature of the data collected using LA.

One notable observation from LA is that the amount of interaction on a learning management system does not necessarily lead to higher grades for all students. Other researchers who advocate the use of academic analytics have also raised this issue. For example, Beer, Clark and Jones (2010) admit that, despite their substantial accumulation of data from their learning management system, there is a large amount of variation between individuals. This variability highlights the major flaw in the argument for academic analytics: not all students interact with information in the same way. The amount of time students spend on the LMS is not an indication of deep or surface learning.

Despite the clear problems with using a behavioural measure for understanding complex social and cognitive processes, LA is clearly not without value. Macfadyen and Dawson (2010) conclude by arguing that the real significance of their study is in the predictive power of LA. Given the current federal government’s agenda of 40% of 25-34 year old with at least a bachelor degree by 2025 (Australian Government, 2009), there is some use for LA in identifying students who are not engaging or are engaging very little with the learning management system because more ‘non-traditional’ students will be entering higher education over the next decade. Based on the observation that this is a simple behavioural measure, it is of concern to see this being touted as a measure of student engagement and success beyond being a blunt indicator. With an increasing emphasis on teaching and learning quality in higher education, this measure is not suitable for assessing quality because it fails to capture a myriad of factors that contribute to student success (see Tinto, 2012). Although there may be benefits in using these tools to identify students who are at risk of attrition, they are currently of little use in ensuring quality and should not be promoted as being able to.

A future for learning analytics

Ultimately, there is a clear need for tracking student engagement as class sizes increase and demands on student and faculty time and attention become more pressing. This argument has been reflected many times in the literature (for instance, James, Krause & Jennings, 2010). LA does provide a tool for assessing a level of interaction and therefore have merit as a broad indicator of students who might be struggling. Despite this, it is evident that LA contributes as much to the understanding of student engagement as did Skinner’s (1948) pigeons to human learning in general. Strict behavioural data such as this lacks the power to contribute to the understanding of student learning in a complex social context such as higher education.

What then is the future of LA in this context of complexity and the need for ensuring quality? We argue that, as with any indicator such as surveys of student satisfaction, LA could become more useful than for managing attrition if it is understood within context. When contextualised within a broader set of indicators, the predictive and diagnostic affordances of LA do indeed provide some ability for understanding student behaviour. As we progress further into the 21st century, it will become less difficult to objectively assess student thinking in ways that are currently prohibitively expensive or unimaginable. The idea of quality learning is going to shift markedly and will necessitate radical revision of the models and learning theories underpinning higher education. We argue that the learning sciences and informatics, in particular, will be at the forefront of these revisions. Our aim with this paper was not to debunk LA as a valid approach to understanding and enhancing the student learning experience, nor was it our intention to single out Macfadyen and Dawson (2010) for particular criticism, we could have just as easily chosen from dozens of other studies on LA. Our hope with this critique is that LA will grow from its current foundation to become part of a larger suite of indicators of quality student learning built on multidisciplinary collaboration, much like that evident in the health sciences. The mining of datasets will continue to provide interesting and useful information about patterns in student behaviour, the future challenge is to better understand patterns in student being, thinking and metacognition, factors that lie at the core of the purpose of a 'higher education'.

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Student views on how role-playing in a virtual hospital is distinctively relevant to medical education

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Virtual worlds have the potential to enact the experiential learning of professional practices in simulated environments. The Otago Virtual Hospital (OVH) is one such virtual world where medical students role-playing as junior doctors make diagnoses and manage realistic clinical cases. To integrate the use of virtual worlds into existing curriculum, their distinctive relevance needs to be determined. A case study was conducted to find out how role-playing in the OVH is distinctively relevant to medical education. Following a trial involving 11 medical students completing the same scenario, three areas of relevance were identified: "making the call"; self-organisation; and "going through the whole process". These areas can provide guidance to educators and staff developers who plan to recommend and sustain the use of virtual worlds in fields such as medical, legal, and management education.

Keywords: virtual worlds, technology integration, medical education

Introduction

> Interviewer: But you guys are busy people, why would you spend two hours in one [virtual] scenario like this?
> Medical student (fourth-year): Can't, can't get it anywhere else. Can't get that same experience. I mean, the [physical] wards are great and you get a lot of time with patients, but you don't get the responsibility. Basically making the decisions.

While medical educators agree on the dangers of allowing fourth-year medical students to make decisions that directly affect a real patient, we continue to debate when and how medical students should learn clinical decision-making safely during their medical education. Avatar-based three-dimensional (3-D) virtual worlds offer a promising way forward: medical students role-playing as doctors could make clinical decisions and live through the consequences of their actions in such simulated environments (Boulos, Hetherington, & Wheeler, 2007). In this paper, we provide empirical evidence on how role-playing in a particular virtual world is distinctively relevant to medical education, with a view to incorporating avatar-based virtual worlds within the current medical curriculum.

The increasing interest to harness virtual worlds for education is reflected in the number of special issues published on the topic in recent years (e.g., de Freitas & Veletsianos, 2010; Lee, Dalgano, & Farley, 2012; Twining, 2010). Accompanying the trend are numerous conferences around virtual worlds for learning (e.g., 5th Virtual Worlds Best Practices in Education Conference, 2012; 2nd Experiential Learning in Virtual Worlds Conference, 2012).

Among the numerous publications on the topic are studies that identified potential uses of 3-D virtual environments by surveying existing teaching practices. The uses range from the delivery of virtual lectures to geographically-disparate students, virtual conversations between foreign language students and native speakers, to the experimentation of gender / ethnic identities. A common use identified by three studies (Dalgarno & Lee, 2010; Hew & Cheung, 2010; Salmon, 2009) is the enactment of experiential learning in virtual 'off-campus' locations (e.g., students role-playing as archaeologists in virtual monumental sites, as lawyers in virtual courts). Experiential learning—'learning by doing'—emphasises students' bodily activity *in situ*, their deliberate reflection on and reconstruction of the experience, thus upholding "the organic connection between education and personal experience" (Dewey, 1938, p. 25). In the same vein, our work around the Otago Virtual Hospital

(OVH) is underpinned by the learning of clinical practice via student participation in and reflection on clinical practice, all within a safe environment.

The OVH

The Otago Virtual Hospital is a 3-D virtual hospital in which medical students role-playing as junior doctors make diagnoses and manage realistic clinical cases within the Emergency Department. Using their avatars, students are able to move around the hospital, communicate with patients, relatives and peers via text chat (see Figure 1 and the two-minute video at http://bit.ly/xZ0Net), perform a 'physical' examination of patients (e.g., clicking on the patient's chest allows students to listen to a series of heart sounds), order laboratory and radiology tests (e.g., CT scan of patient's head), check the results of those tests, prescribe from an extensive range of medicines, and write patient admission / discharge / handover notes. The OVH is built on the OpenSim-based New Zealand Virtual World Grid (http://www.nzvwg.org/).

Figure 1: Medical students role-playing junior doctors taking patient history

Experiential learning is a key modality of medical education within the Otago Virtual Hospital. Many medical educators have speculated that virtual worlds are appropriate for the experiential learning of clinical practice (e.g., Boulos, Hetherington, & Wheeler, 2007; Hansen, 2008; Stott, 2007). However, we recognise that experiential learning can be enacted in multiple ways (e.g., during clinical attachments in brick-and-mortar hospitals) and must give sound pedagogical reasons to recommend the use of virtual worlds over other ways (Loke, in press). Hence, in order to recommend and sustain the use of the OVH in existing medical curriculum, we need to determine its distinctive relevance (Roblyer, 2009).

To ascertain the effectiveness of experiential learning in virtual worlds, many studies have measured the changes in learning outcomes such as level of inquiry (e.g., Ketelhut, Nelson, Clarke, & Dede, 2010) and self-efficacy (e.g., Creutzfeldt, Hedman, Medin, Heinrichs, & Felländer-Tsai, 2010; Henderson, Huang, Grant, & Henderson, 2012). Responding to Kozma's (1994) call to concentrate instead on learning *processes*, we focus here on the differences in the quality of learning experiences. How is the experience of role-playing in the OVH different from existing medical education?

While Gregory et al. (2011) considered this question from the quantitative perspective, in this paper, we provide qualitative empirical evidence identifying the areas where medical students judged role-playing in virtual worlds to be distinctively relevant to medical education. To do this, we interviewed 11 students who had participated in a scenario within the OVH. To better contrast the learning experiences within and without the OVH, we first provide a description of medical education at the University of Otago before we give an account of scenario-based learning in the OVH.

Medical education at Otago

The six-year Medical course at the University of Otago leads to the degrees of Bachelor of Medicine and Bachelor of Surgery. The Year 1 programme (approximately 1800 students) is common to all health professional courses (namely medicine, dentistry, physiotherapy, pharmacy, and laboratory science) and aims to give students a foundation in the biological sciences (e.g., molecular biology, musculoskeletal systems). Interested students then apply to Year 2 of Medicine (limited to 270 places). Other students may seek admission to other degree programmes such as Oral Health, Pharmacy, and Medical Radiation Therapy.

In Years 2 and 3, the focus of the curriculum shifts from the biological sciences towards the medical and clinical sciences. Responding to student calls to increase the day-to-day clinical relevance of the curriculum, the Year 2-3 programme was revised in 2008 to include more case-based learning, clinical skills (e.g., communication skills), and community-based learning in order to increase patient contact (Perez et al., 2009). The case-based learning consists of small tutorial groups reviewing and engaging in tasks related to realistic patient scenarios. These scenarios are used to illustrate the application of medical science to clinical practice and integrate material from other course components. This format is similar to the case-based style of questions found in the end-of-year examination (e.g., http://bit.ly/M0D5fe).

The Years 4-5 see the students divided between three clinical schools of medicine: Dunedin, Christchurch, and Wellington. In each school, the students undertake supervised clinical activities in hospitals, community-based clinics, and general practices (GP). In groups, students will also engage in mannikin-based scenarios for the development of emergency management and clinical skills. During their General Practice rotation, students at the Dunedin School of Medicine participate in simulated consultations with human actors at the Safe and Effective Clinical Outcomes (SECO) clinic (Williamson & Egan, 2011). Their learning experience at the SECO clinic most closely resembles that in the OVH, though student perceptions of key differences will be shared in our findings.

The final year (Year 6) is the Trainee Intern year, a transition-to-practice year where the students are located in clinical practice with supervision from the senior clinical team. They are paid a small stipend and are expected to assume day-to-day clinical responsibility for up to one third of the clinical load of the team. However they remain under the jurisdiction of the medical school, with the focus of their time on education, rather than service delivery (Dare, Fancourt, Robinson, Wilkinson, & Bagg, 2009).

To complement the medical curriculum, we built the OVH to further emphasise authentic clinical practice. Like Butler (2012), we sought to correct the imbalance between knowing and doing (highlighting the latter); but unlike him, we went beyond letting students view virtual world scenarios (i.e., Second Life machinimas) to having students actually participate in such scenarios.

Scenario-based learning in the OVH

The learning design underpinning the OVH is best categorised as scenario-based learning, a form of experiential learning (Hmelo-Silver, 2004) in which “an authentic or contrived scenario forms the basis of all learning, teaching and assessment activities” (Naidu, 2007, p. 251). The scenarios in the OVH were written by the authors of this paper who are practitioners in the fields of education, medicine and nursing. Each scenario is drawn from real-life events and aims to reflect the actual practices of a New Zealand emergency department.

The scenario reported here can be run in the OVH with a minimum of two participants (one playing the patient and another the doctor), hence reducing some of the logistical barriers of gathering enough participants before students can engage in role-playing. Additionally the scenario is flexible enough to include other characters such as senior doctors (e.g., a registrar), nurses, and the patient’s relatives. The patient guides her behaviour based on a pre-written script (e.g., http://bit.ly/o8vUDQ) and can be played by a student or a faculty member.

At the start of the scenario, the junior doctors receive an admission / triage form (e.g., http://bit.ly/rbxI50). Typically, they then apply the patient care framework and take the patient’s history, examine the patient, order laboratory tests, negotiate the treatment plan with the patient, prescribe medications, and finally submit patient admission / discharge / handover notes. Because we aim to mimic actual professional practices, we do not provide any superfluous guidance by, for example, walking the students through the correct steps in patient care.

It is important that advanced level medical students (our target audience) learn to make decisions in authentic and "relatively uncued conditions" (Tishman, Jay & Perkins, 1993, p. 149). Guidance is given via a post-scenario debrief with clinical educators, during which students reflect on their decisions and suggest alternative actions (if any). In experiential learning, this deliberate reflection phase makes experience meaningful (Dewey, 1916). The students are also formatively assessed based on the framework described in Loke, Blyth, and Swan (2012).

We built the OVH in 2010 with a one-year university teaching improvement grant. In order to sustain the use of this virtual hospital, its distinctive role within the existing medical curriculum needs to be determined. Because virtual worlds require relatively higher resourcing (compared to most other e-learning projects), sustainability should be an important consideration (Stewart & Davis, 2012). So, in what ways is the OVH specifically relevant to current medical education?

Method

A case study was conducted to evaluate how relevant the OVH might be to the medical curriculum. All fourth- and fifth-year medical students were invited via email and an in-class presentation to participate in the study. To take part, students registered their interest on a website (http://ovh.otago.ac.nz/) and gave their consent for the results to be published. These documents and processes were part of the successful application for ethical approval by the University's Faculty of Medicine. We carried out the case study with 11 advanced level medical students (Students A-K, comprising 5 fourth-year students, 5 fifth-year students and 1 sixth-year student). These students were selected to have a wider familiarity with clinical practice as well as with the full medical programme. This was the first experience with OVH for all of the selected students.

The students worked on the same clinical case in five groups (of 2-3 students each) during five separate runs. Each run lasted 70 to 90 minutes. The clinical case involved a female patient in her mid-70s, Mrs Gertrude Macfarlane, whose neighbour had found to be increasingly forgetful (e.g., not feeding the cat) and generally unwell (e.g., feverish). In this case study, the patient was played by the same faculty member in all five runs.

After each group had completed their run, a semi-structured interview was conducted with the group and all three authors of this paper. Each interview lasted 25 to 35 minutes. The five interviews had three foci:

1. a group reflection on the decisions made (e.g. "How did you arrive at the diagnosis of UTI (urinary tract infection)?") and learning points (e.g. "What, if anything, did you learn the last 90 minutes?");
2. the nature of the virtual learning experience (e.g. "How did it feel playing house-surgeon?"); and
3. the distinctive relevance of the OVH in medical education (e.g. "What role, if any, can this virtual hospital play in your medical education?").

Although this paper concentrates on the third focus, student views on the three foci were interrelated and were all taken into consideration (e.g. some key learning points signalled areas where the OVH was relevant).

The five interviews were recorded (150 minutes of audio recording in total) and fully transcribed. We analysed the transcripts based on Thomas's (2006) general inductive approach. This approach was chosen because we sought—from our transcripts—to identify themes pertaining to the role of the OVH in medical education. In other words, we were less interested in generating a theory (grounded theory), in exploring multiple meanings in language (discourse analysis), or in describing students' lived experiences (phenomenology).

Each of the authors first read the full transcript in detail. Then, each author created and assigned categories to segments of the transcript individually. As expected, some segments were not assigned to any category because the post-scenario interview had three different foci. The authors then met to negotiate their categories, combining or breaking up categories as well as selecting suitable quotations to communicate the meaning of each category. After reducing the overlap among categories, we arrived at three areas where medical students judged role-playing in virtual worlds to be distinctively relevant in medical education.

In designing this study, we attempted to maximise the "trustworthiness" (Guba & Lincoln, 1989, p. 233) of our findings in the following ways: validity was enhanced by triangulating two sources of evidence (namely students' in-scenario performances and group interviews). Reliability was increased by carrying out five identical runs of the same scenario with five different groups. Indeed, assertions #1 and #3 are supported by evidence from all five interviews, and assertion #2 by four interviews. Insider (tutor) and outsider (researcher) perspectives were maintained and cross-checked throughout the study. Emerging assertions were tested in the entire data corpus and negative examples were actively sought. For example, the assertion that role-playing in virtual worlds was appropriate for developing patient interaction skills was eventually discarded after negative examples were found (e.g., Student K described the text-based interpersonal communication within the OVH as being “a wee bit stilted”).

Findings and discussion

We now present the findings of the study around the three areas where role-playing in virtual worlds was judged to be distinctively relevant to medical education: “making the call”; self-organisation; and “going through the whole process”.

“Making the call”

This category refers to the ability to be fully responsible of the patient and to make clinical decisions that affect the patient. Many students highlighted how the OVH allowed them to actually make decisions and to take action:

> J: Well, you actually *do* the things here. Whereas in the SECO clinic, you write down or you think about what you’re going to do, but you don’t have to practically go and do them. So there’s a bit more here.
>
> H: Yeah, definitely getting to order the bloods was the best. And prescribing things. (...) Yeah, that kind of thing is useful.
>
> E: Most of it, like taking history and knowing what tests to order, is really useful. I mean, we don’t get to order any of that, at the moment.

Indeed, during their medical education, students typically do not get to order any laboratory or radiology tests. A study conducted at the University of Manchester Medical School reported that students on clinical attachments often perceived themselves to be unskilled members of the medical team with no responsibilities (Dornan, Boshuizen, King, & Scherpbier, 2007). While students are involved in clinical decision-making to various degrees, their decisions are always checked by their supervisors to ensure patient safety:

> G: Normally you’d be asked by the house surgeon to fill up the blood form or fill up the X-ray form. In this thing [OVH], (...) you’re actually doing the forms yourself.
>
> H: Generally, what we would do would be, I mean, again it depends on the registrar. In a nice cooperative environment, if they were OK with it, then you could write out the admission notes and examination findings, even though they will want to repeat the examinations anyway. So, they would check it over, I’d probably check with them, and they would check it over and say -
> Interviewer: Have you done that [writing examination findings] before, in your four years?
> H: Kind of.
> I: Yeah.
> H: To a certain extent. But I mean, I certainly wouldn’t be the one making the call. I wouldn’t *want* to be the one making the call.

Allowing students to actually make the call is hence one way that role-playing in the OVH is distinctively relevant to medical education. Dewey (1916), an important advocate for experiential learning, lamented how students often find themselves isolated from professional practice, leading to “the abnormality of the situation in which bodily activity is divorced from the perception of meaning” (p. 141). Based on our students’ views, not being able to make decisions results in at least two disadvantages. Firstly, the students’ learning experience is arguably truncated:

> J: So, when you have like rural GP or something, you get your own clinic, then you get to think a lot. But in the hospital, often, you don’t (laughs).
> K: I know, at my level, often they stop asking the questions at the point where you need to learn most. Like they’d say, “What would you do?” You’d say, “Prescribe fluids.” And they stop. Not how much, which fluids, how long.

Secondly, if students are not allowed to call the shots and to live through the consequences of their decisions, they might find it hard to develop a sense of responsibility toward their patients:

> K: Well, part of it is what supervisor you're getting, how much they try and make sure that you are able to cope with situations and put responsibility on your shoulders. And part of it is making the mental shift yourself. I have to take the attitude with every patient that I see, that I have that responsibility. And sometimes it's a difficult mental shift because you're just thinking, "I'm just a student, it doesn't matter, my decisions don't really count for much." So you've got to physically make that mental shift so that you can prepare yourself for later on.

Similarly, in his anthropological study of medical training in a London medical school, Sinclair (1997) reported that the sense of responsibility is best developed when medical students get to take real action on "'hot' patients" (p. 32) instead of hypothetical action on 'cold' patients (whose diagnoses have already been established by another senior doctor, for example). While the existing curriculum stresses case-based learning, students' responses in 'paper' cases remain purely hypothetical. In a unique way, virtual patients may be perceived as being simultaneously 'hot' and 'cold': student actions result in 'real' consequences (e.g., virtual patient's blood pressure decreases), but the consequences take place within a virtual world. It is important to note that allowing medical students to take full responsibility of a patient is only reasonable because the scenario takes place in a simulated environment:

> Interviewer: Do you think this would be a legitimate experience for you to gain that kind of experience of making decisions?
> G: Yeah.
> F: Yeah, I think so.
> E: It's less scary too, it's not a real patient. If something goes wrong, it's not going to kill them.

The provision of a safe environment makes this learning experience possible. On the downside, two students admitted that, because they were treating a virtual patient, they did take the scenario more lightly. At the same time, their group mate provided the counterexample that their group took a long time to make decisions impacting their virtual patient. Overall, in using computer simulations, we acknowledge and accept the interminable tension between the provision of a safe, virtual environment and the ease of suspending disbelief.

Self-organisation

This category refers to the need to organise one's approach to provide medical care in a fluid yet comprehensive way, adapting the generic patient care framework to the situation at hand. Comparing role-playing in the OVH with a 'paper' case (where all the necessary information to work through the case is laid out), one student expressed the effort needed to adapt his approach instead of simply following the pre-formulated framework:

> B: When you're in the hot seat, like knowing what to do next doesn't come naturally. (…) And when you get a paper case, it does all that work for you already. So there's still a gap in between that [and when] you get in the hot seat. But if you get a paper case, it has already *done* that work for you (…) you're not even tackling the problem, you're just kind of going around it. But whereas in this kind of situation [OVH], you suddenly realise that there's that gap there and you can't get around it except if you go listen and do some of the things.

Indeed, role-playing in the OVH requires the students to first "probe the virtual world" (Johnson, 2005, p. 45) to gather enough information before moving on to the next steps, and not to simply follow pre-determined steps in patient care. Being inherently linear, paper cases channel all students down a single path, doing the work of adapting the approach for the students, and may be limited in developing clinical reasoning (Poulton, Conradi, Kavia, & Round, 2009). The need to adapt one's approach to manage a clinical case was also observed when fourth-year Pharmacy students used a similar (but text-based) role-playing computer simulation (Loke et al., 2011). Adjusting a general idea to the particulars of a situation, as opposed to 'plugging in' what was learned, can be considered as evidence of student *understanding* (Wiggins & McTighe, 2005).

The medical students' varied abilities to self-organise was evident in the number of elements they missed out. During their interviews, students were able to identify missed elements ranging from checking the patient's home situation (Student F), ordering blood tests (Student A), to asking the patient about bowel movements (Student J). To explain their mistakes, many students admitted that they had found it challenging to stay focused during the scenario because of the messiness of the situation: for example, the side-tracking while conversing with the confused patient; the patient's daughter's impatience with their lengthy history-taking; and the simultaneous lines of questioning. Beyond remembering all the appropriate elements in the patient care framework, the students also had to judge whether they had done *enough* before moving on:

> Interviewer: And what did you learn? Or did you learn anything the last 90 minutes?
> K: Just that, things that present very simply, sometimes when you think about them a wee bit more, you start to wonder: "Am I doing it right? Have I done enough?"
> Interviewer: And in this specific scenario, were there things that looked deceivingly simple?
> J: I think yeah, I went from doing the write-up, then I realised I should go back and talk to the patient (laughs). A few things I'd missed, because sometimes, when you're in that spot, you don't think about asking those things [e.g., asking about a possible stroke].

The need to judge the adequacy of one's actions supports our call to reconceptualise medical education as the fostering of doctorly dispositions (Loke, Blyth, & Swan, 2012). As such, learning to become a doctor can be thought of as the 'tuning' (i.e., optimal level, not maximal) of dispositions such as doctorly compassion and responsibility. We speculate that the tuning of dispositions is best learnt through experience and practice. While the medical curriculum focuses on teaching the patient care framework and its components, the OVH provides repeated opportunities for medical students to apply the framework in practice:

> A: I thought that the thing that we never get in med school is the global decision making. (...) What do I do now? Do I call a registrar? I mean, this is the result that you might expect in a dipstick in a UTI, but to take that knowledge and to *apply* it to the care of the patient, from the time they arrive till discharge is a lot different.

The difference between knowing and doing (i.e., application) is also evident when Student C professed to know what a compassionate doctor is like ("Whether you smile, or you're nice to the patient, you introduce yourself, and you ask them how they're feeling"), but then admitted to not having introduced himself to the patient during the scenario.

How one thinks and acts differently *in context* is related to situative theories of cognition. Students used at least three different ways to describe the distinctive moment when they are role-playing junior doctors: "when you're in the hot seat" (Student B); "when you're there" (Student D); and "when you're in that spot" (Student J). They then went on to say how they had behaved or reasoned differently during those in-world moments. This supports the theory of situated cognition which holds that the ways in which human beings think and act are inherently coupled with their environment (Brown, Collins & Duguid, 1989) and that the transfer of learning from educational institutions to the workplace is not straightforward (Lave, 1988).

"Going through the whole process"

This category refers to the need to provide medical care to the patient from the beginning to the end, from the time the doctor first meets the patient until the moment the doctor admits the patient to hospital, discharges the patient, or sends the patient to the operating theatre:

> D: Well, it does help to sort of combine presentation with like, investigation and then treatment. It's always helpful. I mean, back in my mind, I know, "Oh, UTI presents with this, and you give this, and blah blah." But it's still nice to sort of be hit in the face with the simulation.
>
> H: It's nice to tie it all together.
>
> J: It's quite good going through the whole process from beginning to the end, having to think about the tiny, the little things, not just (...) the more straightforward bits. The little aspects of making it actually flow. So quite real, realistic.

Building the "flow" in patient care is related to the second category of self-organisation. In fact, it appears that the open-endedness and the need to go through the whole process are pre-requisites to having students weave their own approach through taking history, ordering investigations, and so on. This continuity is often lacking in the existing medical curriculum. For example, the objective structured clinical examination (OSCE) is a form of scenario-based assessment that is widely used in medical education today. One of its weaknesses is testing students only on "isolated aspects of the clinical encounter" (Smee, 2003, p. 705) in a stations-based structure (e.g., history-taking station, examination station). By going through the whole process, students discover their own strengths and weaknesses:

> J: The whole continuity from beginning to the end, you don't get very much of it. (...) So it's quite useful because it makes you think about what you don't know as well. It sorts of shows what you're not so strong at, so it's good for your own learning. You go back and say, "I need to learn more about this."
>
> A: One thing is a safe way to experience the global decision making. It brings out all sorts of different things that you may not be shown that you don't know. We do an exam in an OSCE, ask a couple of questions from the whole list, a huge list. In OSCE, there are ten stations and 150 topics, so you have no idea what you don't know. What do you do? An ECG? What do you do with the [oxygen] saturation?

The student's last question regarding oxygen saturation is important. Too often, medical students' learning experiences are truncated at the most crucial learning points (as expressed by Student K above): for example, they are asked by their supervisors to measure the patient's oxygen saturation, but not to take any action based on the measurement. Role-playing in the OVH gives medical students the opportunity to provide medical care for a single patient from beginning to the end, requiring them to consider and live through the consequences of their decisions.

Conclusion

We sought to find out how role-playing in a particular virtual world is distinctively relevant to medical education by conducting a case study with 11 medical students. The students identified three areas of relevance: "making the call"; self-organisation; and "going through the whole process". These three areas suggest how role-playing in the OVH can complement as well as extend existing medical curriculum. They can also provide guidance to educators and staff developers who plan to recommend and sustain the use of virtual worlds in other fields such as legal education (e.g., Butler, 2012) and management education (e.g., Pidd, 2004).

While our findings offer pedagogical reasons for us to recommend the use of the OVH within the current medical course, we recognise that curricular relevance is but one of the many factors affecting technology integration. A scoping study on the use of virtual worlds for higher education in Australia and New Zealand revealed that educators should also take funding, support, and other institutional issues into consideration (Dalgarno, Lee, Carlson, Gregory, & Tynan, 2011). Our findings will nonetheless provide pedagogical support for a broader strategy to embed virtual world experiences such as the OVH into medical education.

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Impacts of Scheduling Algorithms on Resource Availability

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Cost and space constraints typically limit the provision of many educational resources, with laboratory apparatus being a common example. This limitation is often ameliorated by utilizing scheduling techniques to manage access over an extended period of time. The specific scheduling algorithms that are used have been shown to have a significant impact on the overall availability of a set of resources and hence the level of access that can be supported. This paper considers ways in which these scheduling algorithms can be enhanced and the resulting impacts. Whilst the results are illustrated through their application to remote laboratory access, the implications are equally applicable to scheduling of access to any constrained resource.

Keywords: Scheduling; Resource Availability; Access; Remote Laboratories; Online Access

Introduction

Laboratories, like many other educational resources, are important tools for supporting student learning whose use is often constrained by financial or logistical constraints. These resources represent a significant financial and logistical investment that can be difficult to develop and maintain, particularly where they involve either significant physical infrastructure or limited software licences (Hofstein & Lunetta, 2004). The resultant limitation in resourcing levels is often dealt with by scheduling student access across an extended time period. This scheduling requires a set of strategies for managing the access and, ideally, optimizing the level of usage.

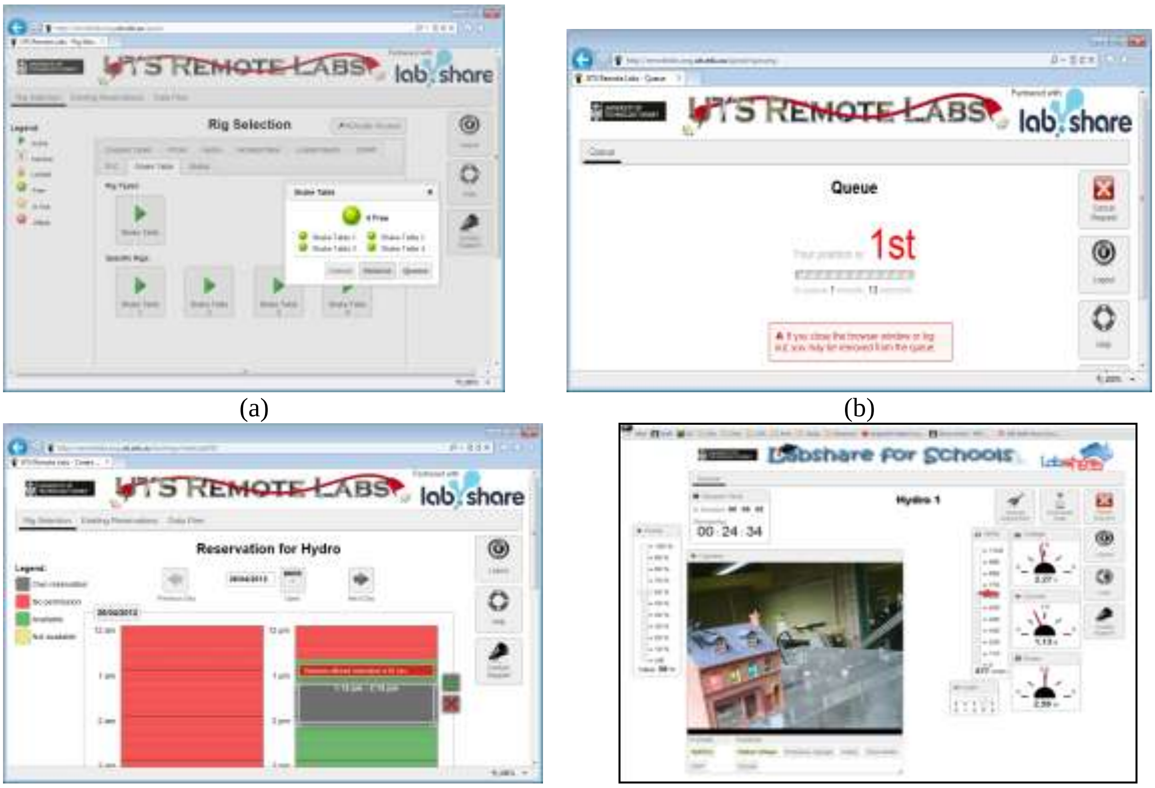
The above issues have been well studied within the context of remote laboratory systems. The rapid evolution and ubiquity of computer and networking technologies and the increasing sophistication of sensors and actuators have led to the emergence of remotely accessed laboratories (or Remote Labs - RLs) as a useful educational tool. Students are able to access, monitor and control physical laboratory experiments across the internet. Various benefits have been shown to arise from their use, including flexibility of access (Gomes & Bogosyan, 2009), the ability to share resources and labs across multiple institutions (Harward et al., 2008; Lowe et al., 2012; Richter, Böhringer, & Jeschke, 2009), security of users, data, and devices (Gravier, Fayolle, Bayard, Ates, & Lardon, 2008), amongst many other benefits.

With this shared distributed use of remote laboratories, scheduling of access has been a significant issue. A number of different strategies have been extensively explored. The two dominant access paradigms mirror those that have been used in many other systems: booking and queuing. In a booking strategy, users are able to select a time slot when they would like to access the system and make a reservation. They return at the specified time and are given access to the system. This is the paradigm that has been adopted by systems such as iLabs (Harward et al., 2008) amongst many others. There are also variations to this technique, such as the scheme used in NetLab (Machotka, Nedic, & Nafalski, 2009) where multiple students can make a concurrent reservation and then share access in a collaborative experiment. In a queuing strategy, such as that supported by Sahara (Labshare, 2010), users request access and are then placed in a queue. They are then provided with access to the first available apparatus that meets their specific request.

Good overviews of these strategies, along with various extensions and hybrids, can be found in the literature (Lowe & Orou, 2012; Orduña, 2011). Typically a booking scheme will be more commonly adopted where the available resources are very limited and student (or teacher, where the lab is being used for demonstration purposes) demand is relatively high – and hence having a confirmed access time is desirable. Conversely, queuing schemes are more commonly used where there is a significant pool of apparatus and students are happy to be allocated any item from the pool. Both of these techniques have benefits and disadvantages. For example, with booking schemes, typically the users will book a session of a specified duration but will very commonly not make use of the whole session. The unused component is then left un-utilised with a resulting waste of capacity. A queuing approach avoids this problem, but does not give users certainty regarding when they may be able to have access.

More recently, the Sahara remote laboratory system has incorporated a scheduling system that allows both queuing and booking to be used in parallel. Figure 1 shows a series of screenshots from the UTS Remote

Laboratory facility illustrating this functionality. The system administrator is able to specify which users can access which scheduling functionality and how different sets of apparatus are handled. For example, with a pool of 6 identical rigs, 4 may be able to be booked or queued, with the other two only available for queued users.



(a) (b)

(c) (d)

Figure 1. Screenshots from The UTS Remote Laboratory facility: (a) Selection of an experimental apparatus and provision of the option to either queue for the next available apparatus, or to make a booking for guaranteed access at a specified time; (c) A user waiting in the queue for access; (c) A user selecting a time slot to make a booking; (d) Accessing a specific experiment that allows students to explore hydro-electric power generation.

Previous work (Lowe & Orou, 2012) has shown that there can be complex interdependencies when both scheduling and queuing are used together. Whilst superficially it may appear that the performance (and hence access for students) would be improved by allowing both scheduling and queuing, analyses of live usage data has shown that significant problems can arise. In particular it was found in this previous work that there would often be significant periods of time where there was a queue of users waiting for access, but apparatus that was not currently in use was not being allocated because there was a later booking and the time available prior to that booking was not sufficient to guarantee the queued users the full session duration to which they were entitled (even if those users would typically not use the full duration).

In this paper we explore the implications of this issue and show how careful adaptation of the scheduling algorithms can lead to significant improvements in the overall resource availability. Whilst the results are discussed in the context of remote laboratories, the findings are generally applicable to the management of access to any restricted resources.

Scheduling Performance Evaluation

To demonstrate the implications of the interplay between booking and queuing systems we developed a Matlab scheduling simulation that emulates the scheduling strategy that is used within the Sahara remote laboratories system. An example of the resultant analysis and visualization is shown in Figure 2. The simulation was validated by testing it with a set of live data drawn from actual usage (277 bookings and 798 queue requests over a period of approximately 7 weeks) and confirming that the simulation allocated the same usage sessions.

To illustrate the implications of the interplay between different scheduling strategies we constructed a sequence of scenarios based around a pool of 3 items of identical experimental apparatus being used by a total of 200 students across a 2 day period (note that the total availability in this period is therefore 3 rigs x 24 hours x 2 days = 144 hours of use). Each of the 200 students will request access to any one of the three rigs, and then when allocated make use of the rig for a random amount of time defined by $T.k^n$, where T is the maximum allowable period, k is a random value between 0 and 1, and n is skew factor that adjusts the likely usage duration. For this evaluation T=1 hour and n=0.5, which gives an average usage time of 0.67 hours, and hence a total usage time of approximately 133 hours –within the available usage time of 144 hours.

Scenario 1 involved all 200 students accessing the apparatus by queuing for access, and making the access request at a random point in the 2 day period. Figure 2 shows the resultant behaviour for one of the 3 rigs. As can be seen there are periods when a randomly greater number of students request access and hence the queue length increases, and there are periods when fewer students request access and hence the queue diminishes. Over the 48 hour period the average queue length is 0.84, there are only a few short period when the queue exceeds 5 users, the average waiting time is 0.61 hours, and the maximum waiting time for any student is 1.76 hours.

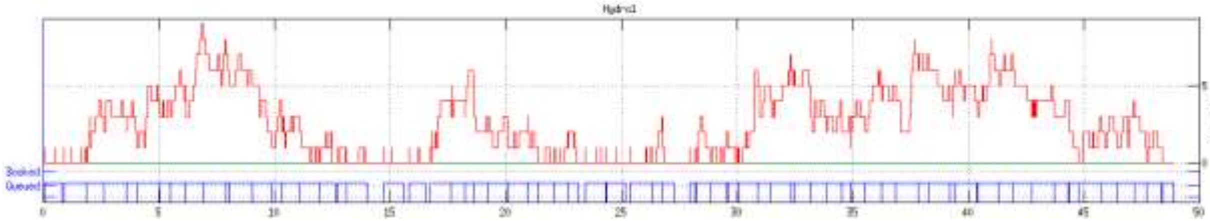


Figure 2. Example of scheduling analysis (Scenario 1) for a hypothetical remote laboratory. The top curve shows the queue length over time (the time axis is in hours) and the bottom curve shows the status of the rig – specifically whether it is idle, in use by a user who queued for access, or in use by a user with a reservation (in this case there are no users who made reservations).

In Scenario 1 no student reserved a specific timeslot, and so no student had a guaranteed access time. To illustrate the consequence of allowing students to make a reservation we considered Scenario 2, where half the students (100) accessed the rigs by making a reservation rather than queuing for access. A reservation will always be for the full time allowed (1 hour) but the users with reservations will still only use the rig for a variable amount of time and then release it back into the pool – potentially to be allocated immediately to a student waiting in the queue. This means that the average usage time (and hence the total usage) remained the same as in Scenario 1. The result of this change is shown in Figure 3. The behaviour in this case is starkly different. Even though the overall requested usage time has remained the same, the existence of the reservations has meant that there are significant periods when rigs are idle, but users are not allocated from the queue because there is less than an hour until the next reservation (because both queued and booked users are allowed to use up to an hour, the system will not allocate them to a rig if there is a reservation within the next hour). The result is an average queue length of 12.55, an average wait of 21.7 hours, and a maximum wait of 31.5 hours. Whilst there are active reservations the queue length continues to grow and does not diminish until after the reservations are all completed. Most significantly, over the first 48 hours, each of the rigs was in use for an average of 29.65 hours, and hence an average of 18.35 hours (38%) of the time was idle despite the existence of queued users.

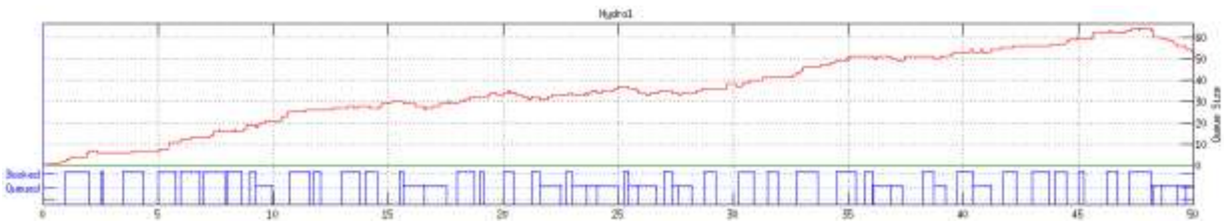


Figure 3. Scheduling analysis for scenario 2. In this case half of the 200 students make a reservation prior to access, with the result that there are substantial unused periods (in between reserved timeslots) and hence a queue that continues to lengthen throughout the period of use.

The third scenario shows how this issue can be addressed by a change in the allocation strategy. The booking and queuing requests were kept the same as for scenario 2, but the allocation algorithm was changed to incorporate two modifications. The first change was to allow a reservation to be delayed by up to a fixed amount (in much the same way that if you have an appointment with a doctor for 3pm, you may be admitted to see the doctor at some time after the reservation time). In this scenario, the commencement of the reservation could be deferred by anything up to 12 minutes. This allows queued users to be more readily inserted into gaps between reservations. The second modification was applied when there were short periods prior to the commencement of a reservation. In this case the shorter period was offered to each queued user in sequence. In the simulation a queued user would randomly accept only if the offered period was longer than the duration of their usage (with the likelihood of acceptance increasing at the offered session got longer). The result of these changes is shown in Figure 4. As can be seen by comparing this to Figure 3, the impacts on the user experience are significant. The average queue length is 1.33 and the average wait time is 1.80 hours. This is longer than the average wait time of 0.61 hours when no reservation at all are allowed and derives primarily from users having to wait for reservations to complete, but is still relatively short. Most significantly, the overall usage level remained almost identical to the case with no reservations and it was possible to make maximum usage of the resources.

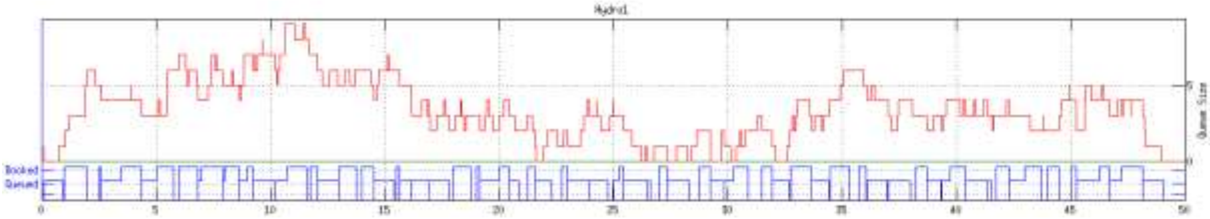


Figure 4. Scheduling analysis for scenario 3, incorporating changes to the allocation algorithm.

Conclusions

This paper has discussed the implication of merging booking and queuing strategies for managing access to laboratory resources. It was shown that if care is not taken a highly suboptimal allocation can result that leads to a significant reduction in capacity and major impacts on the user experience. Conversely, relatively simple adaptations to the allocation strategies can ameliorate these problems and allow the benefits of both queuing and booking to be leveraged.

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Remote Laboratories: Sharing Resources and Sharing Expertise

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Intended audience and degree of expertise/past experience required

This workshop is aimed at those who would like to gain an understanding of the role that can played by remotely-accessed laboratories in supporting enhanced access to teaching laboratories - either within the higher-education sector or in supporting science education in K-12. No previous expertise is necessary, though an involvement in laboratory-based SET education and an interest in technological innovation is beneficial.

Statement of objectives for the workshop

Laboratory experimentation is generally considered central to science- and engineering-based education. Logistical constraints can however place significant limitations on the ability to provide and maintain high-quality science laboratory experiences and equipment. One potential solution is the use of remotely accessible laboratories. These laboratories allow students and teachers to use high-speed networks, coupled with cameras, sensors and controllers, to carry out experiments on real physical laboratory apparatus that is located remotely from the student. Research has shown that when used appropriately this can bring a range of potential benefits, including the ability to share resources across multiple institutions, support access to facilities that would otherwise be inaccessible for cost or technical reasons, and provide augmentation of the experimental experience.

This workshop aims to provide participants with:

- An understanding of the challenges associated with supporting laboratory-based science and engineering education;
- The opportunities represented by the use of remote laboratories;
- The pedagogic, technical, and logistical challenges associated with developing, maintaining and sharing remote laboratory infrastructure;
- The opportunity to see a range of remote laboratory apparatus in operation;
- The opportunity to become involved in subsequent follow-up activities and remote laboratory trials.

Detailed description

The workshop will incorporate the following elements:

- A general introduction, by the presenter, to the concepts, pedagogies and technologies of remote laboratories;
- A demonstration of a range of laboratories from the UTS remote laboratories system;
- An open forum Q&A session focused on exploring ways in which remote laboratories can best be utilised.

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Learning with technology: theoretical foundations underpinning simulations in higher education

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Embracing learning for the future through learning technologies requires a clearer understanding of the pedagogies that inform the simulated teaching and learning strategies used to facilitate student learning. Higher Education e-learning literature often groups educational games with simulation. However, educational simulation attributes are different from games or simulated games with very different aims and objectives within the learning context, which have implications for technology-based learning designs. In order to optimize the use of technology-based simulation this paper presents the theoretical foundations of educational simulation in a disciplinary context. Understanding the simulation pedagogy will assist academics to create technology-based simulated learning environments that highlight the inherent simulation attributes to enable and facilitate learning.

Keywords: Educational Simulations; theoretical underpinnings, e-learning, technology-based

Introduction

A wide variety of educational teaching and learning strategies are available to the teacher in a learning environment. Almost all the possibilities of face to face teaching can be replicated by technology, although some of these strategies can only be represented in a limited manner. Alternatively, some teaching and learning strategies can be enhanced through technology either by presenting alternative approaches to learning (Aldrich, 2004; Gibson, 2004; Milton & Lyons, 2003; Lyons et al., 1998); by extending learning through added dimensions that maybe impossible to conduct in face-to-face interactions (Garrison & Anderson, 2003; Gardner, 2007); or through the use of technology aids, in developing or creating a new understanding of the concepts and knowledge (Lasater, 2007; Lyons & Milton 1999).

Learning by simulation and games enhances the acquisition of new knowledge, and skills, According to Whelan (2005), games if they have the mechanism that promote learning and the development of knowledge and skills will ensure that:

> Games translates into acquisition of new knowledge, transfer of learning, the development of intellectual skills (abstraction, anticipation, strategy-building, problem solving, lateralization, spatial representation function-movement relationship), and the development of behaviour and attitudes (p. 250).

The skills are developed through games and simulation if they provide immediate feedback, interaction, active engagement and participation, control of learning, repeated practice challenge, motivation, dialogue and teamwork (Barnett et al. 2005, and Lyons & Milton, 2002). Sauve et al. (2007), citing others suggests using socio-constructivist pedagogy inherent in games to meet the needs of the new generation learners.

The difference between games and simulation are that games attributes include player, conflict, rules, predetermined goals, its' artificial nature and pedagogical nature, whereas, simulations are based on reality, are dynamic in nature, are simplified representation of reality and has fidelity, accuracy and validity (Sauve et al, 2007). These attributes in simulation promotes basic and complex competency development; promotes interaction, and enables repeated practice in safe learning environment. Simulations offer learning environments which: promotes development of mental models in learners; allows efficiency testing to explain or predict events and outcomes; optimalises discovery of the relationship between variables and divergent approaches; decreases cognitive load using enabling and facilitating functions for learning to take place (Milrad, 2002; Goldenburg et al., 2005).

In order to optimize the use of educational simulation in disciplinary context this paper presents the use of simulations in midwifery education commencing with an emphasis on the use of experiential learning and simulation in the broader educational context. This is followed by a discussion on theoretical foundations of simulations in educational context. The pedagogy of simulations as an educational approach is also described in detail to enhance the learning designs of the future.

Theoretical foundations of simulations as pedagogy

Simulations as learning environments have a long history of use in education and training. Simulation derives its foundation as a pedagogical approach from as far back as the "writings of Aristotle and the practices of Socrates", (Ruben, 1999, p.500). These predate the evolution of learning theories such as experiential learning based on John Dewey's work and later Rogers (1969) experiential learning theories. According to Walter and Marks (1981, p178) simulations may be defined as "models or representations of some facet of the human experience". Jonassen (2000) argues that a computer-based simulation can be a powerful vehicle for learning by applying the critical characteristics of the traditional apprenticeship. It involves placing learners in realistic situations to experience a variety of realistic situations and to learn from them in a safe learning environment without jeopardizing other people. Simulations can present authentic tasks by focusing on the learning knowledge and skills in contexts that reflect the way that the knowledge is used in real life (Brown, Collins & Duguid, 1989). Most effective learning experiences are meaningful, motivating and can be created by goal-driven simulations and scenarios where learners apply the knowledge to solve problems similar to what they would encounter outside the learning experience as highlighted by works of Reeves, Herrington & Oliver (2005).

Simulations can precipitate deep reflection, understanding and behavioural change that results from deep learning. Dewey's central idea of reflective learning and reflective thought as "active, persistent and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusions to which it tends" (Dewey, 1910 p6) underpins any basic tenant of simulations. More recent interest in simulation stems from the belief that effective learning results from sustained interaction between the learner and the environment and where there are opportunities through social interaction to reflect on experiences in that environment (Gredler, 2004; Gibson et al, 2007).

Simulations are commonly used in nursing and midwifery education. Simulations do not necessarily need to involve high end and expensive computer platforms as seen in full model simulation such as flight simulators. Research has demonstrated that even low end; low fidelity simulations can be used to provide effective teaching and learning approaches and experiences, (Underberg, 2003; Medley and Horne, 2005). Simulations can involve a broad spectrum of tools that are used in nursing and midwifery education including case reports, scenario discussions, and computer-based simulations. Simulated learning is also used in nursing and midwifery laboratories with standardised patients in simulated clinical situations, virtual reality trainers, mannequins, pelvic models and high fidelity human patient simulators.

Computer simulations are programs that model aspects of real world situations and require decision making or some active input from students. Simulations differ from computer tutorials in that the student learning experience and engagement is by performing tasks in situations that reflects real world situations, (Alessi and Trollip, 2001). These authors further add that the simulated environments are generally a simplification of reality in which the learners can learn procedures, develop an understanding of a phenomenon and experiment with alternative approaches to learning. They encourage students to be more active participants in their learning because they are not controlled by a predetermined sequence of events and can experiment with the situation (Alessi and Trollip, 2001). Computer-based simulations provide a less structured environment in which there is no linearity imposed on the student by the program itself (Gibson et al, 2007) and can powerfully present a wide variety of relevant situations within a compressed timeframe.

In the simulated learning environment student centered goal setting and introduction of the learning activity commences the simulation. Case scenarios or situations can be used to provide the simulation context that requires students to make decisions and solve problems. Questioning may also be used to form the basis of a computer simulation of a real life event, during which the students must decide on the appropriate course of action and respond to the situation (e.g. an emergency procedure or situation). Once the student provides a response appropriate or otherwise, the student action is then used to update the initial simulation which reflects the consequences of students' decision and response. The system updates by providing further details on the incremental case scenarios or situations or it may provide feedback for students to consider and which again may require further student action, reflection and input. The feedback provided also closes the loop of the learning sequence where the system generates a response to student action that represents what may happen in real life.

A simulation can be realistic in terms of its physical and functional components, with the latter component related to the types of situations, tasks or settings included in the simulation. Gredler (2004) offers two major classifications of simulations: the social process simulations and the tactical-decision simulations. Social process simulations, emphasises the interpersonal communication skills and the study of human interactions and emotions in pursuing social, political or ethical goals in realistic situations. In tactical-decision making simulations the emphasis is on problem solving and decision making based on collection and interpretation of information to analyse situations and consequences and to develop strategies to achieve specific goals. These types of simulations create an immersive environment in which learners are encouraged to make difficult decisions and explore the consequences of their decisions.

Alternatively, Alessi and Trollip (2001) identified four distinct types of simulation, namely:

a) Physical simulations

Physical simulations demonstrate how a system works and facilitates the manipulation of system components to alter the output. This type of simulation technology is conceptually linked to what is referred to as system dynamics approach which provides a way to describe and study our complex biological, physical and social world around us in terms of inputs, throughputs and outputs. It enables learners to describe and understand the cause and effect relationships, as well as the consequences 'ripple effect' which may be both intended and unintended effects of an event or decision activity.

Simulations are student-centered approaches to learning that incorporates the cognitive, psychomotor and affective domains of learning, (Nehring et al, 2002; Peteane, 2004). This type of learning is particularly true when sophisticated high fidelity simulators are used to simulate complex functionality and combine the different types of simulation. One such simulation is the 'SimMan' developed by the American Medical Plastics Laboratories. It is a realistic life-sized human model on which students can practice simple procedures such as male urinary catheterization or naso-gastric intubations. Additionally, this computerized simulation is more technically advanced than the "Resuscitation Annie" model used by all health professionals for cardiopulmonary resuscitation and advanced life support training. The SimMan as realistic, complex simulation mimics the human cardiovascular system, i.e. heart sounds and murmurs, central and peripheral pulses an electrocardiograph output including the entire advance cardiac life support arrhythmias. The respiratory system simulates respiratory process including breath sounds, chest movements with air entry and output, carbon dioxide production and oxygen consumption by the body. The simulation also simulates the pharmacological reactive system recognizing and responding appropriately to the action of more than 50 medications on the body. The peripheral pulse oximeter signal represents all the changes in the cardiopulmonary and respiratory system and all inhaled gas mixtures with a focus on oxygen saturation of the body. The simulation also shows blinking eyelids, papillary dilation and reaction to light while 'voice grunts' simulate neurological responses of the patient. These types of computerised clinical simulations provide learners with examples and scenarios of actual clinical events that enable learners to make decisions on real-life care situations. It allows the students to practice by changing the input variables as well as outlining the procedure they would use in the resuscitation process when they are placed in a situation of attending to a collapsed patient. Feedback is provided in response to their action where students can analyse what has happened as a consequence of what they have done and make further decisions to deal with the resultant situation.

In midwifery education it seems no such advanced simulation exists but a commonly used model is the 'Resuscitation Doll' which is the equivalent to the 'Resuscitation Annie' model used by all health professionals for cardiopulmonary resuscitation and advanced life support. The resuscitation doll is used in the resuscitation training for babies and small children. The simulation combines the situation of a collapsed baby with the steps in the procedures of resuscitation that enables students to apply these skills and gauge the effectiveness of ventilation and cardiac compression. Another example is the Pregnancy Simulator Learning Package (PSLP) which simulates the human reproductive system during pregnancy and the complex clinical decision making and problem solving skills used in health and pregnancy assessment by health professionals (Lyons et al, 1998; Dow, 2008).

b) Process simulation

These are simulations in which the rate of physical process is changed. This is also referred to as dynamic modelling which allows the slowing down of or the acceleration of the physical process to enable learners to easily evaluate the individual components (Conrick, 1998). This type of simulation is commonly used across many discipline areas and allows students to view an event in a reasonable timeframe for example cell division and other physiological and neurological processes used in health sciences. In midwifery, a non-computerised plastic model of the pelvic torso is frequently used to simulate labour and the birth process showing the descent and rotation of the foetus as it negotiates the birth canal. Students are able to visualise what happens during the birth process paying particular attention to the relationship of the fetus to the landmarks in the pelvis enabling them to practice what they are required to do to assist the birth of the baby.

c) Procedural simulation

Some tasks require a certain sequence of actions to be performed to achieve an outcome. The procedural simulations ensure that students follow the correct sequence of steps in order to achieve the desired outcomes. Students also learn the consequences of not performing the correct procedures. For example, in the resuscitation of a collapsed patient, the student is able to assess the situation, identify the underlying problem and initiate the appropriate patient care and management. If the collapsed patient is not breathing and does not have a pulse then the resuscitation procedure is initiated, which is to: a) Call for professional assistance as resuscitation cannot be sustained over a period of time by just one person. b) Institute the 'ABC' of resuscitation i.e. assessing and managing the airway, breathing and cardiac compression to treat the patient.

In midwifery, procedural simulations focus on how to perform midwifery practice skills hence rubber arms are used for teaching intravenous insertions and giving intravenous injections. The rubber vaginas are used to assess cervical dilatation during labour and rubber perineum together with surgical instruments are used to teach cutting and suturing of episiotomies and perineum care after the birth of a baby to mention a few. The PSLP emphasises the procedure of abdominal palpation and how to perform this procedure in terms of where and how to place the examining hands on the abdomen to obtain accurate findings from palpation. The added advantage is that the simulation provides the opportunity to demystify the age old tradition of following a certain set of steps as it allows the students to conduct and practice each palpation skill on its own and in any order with appropriate feedback to guide the students in seeing the relationships and the rationale for each palpation movement.

d) Situational simulation

Situational simulations are presentations which could be a clinical scenario, a conflict situation or an emergency situation where the student makes decisions to respond to the situation and develops strategies to rectify the situation as they would do in real life contexts. The provision of a real life situation gives learners a sense of immediacy and involvement where time and the chosen response matter to the successful outcomes. A wide range of 'what if' situations can be simulated often using complex programming and branching to allow for the variation in the situation, patient responses, student actions and decisions to solve the problems. In these types of computer simulations feedback provided makes students reflect on their responses prior to continuing or feedback provides the opportunity for students to re-assess their care management and adapt their actions appropriately to remedy the situation. The PSLP through its case studies simulates the variations in assessment findings and simulates the complicated obstetric conditions and emergency situations that a student may not have the opportunity to experience in real life.

Summary

This paper presented simulation pedagogies as educational approaches to designing teaching and e-learning activities. It has a review of current types of simulations in use with specific reference to midwifery education. Simulation pedagogy provides a framework for successful analysis, design, development, and implementation of e-learning that entails simulation attributes to facilitate technology-based learning. Similarly, teaching, assessment, and administration of e-learning can be strengthened though a process of capacity building that is able to release the full potential of embedded learning technologies if the theoretical underpinnings of simulation are understood and applied in the creation, design and development of simulated learning.

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Future-Thinking Flexible Learning Development: A Design Approach for Sustainable Change

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Can you imagine the student's experience in higher education beyond 2020? How will teaching approaches have changed? How will learning technologies play a role in the 21st century student? In higher education, institutions will need to be future focused. So far, institutional change in the use of learning technologies has been dominated by an applied or pragmatic focus that persists despite the increase in uses of constructivist pedagogies and the potential of the read/write web, or Web 2.0. This paper proposes a new, future thinking and sustainable approach to flexible learning development. This approach engages with factors that are often ignored in applied design approaches to learning technologies, including the change management problems associated with introducing flexible learning into higher education institutions and conflicting institutional practices when using technology systems. The sustainable design approach proposed in this paper is referred to as 'FOLD': Flexible and Online Learning Development, as introduced at La Trobe University, Victoria, Australia.

Keywords: flexible learning. sustainable, change, practice, design

Problems of Change Management when Introducing Flexible Learning

In higher education, institutional statements often present 'flexibility' as a unified, coherent entity. However, there are distinct institutional actors involved in its implementation through the organisation, and differences are likely to emerge in practice. Fragmented approaches to curriculum design can miss the opportunities provided by new practices in teaching and learning, as well as the learning opportunities offered through new technologies. The literature on learning technologies and institutional change offers many accounts of a persistent gap between institutional strategy and practice, and a history of costly and dubious outcomes (Russell, 2009; Gunn, 2010; Conole, 2010).

Collis and Moonen (2002) describe flexible learning as a "complex phenomenon" that is "expressed in terms of only four components: technology, pedagogy, implementation and institution" (p. 217). With the ubiquitous presence of learning technologies in universities, the term 'flexible learning' acts as a strategic descriptor that draws together different parts of the organisation that then take greater interest in the hitherto academic concerns of teaching and learning. In practice, these components offer disparate vocabularies and legacies and involve many different roles within an institution,. The consequent tensions can result in a discourse of flexibility and the application of learning technologies that fail to speak to pedagogical practices.

One approach to this structural complexity of flexible learning is an applied focus to flexible learning design. Applied design approaches, according to Bennett & Oliver (2011), tend to be limited to "practical, instrumental concerns" (p. 187), and they tend to confine their scope to local settings of curriculum, students, technologies and teaching staff. This pragmatic approach, or "use-inspired design research" (Reeves, Herrington & Oliver, 2005), the authors argue, tends to an uncritical process in which learning technologies are defined as a narrow field closed off from ideas and approaches from other disciplines.

This applied approach to flexible learning design is also problematic because it is not necessarily sustainable. The approach misses the broader factors shaping institutional flexible learning featured in educational research, such as "the economic concerns of government; second, the commercial interests of information technology vendors; and third, the managerial preoccupations of university administration" (Selwyn, 2007). Where technologies become a key part of learning, competing institutional practices come into play (Hannon, 2012), and a design that reflects a lack of alignment between learning goals and other institutional actors will be unable to put into place the conditions for sustainable use of learning technologies.

FOLD as a future thinking and sustainable approach to flexible learning development

This paper describes ‘FOLD’, an acronym for ‘flexible and online learning development’ in higher education, and a process for sustainable future-focused change management for flexible learning in the curriculum. FOLD has the purpose of designing or redesigning subjects or courses to include blended, online or flexible learning components of design. FOLD is currently being implemented for course and subject design at La Trobe University, Victoria, Australia. FOLD is a University-wide change management project with the key objectives of:

1. Developing and leading a University-wide project that designs or renews strategically important subjects and courses at La Trobe to include flexible, online and/or blended learning approaches.
2. Establishing policies and procedures that embed flexible, online and/or blended learning design in new and revised courses as part of course quality lifecycle review.
3. Providing expert advice and practical assistance at University, Faculty and School levels on flexible and online learning options, including a toolkit, guides, manuals, materials and professional development for academic staff.
4. Advising and informing University academic staff and managers on current research trends and best practice in flexible and online approaches, including learning futures, new delivery partnerships, models and technologies.

The FOLD delivery model envisions single subject design to full course redevelopment, partnering professional educational designers with academic content experts, involving both Central and Faculty teams, for a holistic and collaborative design approach harnessing different areas of expertise and support. Curriculum delivery designs include approaches for multi-campus flexible delivery strategy to ensure sustainability, equity and efficiency across the university campuses. The collaborative team for FOLD can consist of several, or all, of the following roles:

- Flexible learning facilitator / designer – expert in T+L to facilitate subject design
- Curriculum and academic developer
- Academic/s involved in subject teaching + Faculty T+L expertise
- Production and curriculum resource development adviser
- Technologies expertise– For example, Personal learning systems developer or virtual classroom expertise etc.
- Library and digital resources expertise – Faculty liaison librarian
- Language & learning expertise – Faculty academic, language and learning liaison
- Co-curricular and student engagement expertise– For example, work integrated learning, leadership programs, study abroad programs

Assembling sustainable practice

Each FOLD project through this approach exemplifies a program that emerged from a distinct set of negotiations and contingencies involving factors and participants that extended beyond the local teaching and learning setting. The outcome of the FOLD process did not result from the application of a forward-looking design process, but from intensive engagement with an existing state of affairs and a ‘bottom up’, ‘top down’ approach for the purpose of institutional engagement with flexible delivery design.

For example, one FOLD Project in 2012 was development of a resource for clinical educators’ engaged by the University to supervise Physiotherapy students. The project commenced with two intensive workshops with the teaching team, and involved a number of design staff including LMS expertise, a graphic designer and library liaison. The process involved drawing together existing disaggregated practices and resources comprising *ad hoc* one to one arrangements, and establishing a central professional development website with guidelines and resources for clinical educators, that were aligned with program goals and external requirements. The effort involved in the project was distributed to the team for assembly and quality checking. The resulting “Clinical Educators’ Resource Kit” is an instance of sustainable practice since it can be used by many participants, it contributes to a critical component of the program, and requires minimal maintenance to keep updated.

Figure 1: Sample FOLD project

For flexible learning projects to qualify as a 'FOLD project', they must be organised around the FOLD principles and process. This includes collaboration and ownership by discipline teams, alignment with strategic goals and support by Faculty, facilitation and support by curriculum and learning technology expertise. FOLD projects do not implement a pre-designed plan, rather, projects are fit for purpose, assembled to match discipline needs, with the available University resources. This approach, then, engages with the messy reality of specific issues facing a program or course - managing change by making connections, negotiating arrangements, organising places, times and resources. From this process, plans and designs emerge, but as an activity in response to the settings rather than a template to be applied.

Future-focused and sustainable flexible learning

The assembly approach to flexible learning design described above is to ensure that the FOLD process is sustainable and future-focused. FOLD brings a focus on spatial and temporal arrangements of teaching and learning practice. It attends to the embodied activity entailed in the arrangements of activities, actions, goals and practices that constitute processes such as "learning" and work.

This approach follows Stepanyan et al.'s (2009) practice-oriented definition of sustainable e-learning, framed within education values and oriented to practices with learning technologies. According to Stepanyan et al., sustainability is the property of e-learning practice that evidently addresses current educational needs and accommodates continuous adaptation to change, without outrunning its resource base or receding in effectiveness (p.10). FOLD adopts the notion that sustainable education is better able to bridge the gap between practices of teaching and learning and institutional strategies for change (Stepanyan et al. 2010; Gunn 2010). It is able to scope uses of learning technologies beyond simply local innovations (Gunn 2010), and offers an understanding of flexible learning in terms of teaching and learning practices rather than institutional directives. Hence, sustainability provides a more grounded basis for embedding a learning technology change process.

Conclusion

The notion of flexible education is "firmly entrenched" but a contested term in higher education (Tucker & Morris, 2012), that tends to be loosely defined, particularly in institutional policy statements, and generally presented uncritically as an obvious solution to problems facing higher education (Bigum & Rowan 2004; Deakin University 2009, p. 12). Hence flexible learning tends to be tied uncritically to institutional operations, producing a top-down institutional flexible learning environment, resulting in poor take-up and transmissive pedagogical approaches.

This paper explains a future-thinking flexible learning development approach to address the critical need to engage with broader institutional factors shaping flexible learning. At La Trobe University, Victoria, Australia, FOLD is a flexible and online learning development approach to embed flexible learning in the curriculum. This holistic design approach focuses on the various aspects of the curriculum, including students, teaching staff, content, resources, technologies and learning activities. This 'assembly approach' to design organises the connections of networked learning, including Faculty goals, learning locations, schedules, technologies, external drivers of curriculum, such as professional bodies, viability, funding, politics, alliances. FOLD offers an example of a shift from the "ought" of plans & designs to the "doings" or enactments. Plans and designs, therefore, are considered as another activity (Suchman 2007). We argue that the FOLD demonstrates an approach to sustainable flexible learning that can disseminate across institutional disciplines and settings, and embed local, bottom-up practices that are capable of stabilising and persisting.

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Relevant, current and sustainable digital strategies to prepare future teachers to lead e-learning

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This paper describes how one teacher education programme integrates multiple strategies to ensure graduating teachers are prepared to lead e-learning in New Zealand classrooms. Contrary to recent criticism, initial teacher education (ITE) provides strong leadership in the innovative use of e-learning and digital technologies, and emphasises the digital capabilities, knowledge and confidence students need to succeed in their teacher preparation and beyond. This paper reports on the coherent range of strategies employed by one university that model good practice in blended online learning including: a social networking strategy to develop core digital skills; peer mentoring; the use of e-portfolios and Web 2.0 tools; as well as the integration of advanced e-learning pedagogies for course work. Evidence from several projects supports the claim that initial teacher education is developing essential e-learning leadership for future teachers and providing valuable professional leadership to the wider education sector.

Keywords: preservice teacher education, e-learning, e-learning leadership.

Introduction

Initial teacher education providers are acutely aware of the need to deliver high quality programmes and to ensure graduates meet the New Zealand Graduating Teacher Standards (NZGTS) (New Zealand Teachers Council, 2007), including the expectation that, in using "professional knowledge to plan for a safe, high quality teaching and learning environment," beginning teachers will "demonstrate proficiency…in ICT relevant to their professional role." Demonstrating such proficiency is both broad and complex, requiring beginning teachers to understand the technological and pedagogical implications and potential of a constantly evolving field. Recently criticism has been leveled at New Zealand teacher education providers: (a) suggesting they are not preparing beginning teachers to confidently and competently embrace e-learning; (b) raising doubt as to whether ITE providers are using current technologies themselves; and (c) suggesting that ITE providers are failing in their professional and intellectual leadership in the e-learning arena (Newman, 2011). This paper refutes those three allegations and provides evidence from one university where e-learning leadership influences pedagogy and practices throughout ITE and postgraduate programmes. The authors doubt they describe an isolated example of professional e-learning leadership in Australasia and intend this paper to garner response and collaboration from other teacher education providers, and to raise the profile of e-learning in ITE and its value for schools today.

The main evidence for this paper is drawn from an award winning three-year Bachelor of Teaching and Learning degree which underwent significant redevelopment in 2010 and 2011. The deliberate, purposeful and coherent use of digital technologies and culturally responsive e-learning pedagogies (Hunt, Needham, & McMurray, 2012) are interwoven throughout the programme to ensure beginning teachers have experienced learning within a blended e-learning environment and have the opportunity to develop their own capability and confidence. After briefly considering the literature, evidence is provided from this and associated programmes.

Literature

There is no doubt that future teachers need to be well equipped with the skills, knowledge and understanding to effectively integrate digital technologies into classroom programmes to support learning and enhance student outcomes (Davis, 2010). One of the challenges facing ITE is how to develop the capability and confidence for beginning teachers to lead e-learning in pedagogically effective ways with rapidly evolving technology and

changing contextual demands (Gillard, Bailey, & Nolan, 2008). ITE students enter their studies with varying degrees of technological experience (Wassell & Crouch, 2008) and, like the general population, while most are adept at social networking and the use of mobile technologies "they may still be neophytes when it comes to understanding how to use them in purposeful and educationally oriented ways" (Wright, 2010, p. 19). Furthermore, a student cohort may display considerable diversity in their prior technology experiences, attitudes, and capabilities, and academic staff have a tendency to over-estimate students' abilities to appropriate their digital skills and devices to support formal learning (Beetham, McGill & Littlejohn, 2009).
The challenge for ITE is to recognize the diversity of prior experience and to develop, not only technological understanding and skills but more importantly, an understanding of pedagogically appropriate ways to integrate e-learning to promote student engagement and achievement (Blankson, Keengwe & Kyei-Blankson, 2010). Mishra and Koehler's (2006) technological pedagogical content knowledge (TPACK) framework is particularly helpful for understanding and guiding the complex choices teachers face when selecting appropriate pedagogies and technologies. The application of TPACK in teacher education contexts is well accepted and well researched (for example, Abbitt, 2011; Albion, Jamieson-Proctor, & Finger, 2010).

Engaging prospective teachers with learning experiences that will enhance their skills, as well as their beliefs, perceptions and confidence in regard to applying ICT is likely to influence their technological pedagogical practice in schools (Divaharan & Koh, 2010). Therefore, it is critical that teacher educators model appropriate pedagogies (Grossman, 2005) and that technology is used in context "as a tool for learning to teach, rather than content to be learned" (Wassell & Crouch, 2008, p. 214).

Effective e-learning is central to one award winning programme

Following a comprehensive review of the University of Canterbury Bachelor of Teaching and Learning degree a redeveloped programme was launched in 2012. As Hoban (2005) advocates, the process was founded on a research-informed conceptual framework. The conceptual framework: focuses on the educational needs of children; prepares graduates to meet the NZGTS; and clearly articulates a philosophy of teaching and learning. Substantial changes were made to the structure and content of the programme, and a decision was made to replace the existing dedicated ICT strand with an embedded and holistic approach to digital technologies and e-learning. It was clear that a detailed implementation plan was required along with support strategies for staff and students to ensure that digital capability and e-learning were not left to chance. The following discussion provides evidence of the multiple ways e-learning enables the delivery of the programme in three modes for campus, regional and distance students, and the strategies employed to ensure graduate teachers are prepared to lead e-learning.

Preparing beginning teachers to confidently and competently embrace e-learning

A survey of students in their first year of study (n = 110), along with staff interviews, confirmed that generally students were confident in their ability to use email, social networking, mobile technologies, and common features of productivity software. However, they were far less confident with more advanced software features, or tools such as RSS feeds and aggregators (Mackey, Davis, Morrow, Gikandi, & Dabner, 2012). Of concern were the relatively small group of students who appeared to have little or no digital confidence. Strategies were clearly needed to ensure basic digital capability for students to successfully engage in the e-learning experiences integral to their study. In addition to a formal induction to the learning management system (LMS) and e-portfolios, three related initiatives focused on developing capability and providing support for students. These were (1) the recruitment of a peer mentor team; (2) an online self-evaluation and collaborative learning site based on social networking principles (developed within PeerWise, http://peerwise.cs.auckland.ac.nz with assistance from the peer mentors); and (3) the implementation of an LMS e-learning support site providing a central resource area and a Q&A forum. The focus of these initiatives is not on pedagogy per se, however responses and resources are contextualised to teaching and learning scenarios, for example how to record a mihi using podcasting or Web 2.0 tools. As reported elsewhere in more detail (Mackey, Davis, Morrow, Gikandi, & Dabner, 2012) the peer mentors provide the vital link between requests for help and the two online environments, and are largely responsible for the content and ongoing development of the PeerWise site.

Extensive use is made of the Moodle-based LMS for campus, regional campus and distance students as all three cohorts share common course sites, assessments and activities. Schools are increasingly adopting blended pedagogies and these future teachers will have valuable first-hand experience of blended learning based on collaborative and constructivist pedagogies. In 2011 the college switched from Mahara MyPortfolio (Tertiary) to MyPortfolio (Schools) to enable students and staff to use e-portfolios in the same environment and alongside schools. This provides future teachers with experience using the same platform as many New Zealand schools, and the ability to interact with associates, provisionally registered teachers, and school leaders.

Programme initiatives using current technologies

In conjunction with the strategies to prepare students to engage with technology in their professional learning, there has been a purposeful focus on how to integrate the appropriate use of current technologies and e-learning into all courses informed by TPACK. For example, staff have been encouraged and supported through organised professional development, teaching showcase events, and one-to-one mentoring to:

- model blended e-learning pedagogies using the LMS, AdobeConnect, interactive whiteboards, and e-portfolios for students studying in three modes;
- embrace Web 2.0 tools for collaborative work, class activities and assignments;
- integrate appropriate digital content from relevant sources (eg Te Kete Ipurangi, DigiStore);
- adopt e-assessment strategies using the LMS and/or e-portfolios;
- establish virtual connections with teachers, schools, subject associations and educational leaders;
- develop learning networks that include experts from related industry and real-world contexts.

There are many examples of innovative e-learning including the use of AdobeConnect to support interactive workshops for campus, regional and distance students; Web 2.0 tools like VoiceThread for students to record and provide feedback on multimedia assignments; college iPads and personal ‘bring your own devices’ (BYOD) for curriculum activities; existing as well as staff and student-created video; and a specially-designed e-learning lab where up to 81 students can work collaboratively in small groups around shared computers. MyPortfolio is being used increasingly by staff and students for professional learning and development including teacher registration processes. The evidence demonstrates that teacher educators are willingly adopting emerging digital technologies to support ITE programmes and provide students with a range of e-learning experiences.

Professional leadership in e-learning

Surprisingly, Newman (2011) also suggested that there was a perception that ITE providers were not providing intellectual and professional leadership in the e-learning arena. This is difficult to understand given that members of this institution (and undoubtedly those in other institutions too) have actively provided e-learning expertise and leadership nationally and internationally in the last few years including, for example:

- Leading the Research Strand of the ULearn 2010 and 2011 conferences attended by over 1500 teachers.
- Editing a special edition of the Computers in New Zealand Schools Journal (December 2011).
- National and international conference presentations including ULearn, Distance Education Association of New Zealand; Society for Information Technology in Teacher Education, Australasian Society for Computers in Learning in Tertiary Education.
- Contributing actively to the Greater Christchurch Schools Network and associated activities for the rebuild of Canterbury education (including hosting a Think Tank for educational leaders).
- Hosting webinars to ensure that the New Zealand education sector has access to visiting world experts in e-learning (including for example in 2012 so far, Prof. Lynne Schrum, Dr Elaine Hoter, Prof. Paul Bacsich).
- Supervising and conducting research related to current issues in e-learning, virtual schooling, and related areas (for example Stevens, 2011; Zaka, 2012), including school research partnerships.
- Providing professional development and leadership to virtual schooling clusters and local schools including a Postgraduate Diploma in Education (endorsed in e-learning and digital technologies).
- Representation on national bodies for example the Tertiary e-learning Reference Group; Ultrafast Broadband in Schools Governance Board.

In addition, the academic staff teaching the BTchLn (Primary) degree were presented with the Distance Education Association of New Zealand Award in 2012 for their outstanding effort in leading learning through the earthquake interruptions of 2011; an effort which was enabled and sustained through the innovative and extensive use of e-learning pedagogies.

Conclusion

This brief discussion illustrates that ITE providers are well positioned to prepare the next generation of teachers, and that contrary to some perceptions, colleges of education are innovative, progressive leaders in their adoption and advocacy for e-learning. The authors seek further evidence from other programmes in Australasia to raise awareness of the vital role that ITE plays in developing and leading e-learning. The presentation will invite discussion to promote research collaboration and a higher profile for e-learning leadership by teacher educators.

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Designing an online activity for collaborative language learning

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Engaging students when learning new vocabulary, building an environment that allows for collaboration and teamwork and providing approaches towards learning via problem solving is not an easy feat in teaching a second language. To have an activity that incorporates these three strategies in one for both face-to-face and geographically dispersed students can be challenging. This paper describes how an online activity in Moodle linked to the glossary module allows students to possibly learn vocabulary more efficiently, quicker and in a more engaging way.

Keywords: Collaborative learning, Moodle, language learning.

Introduction

The purpose of this paper is to analyse the design rationale, development and implementation of picture-based online activities for second language (L2) vocabulary learning. The paper provides a short overview of research on effective learning processes and describes online activities for L2 vocabulary acquisition that implement visual images as learning tools. Most students find many vocabulary-teaching methods are at worst painful (Krashen, 1989). Common questions addressed in research on L2 acquisition are concerned with efficiency of traditional teaching methods, long-term retention of vocabulary taught, as well as student motivation and engagement.

Alavi (1994) proposes that there are three attributes for effective learning processes in the area of cognitive learning theory:

1. Active learning and construction of knowledge
2. Cooperation and teamwork in learning
3. Learning via problem solving.

A strategy that covers all of these three attributes is collaborative learning. The term collaborative learning was first introduced by Piaget (1926) and later progressed by psychologists Johnson and Johnson (1975) and Slavin (1987). The benefits of collaborative learning, as summarized by Cecez-Kecmanovi and Webb (2000), are: better motivation (Johnson et al., 1981), higher test scores and level of achievement (Dansereau, 1983), development of high level thinking (Slavin, 1987) and higher student satisfaction (Sharan, 1990). With the introduction of technology in education, the term Computer-Supported Collaborative Learning (CSCL) was fashioned by O'Malley (1995). It can be defined as "the learning sciences concerned with studying how people can learn together with the help of computers" (Stahl et al, 2006). Resta and Laferriere (2007, p. 67) describe it as "interactions take place among students using computer networks to enhance the learning environment […] to support asynchronous and synchronous communication between students on-campus as well as students who are geographically distributed".

Case study

As one of the few Australian Universities, Macquarie University has a Department of Russian Studies. Students of Russian wish to have more interesting and engaging activities to learn new vocabulary outside their classroom environment as opposed to traditional pen and paper drills. Highest priority is given to quick and efficient acquisition of vocabulary to allow for conversation in L2 at early stages. This part of language acquisition is perceived to be the hardest by students, as it requires perseverance, patience and time.

This paper introduces a game-like online activity that was designed to facilitate efficient vocabulary learning. The implementation of Moodle, the new Learning Management System (LMS) at Macquarie University in

Semester 1, 2012 created an opportunity to make changes to the current course design. The new online activity was designed to bring together various multimedia elements essential for vocabulary learning, such as sound, images and texts and helps students to better recall meanings, pronunciation and grammatical properties of foreign words. For instance, the student will be able to hear the pronunciation of the words outside the class, as it automatically links to text-to-speech online service. Further, the online activity corrects their errors instantaneously and provides immediate feedback on their learning progress.

It uses the common principle of matching foreign L2 words with familiar L1 words to help memorising a foreign language vocabulary. It resembles a flashcard-learning pattern as newly added words circulate through the exercises. Oxford and Crookall (1990) discovered that flashcards is one of the most practised techniques by students to memorise new foreign vocabulary.

The online-activity allows choosing between different types of exercises: word to translation or explanation of grammatical properties, word to image/picture, word to audio/pronunciation and image/picture to audio/pronunciation. The exercises are directly linked to the glossary module, so whenever a new entry is added to the glossary it will show up immediately in the exercise.

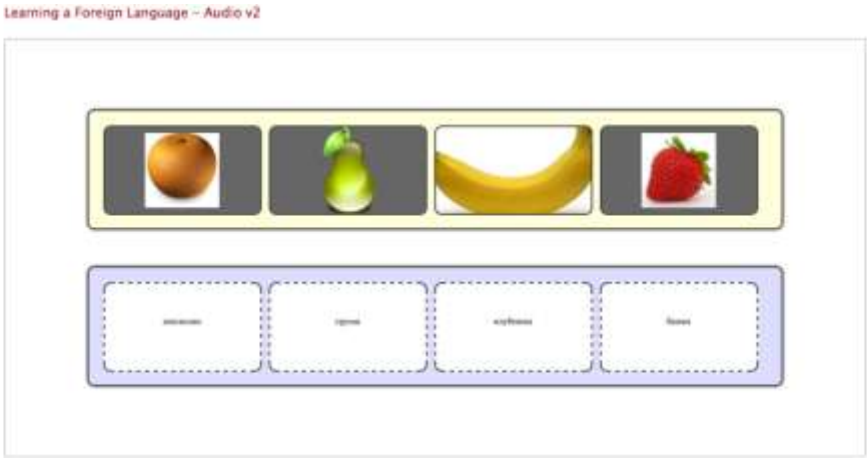

Figure 1: Screenshot of online-activity

The activity presented in this paper then feeds from the information entered in the glossary. The glossary in Moodle enables students to add words, their definitions and images and all entries are visible to all unit members. It also allows for students to comment on each other's contribution to the glossary, permitting them to leave feedback, request further information about a word or even correct the spelling. The convener of the unit is able to decide if he wishes to approve the words entry in the glossary or if all words should be automatically made available to all students. One of the benefits of adding words to the glossary is that if a word is listed it appears on other pages within that Moodle unit. These words are automatically highlighted and when clicked the user is directed to the glossary entry, allowing the user to review the meaning of the word. Entering words to the glossary is simple, as it only requires a word or concept, a description and the option of including an image.

The use of multimedia in second language learning, in particular the presentation of information in various formats (text, audio, graphics, animation, video), has become the subject of much debate amongst researchers and educators. Concerns often raised are whether learning foreign languages would be more effective when visual images are employed. Various studies have been undertaken to assess the impact of visual images on language learning (e.g. Carpenter & Olson, 2012; Chun & Plass, 1996b; Herron, Hanley & Cole, 1995; Omaggio, 1979; Yeh & Wang, 2003). Computer-assisted language learning literature mostly focuses on the impact of pictorial glossing on incidental (e.g. through massive reading or listening) second language vocabulary acquisition rather than on intentional vocabulary learning. Commonly held views are that visual images facilitate reading comprehension (Chun & Plass, 1996b; Herron, Hanley & Cole, 1995; Omaggio, 1979) and that the presentation of foreign words with their pictures, in addition to native language translation, has a positive effect on vocabulary growth for language learners (Oxford & Crookall, 1990; Chun & Plus, 1996a; Kost, Foss & Lenzini, 1999). The explanation for this effect is that lexical terms coded with visual as well as verbal modes will be memorised and retrieved from the memory better than lexical terms coded with only one verbal mode (Chun & Plus, 1996a). There are also suggestions that pictures are easier to perceive than a native language translation, therefore, the use of pictures can facilitate accurate memory predictions (Carpenter & Olson, 2012) and images of familiar objects can facilitate the learning of language (Deno, 1968).

Vocabulary presentation in the glossary includes the audio of word pronunciation and visual aids such as pictures of objects to cater for different learning preferences. The fact that the sound of the word is immediately presented with the new word offers another benefit (verbal mode) to memorise it. In the design of this activity, we have followed and incorporated proven learning strategies to engage students when learning a language. The activity engages students by providing them with control over what they wish to learn. In this case, it is the students who populate the glossary with new items. If this is organised as a class activity, new words are quickly added to the glossary, and are available for practice to all students. It has been shown that when the learner has the control of the instructional material the learner reports a greater positive attitude (Morrison, Ross, and Baldwin, 1992), an increased motivation and greater learning (Cordova and Lepper, 1996). This activity may evoke a sense of control and direction over the activity. The activity was designed to randomly select new words from the glossary and mix them with the old ones, however, students can choose if they wish to practise new words, or revise the old ones first and progress at a later stage.

This arrangement can save valuable time for the teacher as students create their own practice material while collaborating and peer-reviewing each other's entries. This approach gives students many opportunities to practice using new vocabulary, whilst requiring minimal input from teaching staff, apart from organisational coordination. Teachers can limit their involvement to merely proofreading and checking their students' input in the glossary if they wish to do so. Further, this activity will indicate to the teacher what is important to the learner. Moreover, it is very likely that the process of engaging students in populating the glossary with new words in itself will help students memorize the new words better. With this activity, we shift to a more dynamic and user-driven process that characterizes a game-like setting, rather than a single-trial activity (such as completing a worksheet).

Stanley (2007) completed research with regards to issues of implementing the Moodle glossary module in class. He listed the following issues. First of all, it was stated that it was crucial to explain to students how the glossary works and how to use it. A short manual including screenshots or a short instructional video can help. Second, students did not have a clear understanding of what was expected from them. Students did not realize that glossary entries were to be done on a regular basis, for instance, a few entries a week, so the whole group could benefit from the definitions given by fellow students. However, most students left it until the end of the semester to make their glossary entries. Major reason for this behavior was that students did not know where to begin and which words to define as the lecturer kept the task very open. Clearer instructions have to be conveyed to students in the use of glossary to assure benefits to all students and show value of the activity.

A few other problems can be expected when implementing the online activity linked to the glossary in teaching. If wished to be used in a day-to-day classroom environment, students must be provided with computers or laptops and Internet access. A major issue is how to make students see the value of this activity if they would use it. In this case, all students of the unit have to be encouraged to participate in populating the glossary from the beginning on.

Discussion and conclusions

These new online activities were designed to bring together various multimedia elements essential for vocabulary learning, such as images, sound and text, and to help students memorise meanings, pronunciation and grammatical properties of foreign words. We expect that these activities will enhance learning outcomes and improve the current practice resources. This tool aims to empower students and provide them with a tool that would help two-fold: give them an active role in learning through the student-generated glossary.

This paper explores three attributes of cognitive learning theory: Active learning and construction of knowledge, cooperation and teamwork in learning, and learning via problem solving. This activity encourages students to actively learn and construct knowledge by providing them with a platform, the glossary module in Moodle, which allows students to construct their knowledge by manipulating and structuring information. Since the activity relies on students entering new words that they have acquired, cooperation and teamwork in learning is also present. Individual students will be exposed to words that their colleagues view as important and can provide social support to each other. The online-activity offers a challenging problem-solving situation by asking students to pair a word with the correct counterpart, be it an image, a definition or the translated word. Therefore, using this activity as a whole may have a positive impact on the learning process of students.

Collaborative learning embodies all of the attributes above and the benefits of this approach are well researched. While they were initially developed for the Russian language, they are intended to be adapted to virtually every language taught at Macquarie University. We endeavor to establish the Russian unit as a leading subject in this climate of change by responding to its students needs and by introducing new methods of delivery. Apart from developing this new technology, research will be conducted to investigate the effectiveness of this online activity.

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The road ahead: eBooks, eTextbooks and publishers' electronic resources

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eBooks have now become commonplace in the community and are used on a range of mobile devices such as eBook readers and tablet computers. In recent years, eTextbooks accessible on a range of mobile devices have provided an alternative to heavy and expensive print-based resources. Although some institutions have decided that eTextbooks and related resources are the preferred option for their students, research does not yet indicate that students actually favor eTextbooks. There is also little evidence to support whether the additional features offered in electronic resources increase engagement or improve learning outcomes. The author describes how a review of the literature revealed current issues related to eTextbooks and their accompanying resources. This preliminary exploration will guide research to investigate whether eTextbooks and complementary resources produced by publishing companies can lead to improved learning outcomes and student engagement in a business school context.

Keywords: engagement, learning outcomes, eBooks, eTextbooks, mobile devices, iPad.

Introduction

In 2011, The Horizon Report (Johnson, Smith, Willis, Levine & Haywood, 2011) stated that electronic books were moving closer to mainstream adoption by educational institutions with features such as immersive experiences and facilities for note-taking, research activities and social interaction. The 2012 edition of The Horizon Report (Johnson, Adams, & Cummins, 2012) highlighted the emergence of tablet computers as a significant distribution element for electronic books in higher education. Furthermore, the literature shows that a number of institutions are promoting a shift to eTextbooks due to the possible benefits of reduced costs and higher portability (Cross, 2010; Murray & Perez, 2011). In the wider community, eBooks and 'e-reading' are growing in popularity (Rainie, Zickuhr, Purcell, Madden, & Brenner, 2012) mainly due to e-Book portability and ease of access. However, it is still uncertain whether the uptake of eTextbooks will be as dramatic as that of fiction and non-fiction eBooks, as the landscape of eTextbooks and educational resources has become increasingly complex due to the myriad of choices.

The availability of eTextbooks with embedded features such as interactive images, animations, quizzes and simulations is relatively new. The characteristics of this new generation of textbooks offer opportunities that were not available in the past. Some studies have shown that, compared with traditional media, eBooks and eTextbooks provide additional features such as: portability, text searching abilities, quizzes, web links, interactive learning activities, bookmarking, and annotations (Rickman,Von Holzen, Klute & Tobin, 2009; Wilson, 2003). Social networking and collaborative learning through sharing annotations are aspects of eBook environments that may also have an impact on learning (Richardson, Smith, Lenarcic, McCrohan, & O'Hare, 2010). However, current research is not conclusive about the benefits of adopting eTextbooks and it has yet to be established how eTextbooks and other electronic resources could be used effectively by both students and lecturers to enhance the learning and teaching process (Murray & Perez, 2011).

To date, studies investigating student preferences in textbook formats have, in some instances, shown that students welcome eTextbooks over hard copy texts (Porter, 2010; Ugaz & Resnick, 2008). Whereas others have found that students still favored hard copy textbooks to eBooks, or a combination of the two, which are available from some publishers (O'Hare & Smith, 2012; Woody, Daniel & Baker, 2010). Although eTextbooks are usually less expensive than their hard copy equivalents, they are often provided via a rental arrangement for 6-12 months, and in some cases are not transferrable from one device to another (Nicholas & Lewis, 2010). Despite the wide availability of eBooks, some students prefer to have hard copy textbooks to keep for future reference, or for their resale value (Murray & Perez, 2011).

In 2008, Lam, Lam, Lam and McNaught explored students' perceptions of usability and usefulness of eBooks in learning and found that advantages such as portability were outweighed by a range of technological difficulties experienced by their students. They therefore concluded that eBooks were still in an early developmental phase. A later study by Woody et al. (2010) established that the necessary resources (e.g. computers and support) must be provided for eTextbooks to be successfully adopted. Table 1 lists some of the advantages and disadvantages of eTextbooks based on the literature (Nicholas & Lewis, 2010; Nicholas, Rowlands & Jamali, 2010; Rickman, Von Holzen, Klute & Tobin, 2009; Wilson, 2003).

Table 1: eTextbooks advantages and disadvantages

Advantages	Disadvantages
Portability	Platform limitations
Text searching ability	Poor navigation
Lower price of eTextbooks	Expiry of access (some 3-6 months) Non-transferrable access
Accessibility for visually impaired	Some resources are not accessible for visually impaired
Available online and on mobile devices	Unavailability of some texts as eBooks
Bookmarking	Device specific and non-transferrable bookmarks
Annotations	Annotation and copy and paste limitations
Can print a copy	Printing may be limited or prohibited

The variability in platforms (other than PDF) and single platform availability of some products can also limit their usability and uptake (Richardson & Mahmood, 2012). Some of the commonly used formats and platforms for eTexbooks and resources are summarised in Table 2.

Table 2: eBook and eTextbook Platforms

eBook Readers	Platform
Amazon Kindle	Both PC and Mac, Apple iOS (iPad, iPhone), Android devices (tablets, phones)
Apple iBooks	Apple iOS only (iPad, iPhone, iPod touch)
Sony Reader	Android devices (tablets, phones), Sony devices (tablets, readers)
Kobo	Both PC and Mac, Apple iOS (iPad, iPhone), Android devices (tablets, phones)
Web-based eTextbook Environments	**Platform**
VitalSource	Both PC and Mac, Apple iOS (iPad, iPhone, iPod Touch), Android devices (tablets, phones), Blackboard Building block
Course Mate (Cengage)	Both PC and Mac,-not all mobile devices
WileyPLUS	Both PC and Mac, not all mobile devices, Blackboard Building block

The move to electronic formats has enhanced resource flexibility, particularly due to the ability to mix and match chapters from various textbooks an option provided by some publishing companies (e.g. McGraw-Hill, Wiley) and the capabilities to develop custom eBooks (e.g. McGraw-Hill Create http://create.mcgraw-hill.com/wordpress-mu/australia-newzealand/). The DIY approach to authoring eBooks can be as simple as developing texts in PDF format, or alternatively, using authoring applications and apps e.g. iBooks Author for iPad iBooks (.ibooks format) or Calibre, Adobe Indesign 5.5, Creative Book Builder (ePub format). Apple's iBooks (Textbook) format was released in 2012, but at present produces eTextbooks that are only compatible with Apple devices. If appropriate resources are available, eBooks can be developed in a range of formats and can include animations, interactive quizzes, embedded media such as video and audio recordings, and provide facilities for rotation and scaling of items.

Equity and accessibility are two major concerns when introducing a new range of resources and eBooks can be more accessible solutions for students with visual disabilities. For example, Macquarie University adopted an eBook publishing model (ePub format) to facilitate increased accessibility to learning resources (Lovell-Simons and Kerr, 2011). When designed within the web-accessibility standards, the resources can be read by text reader software (e.g. Jaws) or VoiceOver on the iPad, and also allow for on screen enlargement for visually impaired students. On the other hand, accessibility and equity issues can also arise where resources are platform or device specific. For example, some resources will work only on an iPad (e.g. iBooks Author); while others have components that will not work on an iPad as they include Flash-based components or other interactive content.

Institutional Perspective

From an institutional perspective and beyond the preferences of individual students, eBooks and eTextbooks may be able to provide cost effective solutions for future learners. Some universities and libraries, such as the Northwest Missouri State University (Rickman et al., 2009), are developing institutional strategies for making eBooks and eTextbooks available to their university community. In some cases, the resources are being provided on mobile devices. For example, the Faculty of Science at the University of Adelaide piloted iPads and electronic texts or resources for all first-year undergraduate science students during 2011/2012 (Cross, 2010; University of Adelaide, 2010; 2011). In this instance, each student received a free Apple iPad to use with online curriculum and custom content. The aim of the project was to phase out printed textbooks in favor of offering a range of rich media resources that were ideally open-source or authored by teaching staff.

Additional e-Resources

In the not so distant past, the norm was a hardcopy textbook with some lecturer resources in the form of slides and answers to textbook questions. On occasion the textbook questions were made available electronically online. The newer generations of textbooks are accompanied by a wide range of resources which may include:

- an interactive eBook with embedded media and interactivity;
- an eBook embedded in an interactive learning environment (e.g. VitalSource, Cengage CourseMate);
- interactive study guides (e.g. Wiley iStudy);
- a companion site for instructors with slides, questions and answers, video case-studies and other media; and
- simulations and virtual environments.

Furthermore, some tools can be embedded or accessed via a learning management system (LMS) (e.g. Blackboard, Moodle) where quizzes can be linked directly to the grade book/grade centre and therefore provide resources that can be also used for revision or assessment purposes and to monitor students' progress.

Although a welcome addition for many, the rich set of resources available with most textbooks/eTextbooks, increases the complexity of decision-making for teaching staff. Not only do they need to decide on what they will use (textbook/eTextbook, slides, videos, quizzes), but they must also consider the cost implications (e.g. student buys, library buys), licensing limitations (e.g. 6 month expiry dates, inability to transfer from one device to another), access via an LMS (e.g. which LMSs are compatible), technological limitations (e.g. runs only on iPads versus includes Flash and will not run on iPads), and equity issues (e.g. students have access or devices that support the resources). Given these issues, the role of the educator is likely to be critical to the effective use of eTextbooks and the related electronic resources. For instance, Wong, Liong, Lin, Lower and Lam (2011) suggest that a key to successful use of eTextbooks is for lecturers to proactively make use of eTextbooks in facilitating teaching and learning. Similarly, Sun, Flores and Tanguma, (2012) established that successful uptake of eTextbooks would be facilitated by lecturers actively engaging students in using eTextbooks. Nevertheless, Nicholas and Lewis (2010) found that eTextbook uptake was not promoted by lecturers due concerns about technical issues, equity issues with access to e-readers or computers, battery limitations and students' reluctance to read on screen.

One of the first steps in integrating electronic resources and texts into learning is for lecturers to make some decisions about how the resources will be used in their unit, and to establish whether they are likely to add value for their students. There are a number of ways in which electronic resources can be utilised, as listed in Table 3:

Table 3: Approaches to using Publisher Resources

Approach	Description
Substitute for own resources	Textbook/eTextbook, publishers slides, exercises as the main resources for the unit – 'a textbook unit'
Add-on	Resources are available, promoted to students, but not integrated
Integrated/embedded	Textbook related resources are embedded within the curriculum as required
Selective use	Selected resources from multiple sources are used to illustrate concepts
Extension	Resources are used to provide additional resources for students to explore to enrich their learning experience
Assessment	Assessment tools designed by publishers (e.g. Aplia, Perdisco) are used
Social media or tools in eTextbook environment	Annotation and bookmark sharing are encouraged

In practice, there is currently little evidence about what is sustainable and good practice in using textbooks, eTextbooks, and the range of complementary resources. How should such resources be used effectively? How can the range of resources be used to support student engagement and improve learning outcomes? The future of such resources will be dependent on outcomes and input from both educators and learners.

Research directions

The complexity of the eTextbook and resource landscape has prompted the need for exploration of both the requirements and possibilities available for the Curtin Business School (CBS) and to identify whether existing resources provided by publishers of textbooks may be utilised to increase students' engagement and lead to better learning outcomes. A preliminary review of 276 publications (textbooks, eBooks and related resources) available via the university bookshop for the CBS students in Semester 1 2012, showed that approximately 19% of all the publications included an eBook version and/or a range of online resources. A review of all available Semester 1, 2012 CBS Unit Outlines (documents that provide information about required resources for each unit of study) found that only 4% of the publications with eBooks and online resources were actually referred to or promoted to students in their unit materials. Nonetheless, where such resources were described in the Unit Outlines, the electronic versions of the textbook or other publisher resources were considered to be integral to the unit.

As this is an area of rapid change and development, the availability and use of eTextbooks and related resources are likely to continue to evolve, and resources will become increasingly available for multiple platforms. The current status of eTextbook and electronic resources use at CBS has prompted a research project to explore the effective use of electronic resources in learning and teaching to identify examples of good practice. At present, there is limited current research on how eTextbooks and related resources can be effectively integrated into units, whether and how they are used by students, and whether the use of such resources results in benefits to learning or increased student engagement. Some of the issues to be explored will be the range of resources available with new editions of textbooks currently in use, hardware or software limitations, licensing and cost implications, ways in which resources could be used to add value or increase engagement, and usability and equity implications.

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Designing and recording machinima to illustrate professional practice scenarios

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Immersive virtual worlds, such as *Second Life*, have attracted widespread interest in recent years as platforms for online role-plays of professional practice scenarios. An alternative application of virtual worlds is the video recording of in-world role-play activities, 'machinima', for later use as stimuli for class discussions or individual reflective activities. The scripting and recording of machinima to illustrate particular practice scenarios is seen as an alternative to recording video in authentic practice contexts, potentially addressing some of the inherent ethical and logistic issues. This paper describes the process used to design, record and produce machinima illustrating a series of classic classroom teaching practice scenarios as part of the Office for Learning and Teaching VirtualPREX project.

Keywords: virtual worlds, *Second Life*, role-play, machinima, professional practice, scenario based learning

Introduction

VirtualPREX (virtual professional experience), a project funded by the Office for Learning and Teaching, is designed to explore the use of a virtual world classroom for practice teaching. A consortium of universities is working to develop role-play scenarios that will assist pre-service teachers in their preparation for professional experience (practicum) placements, as well as exploring innovative ways in which these scenarios can be used for assessment tasks.

The initial development of the scenario based learning and the results of the first phase of this study have been published previously (Gregory et al., 2011; Masters, Gregory, Dalgarno, Reiners, & Knox, accepted forthcoming). In this paper we examine the development of exemplar machinima that can be used as either the basis of assessment tasks or as an example to guide students in developing their own machinima.

The paper is structured to firstly provide a discussion of machinima literature: the ways in which machinima have been used in other projects and how this has informed the development of machinima by the authors. An outline is then provided of how the exemplar scenarios were planned, followed by a description of the creation of the machinima and the technical issues that needed to be addressed. In the conclusion of the paper we discuss the value of machinima to this project and also to other fields of endeavour, thus helping to create a sustainable learning future.

Literature Review

Professional experience is well-documented as a problematic aspect of teacher education (Boyd, Grossman, Lankford, Loeb, & Wyckoff, 2009; Swabey, Castleton, & Penney, 2010). One particular concern is the shortfall in placement availability for the number of pre-service teachers in training and, more particularly, quality placements (Abbott-Chapman, 2011; Barbousas & Nicholson, 2009; O'Keeffe, 2011). VirtualPREX, by providing opportunity for teaching simulation, seeks to redress these issues. The use of machinima, for assessment and reflection, is one component of VirtualPREX. In the use of machinima, VirtualPREX overcomes the requirement for a live classroom, demonstrates teaching in a risk-free environment and also alleviates the privacy and ethical issues of filming real children.

Lowood (2011, p. 4) defines machinima as “the making of animated movies in real time through the use of digital game technology and assets”. While this form of animation was originally related to games (Kirschner, 2011), Fosk argues that machinima have advanced beyond game related animation and have now “made their way into higher education courses”, expanding “into genres that include drama, comedy, documentary, educational material, advertising, art, and political activism” (2011, pp. 26-27). It is in the genre of educational material that machinima have been incorporated into the VirtualPREX project.

Machinima have been used in other educational projects for a variety of purposes (Alden, 2008; Butler, 2010; Dreher & Dreher, 2009; Grace, 2009). Alden (2010) briefly outlines how machinima have been used to assist in health practices while Grace (2009) outlines the use of machinima for army training. Dreher and Dreher (2009, p. 5) used machinima within an Information Systems course where students developed machinima, using *Second Life (SL)*, to present a business case and report that “through the use of the Machinima screen capturing technique, students document in detail all essential aspects of their projects, thus providing a critically rich, reflective learning experience that is reusable”. The capacity for reflection and also the possibility of re-use of machinima are elements that are important in VirtualPREX. Pre-service teachers can use machinima to reflect on a range of aspects of teaching and can re-use the machinima for different purposes.

Butler (2010, p. 88) also reports the advantageous use of machinima, in this instance in legal education. He argues that too often traditional teaching “ignores the interdependent relationship of situation and cognition" and that there is a need for more contextual experiences. The work that Butler reports, where machinima were used to “depict real-world-type ethical dilemmas” (p. 91), is similar to the approach taken in VirtualPREX. The VirtualPREX researchers concur with Butler’s (2010, p. 96) comment that “the use of machinima means that, instead of considering such complex questions on the basis of disembodied names and broadly described locations in a text-based problem, they may be addressed in a more realistic milieu”. Muldoon, et al. (2008) used machinima to teach accounting concepts in an authentic setting through a story development and storytelling approach. The machinima developed for VirtualPREX reflect a similar storytelling quality.

Drawing on the ways in which machinima had previously been used to enhance education and training, machinima of the role-plays conducted by pre-service teachers as part of VirtualPREX were developed at an earlier stage of the project (see http://www.virtualprex.com/machinima.html for examples). The development of exemplar machinima was the next progression in machinima use. These exemplars have the capacity to support structured critical reflection activities, which could form the basis of assessment tasks.

Planning the scenarios

In order to prepare for the recording of exemplar machinima, two of the VirtualPREX research team undertook the task of planning the scenarios. These team members (hereafter referred to as designers) decided what the focus of the scenarios should be and how many scenarios might be recorded on the day designated for this aspect of the project and designed a planning template to capture all of the detail needed by those taking part in the role-play to follow. To complete this task, the designers, who were geographically distant, held weekly teleconferences, beginning four weeks before the recording day, and compiled email reports of the discussions allowing other team members to comment on key decisions.

The original term used to describe the machinima was ‘best practice’ scenarios. In the initial discussion, the designers moved away from this terminology believing that ‘best practice’ is a contestable notion. In teaching, views of ‘best practice’ would differ depending upon the learning theory espoused: constructivism, behaviourism, etc. The machinima to be developed, albeit enacted by experienced teachers, would have aspects in them that could be critiqued by others as not reflecting certain views of ‘best practice’. The decision was made to use the term ‘exemplar’ in preference, particularly in terms of its definition as “a typical member” (Turner, 1987): the scenarios would be developed as typical examples of how certain issues would be approached in classrooms by teachers, without claims to either ‘best practice’ or being the only approach.

After the initial discussion regarding the terminology for the machinima, the designers then discussed the template that could be used for loose scripting of the scenarios. It was believed that creating broad outlines for the scenarios was a more productive method than writing full scripts. Scripted machinima would not have allowed for spontaneity from those in the role-play and could have detracted from the natural teaching method of the person playing the part of the teacher in the scenario. In this respect, the VirtualPREX team differed from the previously reported project by Butler (2010) where scripts were written and followed closely.

One of the first tasks of the designers was to decide the issues to be explored through the machinima. It was decided that one would look at aspects of classroom management, as management of pupil behaviour had been a key focus of the earlier role-plays. It was also decided that another machinima should be developed with a focus on the basic teaching skills of introducing and concluding a lesson. To check that the approach taken was accurate, various behaviour management textbooks were consulted, and the identified scenarios were discussed with experienced teacher educators.

A template was designed, with the belief that this could be used for any scenario and could be provided as a guideline for anyone who wished to develop their own machinima. The template included the following sections: the title and overview of the scenario; the lesson content and main teaching strategies demonstrated; the actors, their roles and their avatar names; the additional avatar controllers and production staff roles; a description of the virtual environment, layout and initial positioning of the avatars; and a table containing the series of events, the timing of each and the camera positions. This template, after further refinement, along with guidelines for producing machinima, will be available from the VirtualPREX website at the conclusion of the project. The VirtualPREX exemplar role-play scenario scripts can be found at http://virtualprex.com/exemplarscenarios.html.

Acting out the scenarios

The recording of the machinima took place in a computer laboratory (lab) in one of the host institutions' campus. It took the best part of a day to record four machinima of between 3 and 5 minutes duration each. Six people participated in this, with one person managing the video and audio recording, including camera control, a second person controlling all of the non-speaking characters, and the remaining four people acting particular roles. The participants were all members of the research project team or academic staff members. None of the participants had any formal acting training. The designer of each scenario took on the role of director for the recording of that particular scenario, as well as acting the teacher in the scenario. The process of recording each scenario began with a discussion about the purpose of the scenario and the sequence of events and as part of this discussion role allocations were agreed on. Rather than rehearsing before commencing recording, we began recording at the commencement of our first attempt to act out each scenario. Our feeling was that our improvised actions and lines would sound more realistic than rehearsed performances. Nevertheless each scenario took a number of takes (the minimum was three takes and the maximum was four).

At the conclusion we saved all of the audio and video files onto a removable hard drive for editing. This turned out to be challenging due to some technical complexities with the audio recording software (see further discussion below) as well as different ways in which the audio tool was used by participants on the different computers in the lab. In retrospect, it would have been valuable to have a larger team and have one person take on a dedicated director role and another person take on the role of technical producer. The team had allocated the director role to the author of the scenario that was being role-played because they were most familiar with the scenario. However, they were also the main actor for the role-plays. It would have been more appropriate to have the main actor allocated to another member of the team to enable the director to coordinate procedures better. There was a dedicated technical producer who oversaw the machinima production, quality assurance of video, video angle and audio. However, because they were also responsible for controlling the five cameras (each attached to an unassociated hidden avatar controlled through separate computers), the technical producer was unable to also ensure that the audio software was recorded by the actors correctly (there were some takes where the audio was not recorded correctly on the particular actor's computer, but the quality of the audio captured by nearby computers was found to be sufficient).

Student avatars were provided with a variety of *SL* scripts to enable the actors to animate their avatar during the role-plays. These included pre-installed scripts from the software and also animations for sitting, reading and writing. The school student avatars were animated to respond to requests from the teacher to ensure that the machinima recordings appeared authentic.

Technical process

The technical producer set up five computers to record the machinima to ensure various camera positions and angles could be used in the final editing process. As previously mentioned, the role-plays were recorded in a computer lab, to ensure all actors used the same hardware and software platform. The original plan was for dialog to occur using *SL* audio, with actors wearing headsets to avoid audio feedback. Unfortunately, the audio was not working in *SL* due to network restrictions. To address this issue, we decided to speak out loud and record real talking. This turned out to be an excellent way of creating the audio as it was clear and crisp and ensured good quality. There was still one problem that was not foreseen. As the audio was not working in *SL*, the avatar's mouths were not lip-synced: that is, the avatar's lips did not move when speaking. This problem was overcome during production by re-recording the close ups with the avatar's lips moving when speaking. Fortunately, this was not required on many occasions.

Finally, the machinima was created using video editing. Overall, creating machinima takes several hours for a five minute script. It is much faster if high quality video images and multiple camera angles are not required. However, for the VirtualPREX machinima, this level of quality was essential.

Conclusion

This paper has reported on the process used to create a series of machinima illustrating particular classroom teaching scenarios for use by pre-service teachers as part of an in-class reflective discussions or alternatively as part of assessment tasks. We have described the process we used to design, record and produce the final machinima. Some of the key recommendations for others emerging from the process are as follows: using a loose plan for the scenarios rather than tight scripts does work, but probably requires additional takes to get right; ensure that you have sufficient people present when the machinima are recorded, including dedicated people to play each role, to operate the virtual cameras, to oversee the technical process and direct proceedings; and make sure that you set aside a longer period than you think you will need so that if you do need additional takes, or if technical problems occur, you do not need to reassemble the whole team at a later date.

As with the projects referred to in the literature review, these machinima demonstrate the capacity for this genre to be used across a range of disciplines for skill practice and also for critical reflection. They also pave the way for innovative assessment tasks. Given the reported difficulties with professional experience placements referred to in the literature review, machinima provide a sustainable approach to support future teacher training preparation. This approach could make a lasting contribution to the way professional experience is delivered into the future.

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Promoting asynchronous interactivity of recorded lectures in blended learning environments

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Recorded lectures have become one of the most popular methods of delivery in a blended learning environment (Greenberg & Nilssen, 2009). While there are many advantages to using recorded lectures they are limited in their ability to capture the interactive atmosphere experienced by students in the face-to-face environment. This paper examines how the use of audience response systems (ARS) and digital inking, when incorporated into live lecture recordings, can be used to facilitate asynchronous interaction of recorded lectures in bioscience lectures for nursing students. Key findings show that the three most valuable improvements that ARS and digital ink made to face-to-face lectures and recorded lectures relate to the ability to see other students' responses, immediate feedback and reinforcing material covered in class. Students who used recorded lectures more frequently particularly valued the ability to pause recorded lectures to consider the questions and then view collective results with immediate feedback. Moreover, students who viewed recorded lectures more frequently performed equally well with those students who did not.

Keywords: Audience response systems, clickers, active learning, digital inking, nursing bioscience

Introduction

A little over a decade ago Collis and Moonen (2001) posited that blended learning is a hybrid of traditional face-to-face and online learning, where the online component becomes a natural extension of traditional classroom learning. Now, blended learning has become an expectation for higher education students. A well designed blended learning approach of delivery is able to enhance the face-to-face interaction between teachers and students with online opportunities in the form of flexible, self-directed activities (Garrison & Kanuka, 2004) and is perceived to have many advantages for the learner, including anytime, anywhere access, self-paced learning, enquiry led learning and collaborative learning (Ruiz, Mintzer & Leipzip, 2006). There are many blended learning models which combine on-line material and traditional face-to-face teaching. They commonly use a central learning management system (LMS) as a platform to provide content such as online video, quizzes and other activities. The provision of electronic lecture recordings within the LMS has become an effective tool in the flexible delivery of lecture material (Woo, Gosper, McNeill, Preston, Green, & Phillips, 2008). Wieling and Hofman (2010) emphasize that offering recordings of face-to-face lectures is an easy extension of a traditional course and is of practical importance, because it enables students who are absent from the regular face-to-face lectures to be able to improve their course grade by viewing the lectures online.

It has been documented that the success of blended learning can, in part, be attributed to the interactive capabilities of online communication technologies (Swan, 2001). Literature in the field of lecture capture identifies many benefits that can be gained from recorded lectures, such as: reviewing material to complement in-class interactions; improving test scores; improving retention of class material; flexibility of schedule; making up for missed class; and the ability to clarify misunderstandings (Deal, 2007; McElroy & Blount, 2006; Nagel, 2008). One major shortcoming of recorded lectures, however, is that they are limited in their ability to capture the interactive atmosphere experienced by students in the face-to-face environment (Larkin, 2010).The potential drawbacks focus mainly on elements that students miss if they do not attend face-to-face lectures, including: lack of opportunity to ask questions and ability to obtain immediate feedback; lack of interaction with peers and/or lecturer; reduced motivation; and inability to pay attention/focus and distraction (Panther, Mosse & Wright, 2011). Chang (2007) highlights the concern that student engagement is reduced through using lecture capture hence encouraging students to become passive learners.

Whilst there is evidence that lecture capture generally supports student learning positively, there is a need to explore new ways to support active learning using recorded lectures. This perhaps represents one of the major challenges facing the effective use of lecture capture. The greatest increase in the effectiveness of lecture capture systems will come from the application of pedagogical techniques that integrate engagement and interactivity and will ultimately drive the success of this form of learning into the future.

Background

The University of Southern Queensland (USQ) supports high levels of flexibility in its programs of study by ensuring that students have equitable learning opportunities, no matter where or when they are studying. Lecture recording technology at USQ began 10 years ago and forms a central component to support flexible learning options for both on-campus and distance students.

The biological and physical sciences are an important component of USQ's Bachelor of Nursing (Pre-Registration) program. The learning and teaching of science subjects in undergraduate nursing programs can be difficult and a number of issues which contribute to this have been documented (McVicar & Clancy, 2001). An obvious disparity in science background exists amongst USQ's cohort with 60% of the enrolment comprising mature age students who either have never studied science at senior school level or may have left secondary school some 15 or 20 years ago.

Lectures have been recorded live in the course NSC1500 Biophysical Science Foundations in Nursing since 2002 to accommodate the diverse on-campus student cohort and tablet PC technology has been used on-going since 2007. Digital inking, using tablet PCs or pen-enabled screens is a technology that has been adopted increasingly within lecture recordings, both pre-recorded and live, since the ability to draw spontaneous annotation to support explanation in lectures greatly enhances communication and assists in creating close reproductions of the live lectures (Yoon & Sneddon, 2011; Ambikairajah, Epps, Sheng, Celler & Chen, 2005; Subhlok, Johnson, Subramaniam, Vilalta & Yun, 2007).

On-campus nursing students enrolled in NSC1500 can be categorised as: (1) those that usually attend lectures, but may occasionally be unable to attend; (2) those who attend face-to-face lectures about 50% of the time; and (3) those that rarely attend lectures and only attend compulsory tutorials. For many of the students who rarely attend lectures, reasons are predominantly related to travel time, work and family commitments. USQ is a regional university and many of the students are from remote areas where they may have to travel 1 to 2 hours to attend classes. Many thus rely on recorded lectures. Pilot research has revealed that 30% of students (n=97) never or only attended lectures 20% of the time and that these students use recorded lectures both as a supplement and replacement to the traditional lecture (McCabe, 2010). This provides an interesting contrast given that many studies show that students use recorded lectures to support and supplement learning rather than to replace face-to-face teaching (Brotherton & Abowd, 2004; Griffen, Mitchell & Thompson, 2009; Buchanan, Macfarlane & Ludviniak, 2010; Larkin, 2010).

Purpose of the current study

There appears to be scant information regarding how lecture capture can support active learning, particularly for those cohorts which use recorded lectures as a replacement of face-to-face lectures. Thus the challenge remains for educators to incorporate technologies which create an interactive learning experience that stimulate active learning. The relatively large percentage of NSC1500 students who rely on recorded lectures indicates that there is a necessity to enhance lectures to cater for students who are present as well as those relying solely on recorded lectures. This is perhaps especially important to support students using blended learning environments so that they can feel part of the same learning environment as campus-based students.

One strategy is to facilitate interactions during the live lecture and embed them in the subsequent lecture recording. A number of technologies have been used to promote interaction and active learning in live lectures, including audience response systems (ARS). ARS technology or 'clickers' have been used in higher education for over a decade, and a number of studies support its potential to transform classroom participation and learning, especially in science disciplines (Crossgrove & Curran, 2008; MacArthur & Jones, 2008). The technology has been used to improve student interaction, engagement and attention, increase attendance, stimulate peer and class discussion, provide feedback for both students and instructor in order to improve instruction, and improve learning performance. Kay & LeSage (2009) provide a comprehensive literature review examining the benefits and challenges of using ARS.

This study proposes to integrate ARS and digital inking within live lecture recordings as a simple approach to increase active learning whilst students view recorded lectures. The main motivating factor was firstly to provide a more interactive face-to-face learning environment for students attending live lectures and secondly, to enhance the blended learning environment by promoting student engagement and active learning using the subsequent recorded lectures. The adoption of the ARS in this study is therefore pedagogy-led (rather than technology-led) and the emphasis on teaching needs in technology-enhanced teaching is consistent with e-learning trends (for example Draper, 2009).

The aim of the study was to firstly explore how the use of ARS and digital inking in lecture recordings stimulate student active learning in asynchronous learning environments. Secondly, the study evaluated student perceptions of the combined technologies and quiz performance in relation to frequency of lecture recording use.

Methodology

Participants

The participants in this study were on-campus students who were enrolled in NSC1500 Biophysical Sciences in Nursing during the first semester of 2011. Of the 218 students enrolled in the course, 136 (62.4%) voluntarily took the survey, which was approved by the University of Southern Queensland Human Research Ethics Committee. The majority of students experienced ARS in live lectures for the first time, and none of them had used recorded lectures combined with ARS questions and digital inking. The average number of students participating in the live lecture was between 50 and 70.

Course delivery

The on campus NSC1500 course was designed as a blended learning model incorporating face-to-face, online and self-directed learning experiences over 13 weeks. Two modules of NSC1500 were included in the present study, namely chemistry and biochemistry, since these were delivered by the same instructor. The face-to-face component consisted of three 50-minute lectures and one compulsory 50-minute face-to-face tutorial each week. In addition, weekly online self-directed learning activities integrating lecture and tutorial material was provided for students to complete. A secondary teaching supplement was also provided to students in the form of a pre-study DVD which they can access both at the start of semester and throughout (McCabe, Kek and Turner, 2011). This support material was developed in response to the many nursing students who are apprehensive of their ability to understand biological and physical science concepts.

Integration of ARS and digital inking in live and recorded lectures

Audience response systems (clickers) are hand-held, pocket-size remote control-like devices that use infra-red or radio frequency signals to transmit and record audience responses to questions. The response system used in this study was TurningPoint™ software. This was used to present questions about 4 or 5 times throughout the face-to-face lecture and was tailored to hone in on specific points in the lecture. They were used for various purposes, for example: to assess students' background knowledge; to highlight known misconceptions; to review material; or to apply new knowledge to solve a problem. During the lecture sessions the software program recoded the student entries and response data was instantly aggregated and displayed. After the graphed responses were displayed the lecturer provided detailed feedback through verbal explanations and annotations on the PowerPoint slides to support the explanations.

The live lectures were captured using Camtasia Relay software (http: www.techsmith.com/camtasiarelay), which recorded the instructors voice and PowerPoint™ slides containing ARS activity and digital inking. The recorded lectures were made available soon after class in the Moodle learning management system. Figure 1 illustrates a typical slide containing an ARS question with the responses provided by on-campus students and annotations made by the lecturer using digital ink in response to the students' answers.

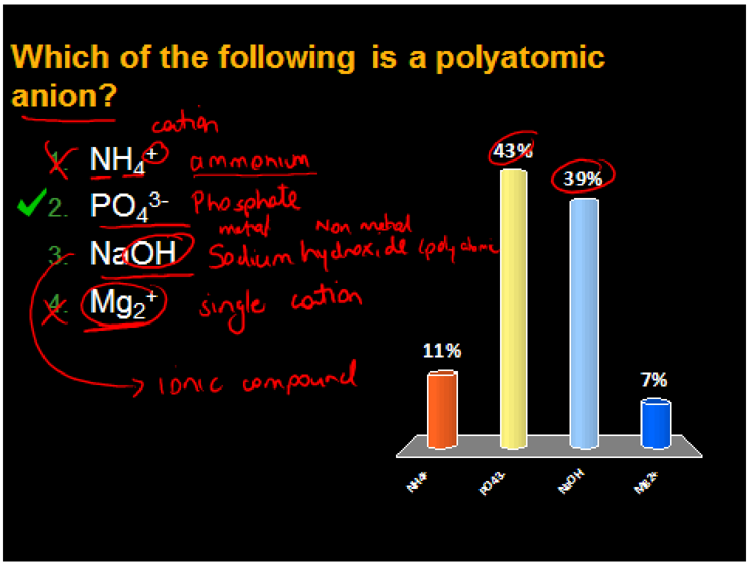


Figure 1: Screenshot example of recorded ARS question including graphed student responses and annotations to provide feedback

Student evaluation and analysis

An anonymous paper-based survey was provided during the last week of semester to the students attending tutorials. The questionnaire was designed with both quantitative and qualitative questions to evaluate the effectiveness of the combined technologies in the different learning environments, that is, live lectures, recorded lectures or a mixture of both. A concurrent triangulation research design was employed (Creswell, Plano Clark, Gutman & Hanson, 2003) where both quantitative and qualitative data were collected simultaneously, and the results of the analyses of both data sets were merged for a better understanding of the research aims. The quantitative questions related to students' perceptions of the use of the combined technologies and effects on their learning. Qualitative data was obtained through open ended questions asking students to provide their comments.

Findings

This section presents the analysis of the evaluation data. Students were firstly asked to rate their frequency of face-to-face lecture attendance and use of recorded lectures. A close correlation exists between students who view recorded lectures versus those that attend live lectures (Table 1; highlighted data). As a summary, 30% of students attend lectures while over 25% seldom or never view recorded lectures. Approximately 25% of students seldom or never attend lectures; the same percentage of students always or usually viewed recorded lectures.

Table 1: Summary of frequency of lecture attendance and recorded lecture use.

Live lecture attendance*	**Use of recorded lectures***					
	Always or usually	Most times	Sometimes	Seldom	Never	Total
Always or usually	5	5	7	16	8	41 **(30.15%)**
Most times	4	9	14	5	0	32 (23.53%)
Sometimes	6	11	8	1	1	27 (19.85%)
Seldom	12	8	2	2	0	24 **(17.65%)**
Never	8	2	1	1	0	12 **(8.82%)**
Total	35 **(25.74%)**	35 (25.74%)	32 (23.53%)	25 **(18.38%)**	9 **(6.62%)**	136

*Always or usually (>80%); most times (50-80%); Sometimes (20-50%); Seldom (<20%)

Secondly, students were asked a series of questions in order to assess their perception of the use of clickers in recorded lectures. The results of the attitudinal survey are reported in Table 2. Students indicated their responses to the first 6 survey questions shown in Table 2 using a 5-point Likert scale: (1) strongly disagree; (2) disagree;

(3) neutral; (4) agree; (5) strongly agree. The next 2 questions used a 4-point Likert scale: (1) not important; (2) neutral; (3) reasonably important; (4) most important. The 8 questions express the students' responses as % agree and % disagree, or % important and % not important, calculated from the sum of students who responded in each category. The mean and standard deviation of the students' responses are also given; indicating the larger the mean value, the more positive the students response.

The first aim of the study was to explore how the use of ARS and digital inking in lecture recordings stimulate student active learning in asynchronous learning environments. The survey data in Table 2 show that the majority of students agreed that clicker activities included in the lecture recordings enabled them to (1) revise the questions multiple times (69.9%); (2) helped them focus when replaying long lectures (64.5%); (3) helped reinforce the material covered in class (76.1%); and (4) enabled them to 'stop-think-answer' (69.9%). The most positive responses were regarding the ability to see responses of other students' answers to gauge levels of understanding (82.6%) and immediate feedback (81.9%), while incentive to play/replay all the lecture recordings and encouraged better grades were rated to a lesser extent (49.3% and 57.9% respectively).

Table 2: Student perception of use of ARS in recorded lectures

Question	Agree (%)	Disagree (%)	Mean ± SD
1. The clicker questions included in the lecture recordings enabled me to revise the questions multiple times which is important for the way I study	69.6	5.0	3.88 ± 1.05
2. Having the clicker questions included in the lecture recording has helped me keep my focus when replaying long lectures	64.5	7.9	3.83 ± 1.11
3. Having clicker questions included in the lecture recording has given me incentive to play/replay all the lecture recordings better	49.3	15.2	3.44 ± 1.09
4. Being able to go through recorded clicker activities has helped me as it reinforces the material covered in class	76.1	5.0	4.04 ± 0.94
5. Seeing responses of other students' answers helped me gauge my level of knowledge	82.6	3.6	4.01 ± 0.78
6. The clicker questions encouraged me to get better grades	57.9	14.5	3.62 ± 0.86
	Important (%)	**Not important (%)**	**Mean ± SD**
7. When viewing the lecture recording, you can stop the recording at the clicker questions, think about the answer and then play the recording to reveal and cross check the answers. How useful do you rate this capability of 'stop-think-answer' for your studies	69.6	5.8	3.00 ± 0.99
8. How important do you rate the immediate answer and feedback provided with the clicker questions?	81.9	3.6	3.24 ± 0.90

The qualitative findings also broadly support the quantitative results. Themes emerged around increasing focus and the ability to revise/reinforce lecture material. Students reported that:

> They encouraged me to actively think rather than sit passively in the lectures – very good for learning.
>
> It was a good exercise because I enjoyed being attentive - it minimized boredom and daydreaming.
>
> I really enjoyed them; it helped me focus overall on the material as a question might have been coming.
>
> Overall I found the clickers to be an AWESOME idea. Helps keep me going when listening to the lectures.
>
> Introduced throughout the lecture definitely breaks it up and ensures you are on the right track and understanding it all. Made the lecture more interesting and engaging.
>
> Even though I attended the live versions I found clicker questions good for rewatching, as I do often get sidetracked in thought.

The combined use of digital inking and clicker feedback in providing effective feedback was another theme that emerged from the qualitative comments. The ability to obtain immediate feedback from both the teacher and other students (i.e. ability to see peers' responses) proved equally important. Students reported that:

> Recorded lectures with clicker questions and interactive slides e.g. writing on slides as we go is the best way for me to learn in an online environment.
>
> I found the clicker feedback with the red pen allowed me to make connections in the work we had to learn.
>
> I found this a great help as I would pause the lecture and write the questions and answers down.
>
> I felt that I definitely enjoyed the lectures that used clickers and it was really good to see where my level of understanding was in comparison to my peers.

The second aim of the study evaluated student's perception of the combined technologies and quiz performance in relation to lecture recording use. A t-test was used to compare students' who attended lectures more than 80% of the time with those that never or seldom attended. Table 4 shows that there was only a significant difference in students' perception of the use of clickers for the stop-think-answer method (question 7). Students who never or seldom (<20%) attended lectures found this function particularly useful compared to students who preferred to attend the live lecture.

Table 3: Student perception of ARS in recorded lectures depending on lecture attendance

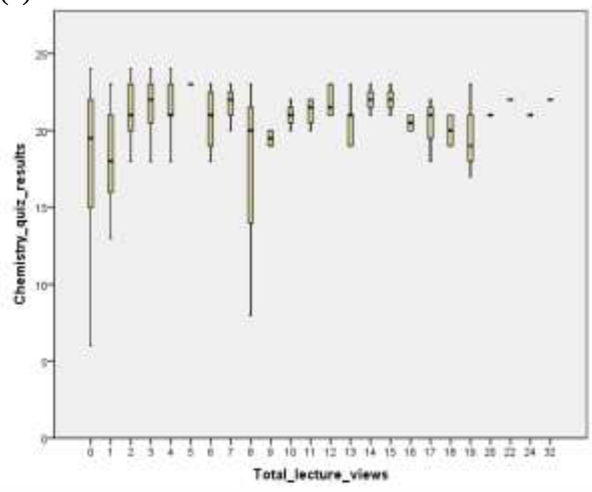
	Lecture Attendance				t-test (cf >80%- (20% - Never)
Question	**>80%**	**50-80%**	**20-50%**	**<20% - never**	
1.	3.68 (1.31)	4.25 (0.72)	3.67 (0.92)	3.94 (1.01)	0.328
2.	3.63 (1.16)	4.00 (0.98)	3.78 (1.01)	3.94 (1.22)	0.257
3.	3.27 (1.14)	3.56 (0.98)	3.41 (1.01)	3.56 (1.21)	0.288
4.	4.15 (0.99)	4.09 (0.78)	3.78 (0.85)	4.08 (1.08)	0.791
5.	4.05 (0.92)	4.03 (0.59)	3.81 (0.88)	4.00 (0.96)	0.821
6.	3.54 (0.87)	3.72 (0.77)	3.44 (0.80)	3.75 (0.97)	0.315
7.	***3.71 (1.10)***	***4.16 (0.88)***	***3.85 (1.03)***	***4.25 (1.05)***	***0.030***
8.	4.22 (1.15)	4.34 (0.83)	4.04 (0.90)	4.25 (0.91)	0.897

One student who attended less than 20% of the time reports that:

> Recorded lectures can cause your mind to drift – the clickers have made the lectures interesting and have helped me stay alert. I was also able to pause the lecture think about my answer, then see if I was correct or not.

Figures 2(a) and (b) show results from an online quiz given to students at the completion of the chemistry and biochemistry modules. Apart from two outliers at 8 and 18 lecture views in Figures 2a and 2b respectively, it appears that students who view lectures more frequently perform equally well, if not better, compared to those students who used them to a lesser extent if at all.

(a)



(b)

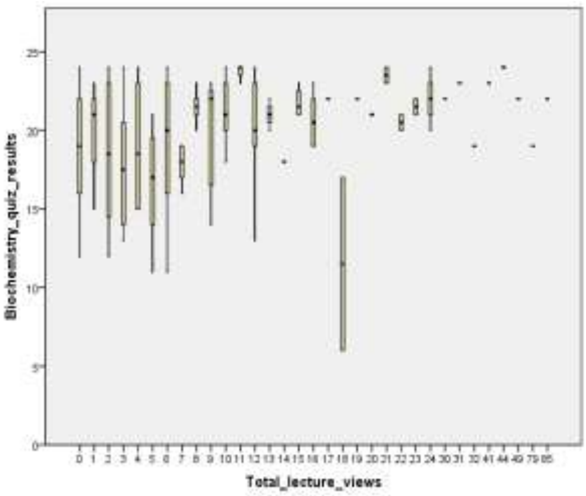


Figure 2: Online quiz performance (/24) for (a) chemistry and (b) biochemistry modules against lecture views

Discussion and Conclusion

Many higher education institutions support the policy that blended learning encompasses the obligation to provide equitable learning and assessment experiences between and across different cohorts. The pedagogic issue therefore is ensuring equal treatment for all students. Brandt (cited in Russo & Campbell 2004) suggests that many students expect online courses to mirror face-to-face classes in providing opportunities for interaction, idea generation and confirmation associated with constructivist learning. Such expectations were promoted through the provision of ARS and inking enhanced lecture recordings in this study. Both quantitative and qualitative findings provided support that the three most valuable improvements that clickers and digital ink made to face-to-face lectures and recorded lectures relate to: (1) the ability to see other students' responses; (2) the ability to obtain immediate feedback and (3) the ability to revise/reinforce material covered in class.

Seeing responses of other students' answers rated the highest positive student experience in this study. Maintaining a sense of community and interaction amongst students is critical to the success of online delivery (Rovai & Jordan, 2004). This is particularly important when considering the use of recorded lectures as part of the blended learning experience, especially in light of the relatively high percentage of students who rely on recorded lectures in this current study. Collaborative learning implies a more dynamic communication among learners that brings about knowledge sharing. Capturing students' responses in the recorded lecture via the use of embedded clicker questions has created a form of peer review activity not normally afforded by traditional lecture recordings by allowing students to see each other's responses. Race (2006) suggests that peer instruction/feedback can itself allow students to learn from each other's weaknesses and the ability of students to compare their knowledge against their peers is particularly important especially in regard to confidence levels. A previous study has found that strategies which increase nursing students' confidence in studying the biosciences are central to their success in these courses (McCabe, Kek and Turner, 2011). As one student comments

> Clicker question helped me think more about the material and helped me gain confidence.

The high percentage of students who positively rated that the technology enabled provision of immediate feedback facilitates active learning through the inclusion of clickers in the recorded lectures. Generally, formative feedback during the learning process helps students to correct misunderstandings, gain clarification, identify gaps in knowledge, and flaws in logic (Beatty, 2004). Feedback from students to the instructor allows on-the-spot adjustments to instruction, such as trying a different explanation, providing amplification with discussion, or using additional learning exhibits. Likewise, the feedback obtained from the clicker questions in the current study provided a dual purpose, allowing both students and teacher to benefit. The additional use of digital inking in the feedback process provided another dimension to the teaching process which can be absent from other methods of clicker instruction and lecture recording.

Recorded lectures enable students to be strategic in their use of recordings for review and repetition of key or difficult concepts. However, it is important that students are able to navigate to sections of the online lecture they felt were the most relevant to them. Davis, Connolly & Linfield (2009) found that students were actively choosing specific sections of the content to review rather than passively revisiting entire lectures. However, finding the critical concepts can be difficult for the less advanced students. It has been found that students can spend a copious amount of time listening to recorded lectures without understanding key concepts. Owston, Lupshenyuk and Wideman (2011) found that highest achieving students fast-forwarded to sections and watched them once, whereas the lower achieving watch the whole video for each class multiple times or watched the entire recording once and sections multiple times. The current study has shown that embedding clicker questions can potentially enable the viewer to identify the key learning concepts and thus aid in the revision process. This is supported by the use of the 'stop-think-answer' method which was valued more highly by those students who used recorded lectures frequently. Moreover, an analysis of viewing patterns of recorded lectures show that those students who viewed lectures more frequently performed equally well in quizzes compared to those students who accessed them less frequently. Interestingly, Le, Joordens, Chrysostomou, & Grinnell (2010) found that students who used the pause and seek features in a maths course performed more poorly than students who used lecture recordings for a concept based course in psychology. Like maths courses, the disciplines presented in the current study differ to the teaching of a concepts based course in their emphasis on the teaching of cognitive skills that are enhanced with practice. This study has shown that, recorded lecture strategies which embed activities that apply knowledge through the application of problems, such as clicker questions, has the potential to enable students to become more proficient in disciplines such as maths and science.

Bennett and Maniar (2007) questioned the value of lecture capture arguing that it could prevent some students becoming independent learners. The survey results demonstrate that independent and self-regulated learning has been encouraged through the integration of clicker questions in the recording. The approach taken in this study aids to transform traditional lecture recording into a form more suitable for blended learning environments by engaging students in a 'pseudo-synchronous' environment, thereby allowing them to feel part of the live lectures without participating synchronously or being physically present. Thus, the ability to pause recorded lectures to consider the content (such as unanswered clicker questions), continue to view collective results with immediate feedback, and repeat this process as desired, affords flexibility to students' individual patterns of engagement (De George-Walker & Keeffe, 2010). This context also implies that the pseudo-synchronous environment provides teacher, content, student and interface interactivity, thus augmenting interaction and cohesion through measures of mediated presence (Russo & Campbell, 2004). Student engagement through stop-think-answer activities are bi-directional - albeit self-determined - and thus offer students the autonomy to learn at a pace and in the manner that suited their needs (De George-Walker & Keeffe, 2010). The present study demonstrated that the heightened asynchronous interactivity afforded by the use if ARS and digital ink in recorded lectures was especially beneficial to those on campus students who choose to use recorded lectures more, and possibly "facilitated a simultaneous independent and collaborative learning experience…where learners are independent of space and time – yet together" (Garrison & Kanuka, 2004, p. 97).

In conclusion, this study has revealed that lecture recordings with embedded clicker and annotation using digital ink create a pseudo-synchronous learning environment where students manipulate the recordings to suit their learning whilst experiencing levels of social connectivity. The use of ARS and digital ink provides dual support for both the face-to-face environment and the online environment without any extra effort on the part of the instructor, and has therefore improved both efficiency and consistency of delivery. The contextual immediacy of audio-visual activity in lecture recordings has the potential to create a sense of reality for online students. The findings of this study give support to the increase active learning provided by clicker questions and annotation within recorded lectures in a blended environment. Further evaluation of the combined technologies in a fully online environment and direct comparisons with an on campus counterpart would provide interesting insights.

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Multidiscipline role-play in a 3D virtual learning environment: Experiences with a large cohort of healthcare students

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Three-dimensional virtual learning environments (3DVLEs), such as Second Life, have been used in education for some time. Although many writers have addressed where, how, and why 3DVLEs are applied in education, only a few articles have concentrated on the coalface of running a learning project within them. This paper looks at the experience of using Second Life to conduct a multi-discipline healthcare role-playing project with a large cohort of university students. It aims to add to the body of evidence highlighting the technical and logistical difficulties in running such a project, and attempts to offer solutions and advice on directions of problem solving. This paper will also add to best practices concerning the use of 3DVLEs in higher education.

Keywords: Second Life, 3DVLE, interdisciplinary, net generation, education, healthcare, technical issues

Introduction

Background

The use of three-dimensional virtual learning environments (3DVLEs), such as Second Life, within tertiary education is becoming more and more common (Inman, Wright, & Hartman, 2010). Educators quickly recognised the potential that early renditions of Second Life offered for hosting educational activities such as lectures (Baker, Wentz, & Woods, 2009), student building projects (Jarmon, Traphagan, Mayrath, & Trivedi, 2009), simulations (Rogers, 2008) and student interactions (DeLucia, Francese, Passero, & Tortora, 2009). While the use of Second Life for educational purposes is associated with several benefits, such as increased student engagement (Baker et al., 2009) and flexibility (Hansen, 2008), it is important to acknowledge the many challenges that may be encountered when using such technologies (Baker et al., 2009; Bhati, Mercer, Rankin, & Thomas, 2009; Dudeney & Ramsay, 2009; Warburton, 2009).

The purpose of this paper is to highlight and describe the technical and logistical problems that arose during a project where Second Life was used as a simulated role-playing tool amongst a large cohort of Health and Medical Sciences students. In doing so, this paper will add to the body of evidence on best practices for using Second Life for educational purposes. While there is no doubt that the experience of using a 3DVLE like Second Life in education would surely vary from institution to institution, or even from student group to student group, the current paper will be of assistance for educators planning on implementing a 3DVLE in a Healthcare Education framework.

Project description and objectives

The project discussed within this paper took place during Semester 2 of 2011, and included 185 students from multiple healthcare disciplines across the Schools of Health and Medical Sciences at RMIT University. The disciplines involved were Chiropractic [n = 93], Medical Imaging [n = 17], Mental Health Nursing [n = 32], and Midwifery [n = 43]. The aims of the project were to enhance student communication skills in the context of patient history-taking, and to provide opportunities for interdisciplinary learning.

Students worked in intradisciplinary groups of three (or two if necessary) and were expected to simulate a patient-practitioner interaction during a health case history, which was recorded via screen recording of the Second Life viewer. The resultant videos, referred to as machinima in virtual world terminology, were then submitted for assessment purposes. Students were given only a basic level of detail concerning the ‘patient’ and there were no scripts, actors or pro forma to follow. While the case spanned the four disciplines, as the ‘patient’ role was referred from one practitioner to another, the case histories performed within each discipline were independent of each other. Students in each discipline were expected to play each one of three roles in turn, which will henceforth be referred to as *practitioner*, *patient,* and *peer*. Students were also given interdisciplinary activities to perform in the hope that this would foster a sense of interdisciplinary awareness and understanding.

Student assessment tasks

There were multiple forms of assessment used within the Second Life module. Firstly, students completed and electronically submitted the machinima of their patient-practitioner role-play. As stated above, students were expected to assume three different roles for this activity. Each of these roles was designed to allow students to experience a slightly different perspective of the practitioner-patient interaction.

The role of practitioner is most familiar to students, as this is the role they are used to adopting throughout their disciplinary programs. Playing this role allows students to practice their patient history taking skills in a safe environment, without being exposed to real patients. The patient role allows students to use their practitioner knowledge, but they are required to reframe it in order to take the perspective of a client. Qualitative data collected from students indicated that this role was highly beneficial, as several students felt that playing the role of patient enabled them to develop a greater sense of empathy with their own patients. The peer role, on the other hand, allowed students to watch a practitioner-patient interaction with a sense of objectivity. This role gave students the opportunity to learn from the history-taking skills of their peer practitioners, and to give them feedback as to areas of strength and weakness. Students playing the peer role were also able to act as the “camera” by capturing the audio and video of the other two students while they interacted within Second Life to produce the final machinima.

The second form of assessment required students to complete a written critical self-reflection of their three role-plays as practitioner, patient and peer. This assessment allowed teaching staff to obtain a sense of what the student had gained from the role-play experience. The following quote, taken from a Chiropractic student’s self-reflection activity, clearly demonstrates how the role-play activity has been valuable to them:

> I can see some areas in which I could improve. My language definitely needs to improve. I seem a little casual at times and need to display more empathy towards the patient. I also feel I could improve the flow of my history and control the content a little more. At times I may have gotten not enough information while at others I may have let the patient go on for a little too long. It was good to see how other students of the same discipline went about the activity. By doing this I was able to get some good ideas about how to improve my own performance but I was also able to realise what I did well.

The third form of assessment was designed to promote interdisciplinary knowledge and understanding. To this end, students were expected to access and read introductory material about each of the involved disciplines within Second Life. They were then asked to write about what they had learned from this material. Students also watched the recorded role-play of a student practitioner from another discipline and completed an interdisciplinary critical reflection on that patient history.

Benefits of the project

The project described here focused on the type of interaction that 3DVLEs like Second Life do well; human interaction. Although this interaction is limited to vocal and visual exchanges between avatars in Second Life, it would be inappropriate to call it ‘simulated human interaction’, for it is only the appearance of physical presence that is simulated here. The interaction occurs fundamentally between two or more people in real-time, and the use of voice chat throughout the role-play supports this. This allowed students to feel engaged in the virtual environment when they were performing their role-plays in Second Life:

> [The] creation of an avatar to portray myself as a qualified radiographer was definitely an engaging method for developing interdisciplinary interactions and patient communications.

One of the greatest things that a 3DVLE affords well is flexibility. Online learning platforms allow students to access their learning materials at their own convenience, which makes them extremely useful for conducting collaborative learning activities with distance education students (DeLucia et al., 2009; Eschenbrenner, Nah, & Siau, 2008; Hansen, 2008). This was definitely the case in the project discussed here, as the following quote from a Medical Imaging student shows:

> The ability to connect and learn via the internet gave us much flexibility in where we undertook our learning, be it the couch at home, the local coffee shop, or the university library, we could access and utilise the online 3D simulated environment anywhere with a network connection.

Furthermore, this project was also designed to afford students flexibility in the way they completed their assessments. They were able to come and go from Second Life, and to practice and refine their role-play performance as many times as necessary until they were ready to submit their machinima for peer-review. Several students pointed out how beneficial this aspect of the project was for them, as reflected in the following comment from a Medical Imaging student:

> I would rate the ability to complete the activities at my own convenience very high. It means I can complete tasks in my own time and practice the role-play as much as I would like to.

As the final recording was performed in the presence of peers, it allowed for immediate self and peer reflection. The following Chiropractic student identified this as an area of value to them:

> All in all the Second Life exercise has been a valuable experience, via listening to ourselves [and] others conduct [a] history on the same patient has allowed [me] to identify key [mistakes] which I have made, and to see how others do the same thing and pick up on areas in which I can improve, and to give and get reflection on the task is invaluable.

The flexibility of the 3DVLE also provided opportunities for interdisciplinary interaction between students. Due to factors such as timetabling differences and being sent out on external clinical placements, opportunities for on-campus interdisciplinary interactions are rare. However, while completing the learning activities in Second Life, some students were able to interact virtually with students from other disciplines. Qualitative data showed that when these chance meetings occurred, students reported them favourably. For instance, one chiropractic student offered the following anecdote:

> Whilst roaming the streets in the Second Life location I met a girl in the mental health profession. We discussed different ways we would approach the maternity case we were given and it made me realise that although we go through psychology in class, its not quite to the extent that a mental health patient is taught. The interaction with this student made me see the benefits of referring a patient out if I thought that they had a psychological element to their history.

If the course of study is to be run across disciplines synchronously, the encouragement of such interactions within the 3DLVE could be a desirable approach.

Another benefit of this project stemmed from the role-playing activities. The activities used with this project allowed for a range of roles to be played by the learners. An ability to strongly emphasise reframing, specifically in the patient role, was also presented. In the Second Life module described here, scripts, actors, or automated responses were dispensed with in favour of students being expected to engage with the material in an educated way. This allowed them to reframe the knowledge they have acquired from the perspective of a practitioner in order to play the role of patient.

The peer role added an opportunity to objectively reflect on a performance. This is also true of one of the major components of the project; the interdisciplinary interaction. If more than one involved discipline runs their projects at the same time, and lines of communication are efficient, students from one discipline could act as a peer for students from another discipline. This would allow a unique insight into the workings of another discipline concerning the same patient. If the courses from each discipline are not running in synchronisation, role-play machinima from one discipline can serve to act as material for peer review. In the current project, the latter arrangement was the case. In the event that a discipline does not have a bank of machinima to contribute, interdisciplinary roles can still be assessed by students if the instructors of both disciplines come together to make a range of "exemplar" interactions. This would also facilitate the use of rubrics to assess student reflections. This approach would be of great benefit, not only when the project is used asynchronously, but also if a "patient" does not cover an area of interest within one of the discipline's course of study, but does for another.

Difficulties with the project

The venue

The location where students and staff are to access the 3DVLE seems to greatly influence the resultant difficulties and hurdles, sometimes in quite paradoxical ways. The use of 3DLVEs would be most appropriate where minimal (or a complete absence of) campus presence is used in the delivery of the course of study. The project described here involved a varied mix of distance educated/off-campus students, students who spent some time on campus before heading out on external placements, and students educated on-campus. This meant that allowances had to be made for the place and means by which students wished to conduct the learning tasks and related activities.

Students were encouraged to perform the assessment tasks off-campus using their own equipment. They were given a detailed set of instructions on setting up the Second Life 2 viewer, and also in gaining access to the Second Life island (a purchased area of virtual land, usually bounded by virtual water) where the tasks were to take place. The qualitative data gained from the project indicates a wide spread in the success of this. Some students had little to no problem in installing, configuring and accessing the required software for use at home. There were others however, who had great trouble in getting the required software working. For instance, one student commented:

> My computer was quite old, so downloading the software was much more difficult than it should have been.

As the above quote highlights, the reasons given by many students centred around insufficient computer specifications, though these are quite undemanding on lower (but still usable) settings of the viewer, especially for use in the confines of a virtual office environment. There was also some difficulty with accessing the island within Second Life, which some students perceived as a technical issue:

> The downside was the technical difficulties such as getting an invite by the administrator, and particularly getting into the clinic.

One of the great difficulties in managing software for a Second Life project is the huge range of variables that are at play. Such variables include the type of platform (PC/Mac/Linux), the operating system and version of said, the configuration of the system, and the firewall rules of the off-campus Internet access. Quantitative data collected from students showed that the majority used a computer "often" or "frequently", however most of the students who experienced difficulties seemed incapable of seeking a solution themselves, or using the vast online resources available concerning the use of Second Life. This would seem to indicate a culture of Technology Consumers rather than Users. In support of this, Selwyn (2009) challenges the view that the current generation are "digital-natives" or talented users of technology, and argues instead that their use is unspectacular. Perhaps one could say that such Users consume technology when it is presented in a user-friendly, or palatable, form, but find difficulty when they must use it in a way that involves a deeper level of understanding.

On-campus access to Second Life can result in more control over the aforementioned variables, but this may be incumbent with its own difficulties. One can, to a certain degree, ensure the minimum requirements to operate 3DVLE software are met, as most office computers should fall within the minimum system requirements needed for Second Life. There is the matter, however, of IT support at the host institution. Each location (computer/workstation) needed for 3DVLE access must have the required viewer installed, and be maintained and updated regularly. This last point is crucial, as when updates are released, older versions may cease working. In a small institution where one computer lab is maintained, this may be an easily managed task, however once multiple labs, differing user groups, and increasing administrative complexity are involved, this task can be a real risk to the success of the project. Linden Labs, the proprietors of Second Life, have a detailed guide for system administrators and IT security, which should aid in matters of configuration and firewall measures (Linden, 2012). In the experience of this project however, it is apparent that they may require the approval of newer rules than are already in place. This was the cause of several delays, and a degree of staff and student dissatisfaction during the project.

Along with basic firewall settings, audio settings such as default enabling of the microphone and speaker ports, and configurations such as proxy settings, are also important. The viewers used in 3DVLEs access the Internet via different streams of traffic, therefore in-world access to multimedia and the Internet may involve a proxy. Furthermore, voice chat may use a different path than the rest of the Internet traffic generated by the viewer. Once again, tight restrictions can cause problems in the function of the viewer, which can affect the completion of the assessment tasks and reduce student satisfaction. In the experiences of this project, increasing IT administrative complexity led to increasing division. Moving from one lab to another, or one campus to another, sometimes resulted in moving to an area where the configuration rules had not been changed to allow the Second Life specific traffic, which once again limited access and usability. A very clear and definite list of requirements to IT administrators will go a long way to alleviate this, but such complicated bureaucracy can be a very real and ongoing danger to such projects.

As the use of 3DVLEs would preferentially involve real-time voice chat between the participants, there is a desire to provide an on-campus environment to support it. It was notable in the feedback from our students that a general computer lab environment was not ideal for this purpose. Students reported that sharing the lab with general users made it difficult to secure a computer when they wanted to use it (groups of three were needed for the tasks in world). In situations where students were able to secure computers, they felt that environment was too noisy to converse freely using headsets or concentrate on the interaction. So too, when it was time to record the machinima for the purpose of assessment, as this Medical Imaging student points out:

> [One] problem was the limited amount of computers available to complete the assignment. [The on-campus computer lab] is very busy during uni hours and recording was difficult with the background noise. This resulted in staying back at uni till late to attempt to record the role-play.

It is likely that other users not engaged in the Second Life task would also find students conversation a distraction. This is yet another reason that it is advisable to encourage students to conduct the tasks off-campus.

Virtual space

One of the first challenges when using Second Life is making sure that there is a private area, such as an island, available in order to conduct the learning activities. If an institution does not have an island, and a grant does not allow for purchasing one (and there is no budget to support same), there are cheap alternatives available such as ReactionGrid and OpenSim. Discussion regarding which of these platforms is best is, unfortunately, outside the scope of this paper. However, a 2010 pilot project at RMIT University, in partnership with the University of South Australia, used ReactionGrid. In the project discussed within this paper, the provision of University funding meant that a Second Life island could be purchased.

Whichever platform is chosen, the project is going to need at least one Second Life architect. This person is necessary for building an environment that is suitable for use in the tasks. This may be as simple as a room with chairs, or as complex as multi-discipline polyclinic (a medical clinic housing several disciplines). The latter was employed for the project discussed here, and a follow up project conducted by the same research team in 2012 will use an updated and expanded version of this facility.

Figure 1: Polyclinic facilities designed for the 2011 project

As well as an architect(s), or perhaps as part of their role, a Second Life administrator is also needed. It is not within the scope of this paper to get bogged down in any legal or ethical responsibilities that an institution has for their students' behaviour or experiences while using a 3DVLE (Grimes, Fleischmann & Jaeger, 2010). Suffice it to say, though, that it is in the best interests of students involved in such projects that an administrator locks down access to an island, or an area of an island, to the relevant staff and students involved.
A necessary outcome of locking down an island is that the island administrator must ensure that the appropriate users are able to gain access to the restricted area. There are two ways of approaching this task; sending invitations to join an access group or manually adding usernames into an 'allowed residents' list. If using the invitations method, the administrator is required to send a personal message within Second Life to all of the relevant staff and students. One disadvantage with this method is that users must be aware that they need to look at their Second Life notifications and click 'Join' to agree to be part of the group. If they fail to go through this process, additional invitations need to be sent until this task is achieved. On the other hand, if manually adding users to a list of 'allowed residents' (Second Life user accounts), there are limitations on the number of avatars allowed to access the area. Furthermore, when using this method, it is not possible to enforce access restrictions on a 'per region' basis. Instead, restrictions apply at the estate level and this will affect all regions within this estate.

Due to the drawbacks associated with the manual addition method, students recruited in the 2011 project were given access to the polyclinic using the invitations method. Unfortunately, this process was not without difficulties, and many students reported not being able to access the required areas of the island. One of the most common factors associated with these accessibility problems was inaccurate usernames. Ideally, each student would sign up via the Second Life webpage, then supply their exact username to their lecturer. The lecturer would then pass this information on to the island administrator, who would invite the user onto the island within Second Life. However, when students did not supply their exact username to their lecturers, the island administrator had to spend time looking for them. In some cases, the administrator failed to find the user, and this was far from an ideal scenario.

Another commonly cited reason for difficulty accessing the island was trouble with invitations. On some occasions, students had been invited to access the island, yet they still claimed they could not gain access. This was sometimes merely a case of the student failing to accept the invitation. One unfortunate feature of the release version that was current to the project (2.x.xx) was that users entering in “basic” mode (the default) could not see messages including invitations. This is no longer a problem in later versions (3.x.xx) of Second Life software. Invitations do need to be accepted if they are offered, but if they are not accepted and the user logs out, the invitation will be permanently removed. Unfortunately, this causes another problem, as multiple invitations may need to be sent to users who log out before accepting their initial invitation. As a problem solving measure in the 2011 project, one of two staff members with administrator access met in-world with students who had had accessibility problems. In these instances, the staff member was able to add students to the access group manually by right clicking on their avatar, and selecting ‘invite to group’ from the context menu. As a result, the user's accessibility issues were immediately solved.

In the 2012 project, it is planned to use more strict logistics surrounding accessibility. In most cases, teaching and technical support staff will run face-to-face tutorial sessions to walk students through the following activities: signing up to Second Life, gaining entry in-world, arrival at the open access area, accepting invitations to the group, and obtaining access to the restricted areas of the island. In large groups (n = 90+), or in cases where students are enrolled in off-campus programs, a variation of the 2011 method will be used. This will require students to sign up for Second Life, then lodge their username with the appropriate teaching staff member who will then verify the student's identity and pass it on to an island administrator. Certain times shall be scheduled where an island administrator can be present in-world to assist students having difficulty and invite them in to the restricted island areas. This process will provide students with immediate access, rather than the ad hoc stopgap method used in the 2011 project. While this may entail walking them through some of the processes, it is hoped that the number of students needing such assistance will be low.

The provision of extra funding in 2012 has seen the RMIT University island gain an improved welcome and orientation area. This will help with some of the accessibility issues mentioned above, as this area will not be restricted access. Students will therefore be able to gain experience in-world while they are waiting to be permitted entry to the restricted access area. This addition was made as a small proportion of students from the 2011 cohort became lost in-world, despite being given a SLURL (Second Life URL: an address for a location in-world, used the same as one would a web address). Having this extra space should also decrease student frustration, as in one session they will be able to visit and explore Second Life in an area owned by RMIT University, even without access to the restricted area. Providing the SLURL is still a suggested measure however, as it can facilitate students' movement to the task area. It is recommended that it is made as easy as possible for students to get to a host institution's area in order to minimise unwanted contact from outside users. While this does mean that users who are not from the participating institution will have access to these unrestricted areas, it at least protects students from exposure to highly public areas.

As one may have already concluded, island access problems are almost exclusively due to user/student error. It is the belief of the authors that a clear set of instructions and rigid logistics will go a long way to managing these types of errors.

Expectation

As mentioned earlier, there were a number of students across the disciplines that reported dissatisfaction and frustration at their inability to complete various stages of the tasks. These frustrations were reflected in both the qualitative and quantitative data. It became quite evident to support staff, however, that these students were often making their first contact late in the timeline, as the following quote reveals:

> The recording process was a technical nightmare. Not having the required hardware on my PC to enable my peers to hear my voice in avatar, and my PC crashing every time I entered one of the clinics was very frustrating, this with the fact of leaving it to the 'last minute', much like many of my peers did not help my cause.

This area of failed student expectation - that they would be able to set up and configure their workstation, sign up, gain access, enter the task area and perform the task in one sitting - is grossly inappropriate. One could liken this to having a written assessment due at the close of a business day and choosing to go and buy a computer that same morning, expecting to be able to finish in time. The root of the concern then is a combination of user error, apathy and procrastination. However, some student feedback indicated the root was in the project itself:

> With the large amount of technical difficulties experienced, this limited our time in Second Life which also limited the possibility of interacting with other disciplines. The technical issues took up approximately 50% of the time during the assignment and [were] a major limiting factor.

These sources of frustration for all concerned would seem best eradicated by a strict timeline and well planned times for support, especially for off-campus students. It appears that a confounding factor in this is students' familiarity with computers at a user level. Our data revealed a clear relationship between the amount of students reporting that they have used 3DVLE/MMPORGS and the amount of students reporting that they had little problem in setting up for the project. It is not the intent of this paper to lay blame but, as mentioned earlier, it may be that our cohort consisted of many Consumers rather than Users of information technology. With approximately 80% of the participants being members of Generation Y, this would support Bennett, Maton and Kervin's (2008) stance that this generation, often referred to as the "net generation", is misconceived as being tech-savvy, high-end users.

Assessment and evidence of learning

As part of their assessment, students were required to submit a machinima of their role-play interactions. Unfortunately, the Second Life viewer has no inbuilt process for capturing video or audio, so a third-party application had to be used. This presented its own difficulties. The available software to easily capture screen content, with both audio from the host computer and audio originating from another source (referred to as capturing audio from microphone and speaker) is not cheap. Again, if running a small computer lab, this may not be an unsurmountable problem, as not all participants need to perform screen captures at the same time. However, in a large institution running a project with a high number of students, it can become very expensive to achieve this. The problem that occurred during this project was in using the free software, CamStudio. It has certain eccentricities and, while quite usable, was not user friendly. This was another source of much student dissatisfaction, as the following quote demonstrates:

> When it came to recording the role-play we also had several technical problems. First two of the people in my group couldn't even use the screen capture software on their computer, and when the third person could, it would only capture audio and not the visual. Again this wasted a lot of time fiddling around and doing the role-play multiple times.

Because not all participants needed to capture at once, (indeed only one out of a group of three need act as "camera") a site licence for a commercial product such as Camtasia, while not cheap, seems the best option and offers a cross platform solution. However, this licence would only be available for on-campus use, and so leaves the question of what the students would use off-campus. At the time of publication, Camtasia offer a free trial period of 30 days, though it may, (as is the case at RMIT University), be against the policy of the institution to require students to use trial software. Mac users who have Quicktime 10.x can record from their screens natively, but they cannot record both speaker and microphone audio. Again, there are workarounds for this but they are far from ideal. Whatever the chosen program, it should be able to output audio and video to set parameters that would suit electronic transmission and storage. Students may also be given instructions on compressing and converting their file for electronic transmission. However, this is another step in the workflow and is fraught with the same problems related to unfamiliarity.

In the project discussed in this paper, it was unfortunately the case where providing the evidence of learning (the machinima) became a distracting frustration for students (and staff). There were times where CamStudio's eccentricities were too much for some students to overcome. In desperation, some offered audio only recordings, which led to fewer technical issues than the machinima. On occasion, the problem was reported as being with Second Life's voice chat not activating. This can be an issue with Second Life itself, or run of the mill server dropouts, but was found to be less of an issue when off campus. Some students bypassed this altogether by using a mobile phone or Skype audio. Skype is only a slight compromise, mainly in that it requires yet another application to be downloaded and installed. However, in the 2010 pilot project, Skype was used due to a lack of native audio in ReactionGrid, and it was found to be quite adequate.

Once again, it cannot be stressed highly enough that, on many occasions, student frustration was compounded by the expectation that they would log on, complete the tasks, and log off. It is the intention in the 2012 project to encourage students to do "sound checks" before they intend to sit down and record their final interaction. It is hoped by overtly instructing students to test their settings early in the timeline, that by the time they come to finalise their performance any problems will be sorted out.

Dissemination

The very final part of the puzzle is dissemination. Once the student has recorded their performance how do they then share it with other students and teaching staff for the purpose of reflection and assessment? The host institution itself would best answer this, as it depends on the details of the project in question. The 2010 pilot project relied on physical media such as DVD/CD and USB devices, though it was apparent this would work only for small cohorts and those with easy campus access. The 2011 project used RMIT University's official dissemination tool, myRMIT, which is powered by Blackboard. Unfortunately, this medium has a known disadvantage as it uploads files via a HTTP interface, which slows the speed of uploading and does not give the user an indication of progression of the upload. Whichever vector is chosen for dissemination, it should be able to handle file sizes needed for the machinima, allow access across different disciplines or departments, and be secure. Another possible avenue is uploading to YouTube via private links. The resultant uploaded machinima can then be accessed only be clicking on a private link, and not through search or browsing. YouTube links can be shared easily via email, or whichever means is suitable for the project in question. However, when selecting a vector for dissemination, it is important to consider the given institution's rules of storage for student work. At RMIT University, the use of third party vectors, such as the aforementioned YouTube, is forbidden for official student work. This is an unfortunate barrier for the 2012 project, as being restricted from using the most suitable solution may again impact on student satisfaction.

The difficulties that students had with recording the machinima, which were discussed earlier, were compounded when it came to dissemination. It was crucial to the tasks, namely the interdisciplinary reflections, to be able to view machinima of other disciplines interactions. When there were delays in recording (which consequently led to delays with dissemination), many students felt severely frustrated at not being able to complete the necessary reflection tasks, as the following quote from a Chiropractic student clearly shows:

> It was required that we had to listen to a recording from another discipline as well as from our own [by] a certain due date. It was unfortunate that we were the only discipline in our group that actually uploaded anything by the due date, so we were unable to comment on someone's video from another course.

Suffice it to say that the above is, of course, a problem with the recording process and not with dissemination.

Points of interest

The project described within this paper afforded a great learning opportunity, not only for students, but also for the project team members. Throughout the implementation of this project, much was learnt about how best to conduct learning activities using a 3DVLE such as Second Life. The main purpose of this paper, therefore, is to provide advice for educators who are thinking of using an online learning platform for the purposes of learning and assessment. The main points of advice given within this paper are reiterated below:

- It is advisable to specifically instruct IT security of the project well in advance, and have staff perform tests at all stages.
- Use software vendor's instructions if the IT department will accept them.
- Encourage students to use their own resources off-campus. Where an on-campus venue is required, attempt to make it a quiet and contained space - preferably several small venues with a small number of workstations.
- Make sure you have technical support, both to build your virtual space and to administrate it, even if via a funded project.
- The land should be able to be used by several groups collaboratively or in isolation.
- Video and audio capture to produce machinima is difficult, and there is no one solution to meet all needs.
- Allow students plenty of time for set-up and testing, but instruct them to do it sooner rather than later. This leaves more time to go in-world and become familiar with it before trying to produce quality assessable evidence.
- Make sure participants have a clear and reasonable expectation of their ability to produce quality assessable evidence.
- Have a restricted area for students, but allow them to explore a custom-built area while access to the restricted area is arranged.
- Get students in-world and to the project area as quickly as possible.

Conclusion

The experience of this project has shown that, even with unfamiliarity and technical issues, students find 3DVLEs such as Second Life useful and engaging. They are of great use when conducting simulated face-to-face interactions in role-plays concerning a practitioner and a patient. They facilitate interdisciplinary interaction, above and beyond what can and does occur in real world clinical settings. 3DVLEs also allow a great opportunity for reframing of knowledge, and immersing students in content through the perspective of different roles. Despite these benefits, this paper clearly shows that the utilisation of 3DVLEs is not without difficulties. However, it is the opinion of these authors that, with careful planning and subsequent efforts with the same cohort, these issues can be lessened or avoided.

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Game-like digital training tools: Transfer of cognitive and perceptual skills from static to dynamic interfaces

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This paper explores the principles of skill acquisition and training transfer within the context of game-like digital training tools, expanding on previous research using an instrument scanning task in novice versus experienced pilots. While previous work demonstrated a game-like training tool is capable of developing high levels of performance within the game environment, initial findings suggest the likelihood of practical transfer to a real world environment is strongly dependent on the nature of the cognitive and perceptual skills developed. This paper investigates whether instrument scanning skills developed within a static training task transfer to a more dynamic video-based task. Despite strong performance within the static environment, preliminary data suggest a lesser degree of transfer when more dynamic perceptual skills are targeted. Findings are discussed broadly in terms of the principles of skill acquisition and training transfer, and how these principles may apply to game-like digital training tools.

Keywords: Training Games, Training Transfer, Skilled Performance, Instrument Scanning,

Introduction

Today's students and trainees grow up in a digital world, in many cases potentially spending as much time interacting with digital technologies and virtual worlds as they do with the real world around them (Gee 2007). Having grown up in this technology rich environment, it has been argued that today's learners may have developed an alternative skill set more tailored to learning within the digital world and this notion has led many researchers and practitioners to consider how to leverage these technologies for educational and training purposes (Gee, 2007). Much of this interest has focused on the use of virtual environments, serious gaming, and game-like digital training tools to build knowledge and skills relevant to the real world.

The variety of game-like technologies currently in use is immense and while some have undergone a variety of evaluations (e.g., Roman & Brown, 2008), others have seen very little if any. In some fields, interest in game-like training tools has resulted in such technologies rushed into service in order to meet the increasing training demands of both students and instructors alike. This has been particularly the case within some military training environments where the pressure to provide trainees with cost effective training tools continues to mount, potentially at the expense of proper training needs analysis and evaluation of training tools, training programs and training outcomes. "Right now, nobody wants to be the control group" (Robert Bowen, Chief of U.S. Army Training and Doctrine Command Capability Manager (TCM-Gaming), cited in Peck 2012; pg 2). Particularly within the military environment, it is critical to establish firstly whether these new training technologies represent effective training environments, but secondly whether the skills developed using digital training tools effectively transfer to real world operational environments and modes of practice. There is also the very real possibility that training with tools based on a games metaphor may lead trainees to develop bad habits or result in instances of negative training transfer, through the types of motivational incentives built in to game-like scenarios.

While the diversity, graphical detail, and ubiquitous nature of game-like training environments have developed considerably in recent years, the underlying principles of skill acquisition and training transfer have not. While game-like digital training tools differ significantly from more traditional training environments, it is still possible to effectively establish their training effectiveness based on the nature of the fundamental cognitive, perceptual, and psychomotor skills developed. This paper uses a relatively low-tech example of a game-like training tool (based on a tool developed by Kellman & Kaiser, 1994 and further modified by McLean, Wise & Williams, 2011) to investigate these issues and examines aspects of training transfer within a game environment.

Developing Pilot Instrument Scanning Skills - A game-like digital training tool

In 1994, Kellman and Kaiser developed what they termed a perceptual training module designed to promote more efficient information extraction, higher order pattern processing, and levels of automaticity in pilot instrument scanning skills (Kellman & Kaiser, 1994). The task required participants to view a static display of a standard-six aircraft instrument panel and identify the aircraft situation as quickly as possible (e.g., climbing, descending, turning etc). The findings demonstrated dramatic improvements in speed and accuracy after only a brief period of training (approximately 1 hour), both in novice participants and experienced civil aviation pilots. As to be expected, experienced pilots were initially much faster and more accurate than novice participants, yet by the end of the training task, novice participants' accuracy had increased dramatically (performing close to ceiling) and they were exhibiting reaction times significantly faster than those initially demonstrated by experienced pilots (Kellman & Kaiser, 1994). The interpretation of the authors was that this training task was clearly effective in developing instrument scanning skills in novices and improving skills in pilots. In principle, if such high levels of performance (equivalent to those of expert pilots) can be developed so rapidly, then these findings hold significant potential, especially considering that with the technology available today, such training tools could easily be disseminated across personal digital devices such as iPads or Smartphones, technologies that were not available, nor as ubiquitous, when the study was originally conducted.

While at first blush the findings of Kellman and Kaiser (1994) indicate that these game-like tasks have considerable potential for training, there is a missing link between the experimental findings and the realisation of such training potential in real world environments. As highlighted above, it is important to understand the nature of the skills being developed within the training task, and crucially, the likelihood of these skills to be applicable within a practical aviation context. Expert pilots demonstrate superior performance compared with novices when initially completing the task, which suggests that their expertise is at least of some relevance, yet the complex cockpit environment (and their extensive experience of this environment) has been significantly condensed in the simple representation provided by the game-like training tool. For example, novice participants may have merely developed a basic perceptual understanding of the relationship between instruments, without the necessary cognitive knowledge of each instrument's meaning or how it relates to other instruments in the panel. Conversely, participants may have developed a basic cognitive understanding of how different instruments interact, but no perceptual concept of how these instruments behave in a dynamic environment. Without understanding these differences, it is difficult to make an educated judgment as to whether the skills developed will prove to be in any way practical in a more realistic scenario.

The Current Study

The current study expands on the recent work of McLean, Wise and Williams (2011) who replicated the original Kellman and Kaiser (1994) instrument scanning training task in a sample of undergraduate psychology students. The findings from this research again revealed that non-pilot participants, most of whom had no intrinsic interest in aviation tasks, were capable of rapidly developing instrument scanning skills in this game-like environment demonstrating dramatic gains in reaction time and accuracy (McLean et al., 2011). This study furthered the findings of Kellman and Kaiser (1994) however by adding an important transfer condition to the original experimental design. While participants were initially trained using a stylized instrument panel as in the original Kellman & Kaiser study (see Figure 1, lower-left and lower-middle panels) performance was later examined on an identical task, except that the stylized instruments were replaced by a more realistic instrument images (Figure 1, lower-right panel) developed from flight simulator imagery (X-Plane Flight Simulator software). Interestingly, while participants were relatively successful in this transfer condition, reductions were still evident in both accuracy and response time compared with performance on the stylized instruments they first encountered in training. That is, despite completing an identical task in two highly similar environments, training transfer was not absolute. A plausible explanation is that, while participants had developed an adequate understanding of the cognitive association between the instruments, a significant portion of their skills was invested in the perceptual representation of the instrument panel and when this perceptual representation was manipulated, albeit only superficially, there was a significant impact on performance. The susceptibility of training transfer to superficial changes in the perceptual rendering of the instrument panel is particularly troubling in the context of the design of the static stimuli used in Kellman and Kaiser task. In order to interpret an aircraft situation from a static instrument display, the motion of some instruments (for example, the rotation of the altitude indicator during a climb) was represented symbolically by use of arrows (see Figure 1). The symbolic representation of direction of motion did not include any indication of the rate of motion or the degree of displacement generated by different instruments as a function of aircraft situation.

This paper seeks to explore the nature of the cognitive and perceptual skills developed within a game-like training task by further testing the robustness of these skills to perceptual manipulations, specifically, by examining the degree to which these skills transfer from a static environment (either stylized or realistic) to a more dynamic one involving real motion of aircraft instruments. By exploring performance on a similar task utilizing actual instrument motion rather than symbolic representations, significantly more demands are placed on the cognitive representations and perceptual skills developed within the static instrument training task. If the degree of training transfer remains strong within this dynamic setting, it suggests that the cognitive skills developed within the static training task are sufficiently tractable to be of use in more realistic environments. Conversely, if a reduction in training transfer is evident this may indicate that the development of adequate cognitive skills may be of little use, if the real-world perceptual cues remain indecipherable. Such a finding may have important implications for the way in which training tasks using digital technologies and virtual environments are developed for real-world operational tasks, not only in aviation, but also in a range of other skilled domains.

Method

Participants

Participants consisted of a convenience sample of three novice participants and three experienced pilots, with additional data collection in progress. Novices were aged between 26 and 33 and had no aviation experience. Those participants classified as experienced pilots were aged between 28 and 34 and had logged between 52 and 250 hours of flying experience. Participant performance will also be compared with the sample of 87 non-pilot Psychology undergraduates who performed a similar training task as part of the original McLean et al. (2011) study.

Materials

The experiment consisted of two separate instrument scanning tasks; a static instrument scanning (SIS) training task based on the task used by McLean et al. (2011), and an Instrument Failure Video (IFV) task.

Static Instrument Scanning (SIS) Task
The stimuli and procedure used in the SIS task comprised the same standard six instrument panel (Figure 1, top-left panel) utilised by McLean et al. (2011). These instruments consisted of the Airspeed Indicator, Attitude Indicator, Altitude Indicator, Turn Coordinator, Heading Indicator, and the Vertical Speed Indicator. Prior to commencing the experimental phase of the task, each participant was given a detailed explanation of each instrument and how to interpret them in combination. As in Kellman and Kaiser's (1994) task, in each trial the participant was presented with a panel of six instruments, with the objective to determine the aircraft 'situation' as quickly as possible – i.e., "Straight and Level", "Level Left Turn", "Level Right Turn", "Level Climb", "Level Descent", "Climbing Left Turn", "Climbing Right Turn", "Descending Left Turn", or "Descending Right Turn". An additional aircraft 'situation' was also represented where the instrument panel displays "Incongruent" information. For example, as shown in Figure 1 (lower-middle panel), five of the six instruments display a level climb, yet the altitude indicator is incongruent suggesting a descending aircraft. Participants first completed a short series of 10 practice trials before completing 3 blocks of 30 trials utilizing the stylized instrument panel (a total of 100 trials). Following these blocks, participants then completed a transfer condition block (30 trials) in which performance was evaluated on an identical task utilizing a set of stimuli generated using more realistic instrument images (Figure 1, lower-right panel). See McLean et al. (2011) for further details.

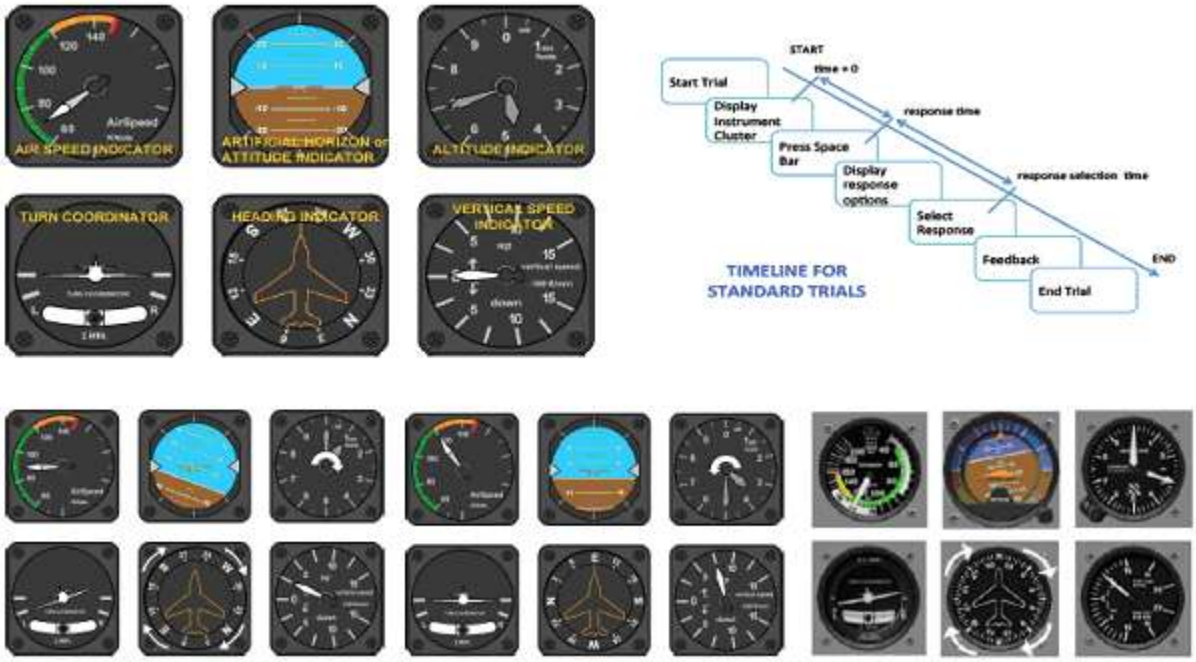

Figure 1: Experimental stimuli. Top-left panel shows the six main instruments of a Cessna cockpit as stylized static stimuli. The top-right panel shows the timeline of stimulus presentation for each trial within a standard trial block. While the top-left panel is congruent with a straight and level aircraft situation, the lower left panel is compatible with a climbing left turn. The middle lower panel conversely shows an "Incongruent" display, with most instruments compatible with a level climb, yet the altitude indicator suggests a descending situation. The rightmost lower panel shows the transfer condition using a more realistic instrument display.

Instrument Failure Video (IFV) Task

In the IFV task, participants viewed 32 short 30-second videos of flight simulation footage captured using flight simulation software (Laminar Research, X-Plane – see Figure 2 for a screenshot). Each segment would start with the aircraft flying straight and level, before executing one of the maneuvers depicted in the SIS task (e.g., "Climbing Left Turn", "Descending Right Turn" etc), and then finally returning to straight and level flight. In half of the video segments, at the 10, 15, or 20 second mark, one of the instruments would 'fail' (i.e. pause) and hence cease to be congruent with the other instruments (akin to the "Incongruent" aircraft situation in the SIS task). The participant's objective was to observe the video and determine whether any instrument had failed, and identify that instrument as quickly as possible by clicking on the instrument with the mouse.

Figure 2: Example of a screenshot from the IFV task showing the aircraft flying straight and level. In this example, the Turn Coordinator (highlighted in red) has failed indicating a left turn while the remaining instruments suggest straight and level flight.

Procedure

After receiving a series of instructional slides explaining the nature of the task and the instrument panel, participants first completed the IFV task. Following the completion of the IFV task, participants were given a further series of instructional slides before completing the SIS training task inclusive of both the stylized and realistic instrument panel (i.e. transfer condition) trial blocks. Once participants had completed the SIS training task, participants repeated the IFV task with pre and post SIS training performance evaluated across both the experienced and novice pilot participant groups.

Results & Discussion

As shown in Figure 3, initial analyses examined the accuracy and reaction time of novice versus experienced pilots on the SIS task. Consistent with the findings of Kellman and Kaiser (1994), experienced pilots had an initial advantage in accuracy and response time, but non-pilots became as fast, although not quite as accurate as pilots after only 90 minutes of training. Performance of non-pilot undergraduate psychology students from the original McLean et al. (2011) study is also shown in Figure 3 to provide context from a larger sample of participants. It should be noted that differences in performance between the novices from the current study and the undergraduate psychology students from the McLean et al. (2011) study are potentially due to differences in experimental procedure with the undergraduate psychology students completing the study via online delivery (i.e. unsupervised), while the novices in the current study participated in a supervised laboratory environment with substantially fewer trials per SIS block. Furthermore, the small sample size and fewer trials per block may account for the high level of variability in the novice and experienced pilot sample.

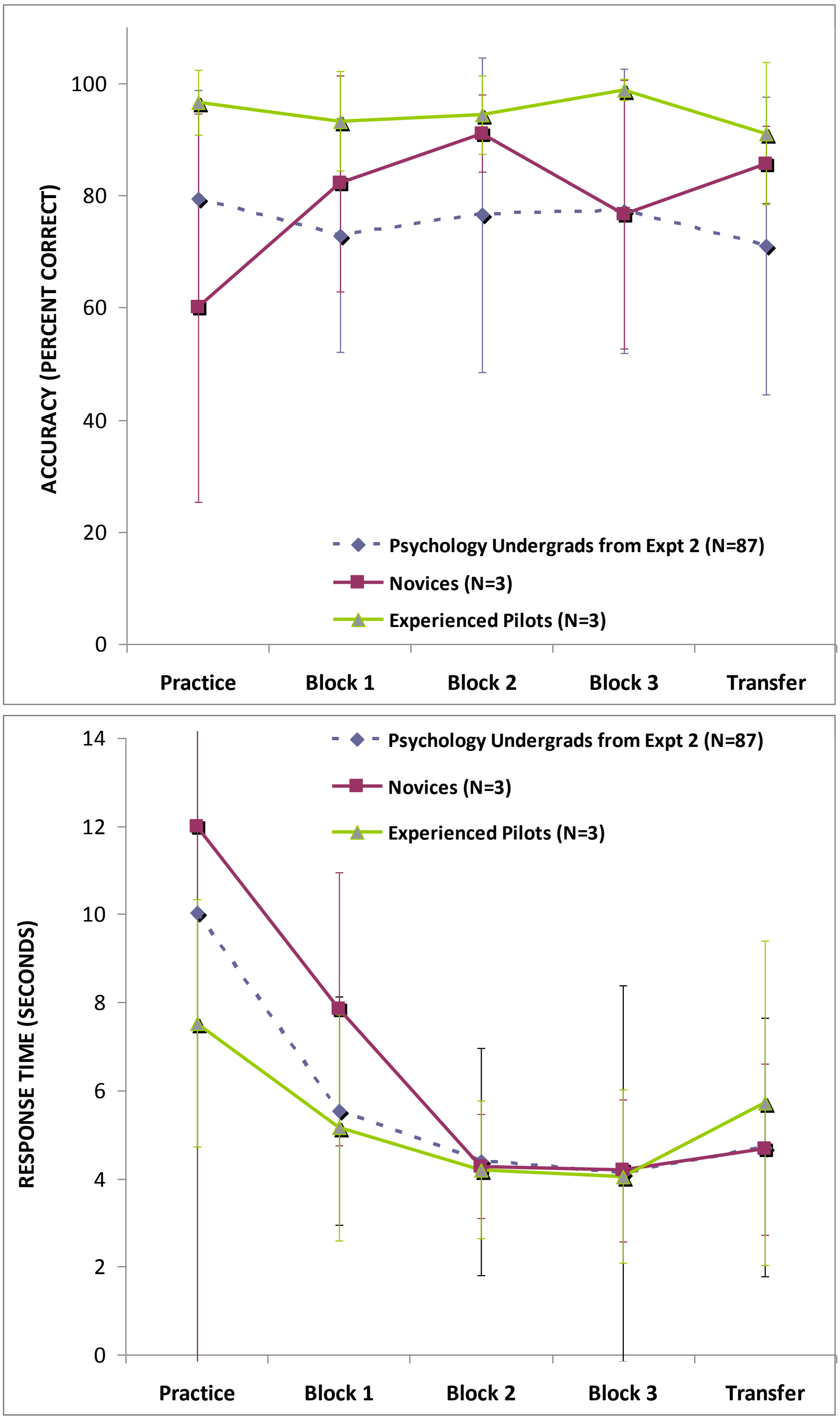

Figure 3: Accuracy and Response Time data for Pilots, Novices, and psychology undergraduate students on the static instrument scanning task (Error bars represent Standard Deviation). See text for further description.

In relation to performance on the transfer block, similar to previous findings discussed by McLean et al. (2011), there was a small reduction in accuracy on the realistic SIS transfer block for experienced pilots, although this trend did not occur for novices in the current study and did not reach significance for either sample. In terms of response time in the transfer block, while participants exhibited faster responses compared to their initial attempts at the stylized SIS task, all participants in both the novice and experienced pilot groups exhibited slower response times compared to the final training block of the stylized SIS task. As discussed above, while there was substantial training transfer between the stylized and realistic SIS conditions, transfer was certainly not absolute.

In regards to performance on the IFV task, Figure 4 highlights performance on the task both pre and post SIS training. Similar to the pattern of performance evident on the SIS training task, when first completing the IFV task the experienced pilots exhibited superior accuracy compared with novices. That experienced pilots exhibit superior performance on this IFV task prior to SIS training suggests that the task has considerable ecological validity and is tapping into significant aspects of the pilots' aviation experience. Experienced pilots proved capable of identifying the majority of instrument failures (in fact two pilots performed at close to ceiling – above 90% accuracy). Conversely, novice participants identified approximately half of the instrument failures correctly, that is, they performed at close to chance.

In regards to post SIS training performance on the IFV task, experienced pilots exhibited little gains in accuracy (83%) compared to pre SIS training performance although this could largely be expected given the pilots had initially exhibited a relatively high level of performance pre SIS training (76%). Of more theoretical relevance however, was how novice participants performed on the IFV task pre and post SIS training, with these findings of particular interest in that they can be interpreted in two different ways. On the one hand, a substantial degree of training transfer is evident with performance on the IFV task higher post-training (67%) compared to performance pre-training (47%). Conversely however, accuracy on the IFV task post-training was still only slightly higher than chance (50%) and considerably lower than on any of the stylized (post training – as high as 91%) or realistic SIS training conditions (86%), suggesting a significant portion of the skills gained during the SIS training did not effectively transfer to a more dynamic environment. Indeed a proportion of the gains that are evident on the IFV task could be attributable to practice effects resulting from completing the task pre SIS training.

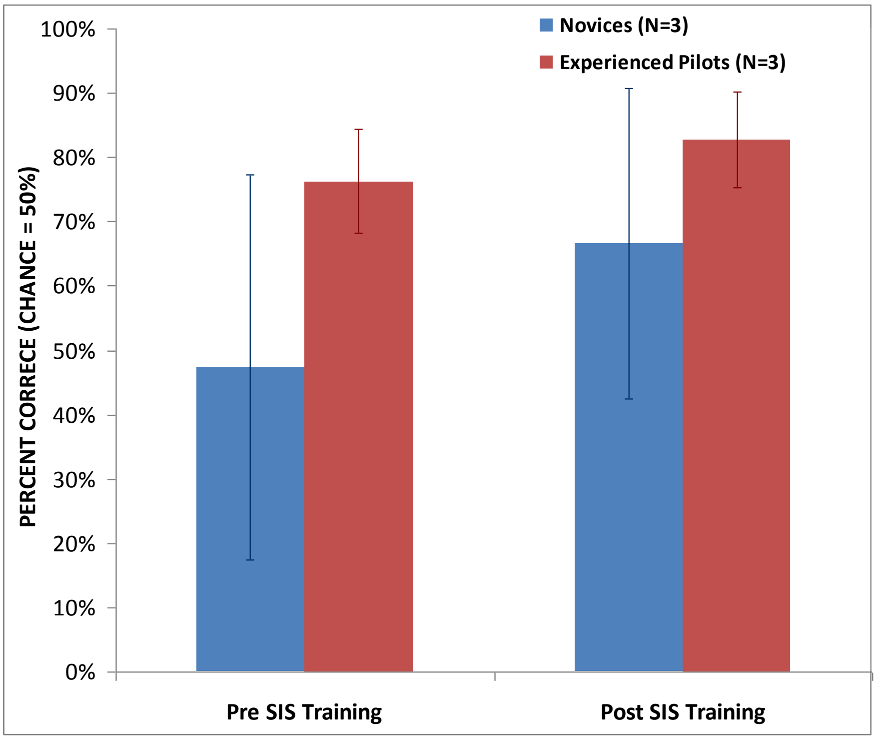

Figure 4. Instrument Failure Video (IFV) Task Accuracy as a function of Novice and Experienced Pilot Participants (Error bars represent Standard Deviation).

These data are only preliminary and further analyses of what is driving this result in terms of cognitive versus perceptual processing is beyond the scope of this paper, yet what is evident from these findings is that despite the level of transfer evident, there remains a disconnect between the cognitive skills and the perceptual skills developed within the stylized SIS training task and how these skills transfer firstly to a realistic SIS task, and then to a more dynamic environment (IFV task). There appears to be an unbridged gap between the skills developed on the stylized and realistic SIS tasks. Considering the similarities in the cognitive demands of these two tasks, this gap is likely to be largely perceptual and hence does not translate perfectly across even superficial changes in task appearance. There seems to be an even greater gap between these static skills and the dynamic skills required to complete the IFV task. As task complexity increases, there is also an increase in the complexity of interactions between the necessary cognitive and perceptual skills, potentially leading to significant issues for performance if these skills are not developed in harmony.

While this study has only provided data from a small number of participants, the development of cognitive and perceptual skills within this type of game-like training tool highlight significant concerns for the potential for such skills to transfer effectively to any real world environment. That is, the gap between the game-like training environment and that of the real world is substantially greater than the gap constructed between static and dynamic training tasks, and as such any potential training transfer is likely to be reduced even further. It is an open question as to how big a role each factor contributing to this gap plays. The verisimilitude of the simulated environment is likely to be only one contributor, the nature of the task being performed and its immediate consequences (i.e., the trainees are not in control of the virtual aircraft nor is there any risk of bodily harm in either of these tasks) are also more than likely to play significant roles.

As highlighted by the current findings, when attempting to develop perceptual or cognitive skills it is not sufficient to train either of these skills in isolation (not to mention training them in isolation from the relevant motor skills). While training components skills has clear benefits, they must be targeted within a meaningful environment that acknowledges the interaction between them. This is a particularly important lesson within serious games and game-like training tools where it is often (albeit not always) acknowledged that psychomotor and perceptual skills are not necessarily well-understood or fully represented, but the importance of developing cognitive and decision-making skills is promoted (Roman & Brown, 2008). In many game-like training tools this may indeed prove to be problematic; and it remains important to demonstrate that the interaction between these skills is correctly developed and is plastic enough to effectively transfer to the practical real world environment. Moreover, the findings from this paper highlight that training transfer can be effectively evaluated within the laboratory environment without the need for expensive real world exercises.

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A Pedagogical Evaluation of Moodle Extensions

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There has been a shift by the Australasian tertiary education sector towards open source Learning Management Systems (LMSs), in part due to the potential for extending and tailoring the systems using community sourced plugins. This paper reports on a comprehensive and systematic evaluation of Moodle extensions based on a six-month cross-faculty project conducted at Macquarie University. Findings included that despite over several hundred plugins and patches being uploaded to the Moodle Community website, the reference group only deemed nine of these as suitable for extending the functionality of the University LMS. The paper also describes the process and instruments that were utilised to evaluate the extensions themselves, which could be of interest to others making decisions about how best to balance the flexibility afforded by open source environment with extensibility within the constraints of complex and diverse institutional needs.

Keywords: Evaluation, Moodle, Extensions, Plugins, Learning Management System

Introduction

In 2010, Macquarie University made the strategic decision to move to Moodle as their Learning Management System (LMS), partly due to the flexibility afforded by an open source license which permits free use, adaptation and restructure of the software (Dougiamas & Taylor, 2003). This flexibility, along with the social constructivist philosophy behind the design of Moodle has contributed to its rapid rate of adoption in the higher education sector (Andrews & Daly, 2008). However, taking advantage of the flexibility to incorporate these features into the LMS poses challenges for institutions. The currently available literature offers a wealth of information about the contribution of LMSs to education but there are still some areas about which little is known. For example, while other studies (Weaver, Nair, & Spratt, 2005) confirm that many teaching staff are primarily focussed on the technical and administrative aspects of using the LMS, what of the affordances of the newer tools to enhance student learning through providing for more diverse learning experiences, timely feedback and positive interaction with staff and peers? When new extensions are developed to further these pedagogical aims .in an open source community where each institution's instance of Moodle is unique, how are new additions and adaptations to be evaluated and selected for sustainability as new versions of the LMS are released?

The aim of this project was to assess a range of extensions for their pedagogical value within Macquarie University's new LMS and to inform selection and adoption of extensions. While the standard version of Moodle comes with a range of valuable features, one of the key advantages of the open-source LMS is the ability to download and install a range of extra modules and extensions that have been developed by educators and technology enthusiasts from around the world. At the time of performing the review (July 2011 to February 2012) there were over seven hundred Moodle extensions that had been uploaded to the Moodle community website (http://moodle.org/mod/data/view.php?id=6009). With such an active community involved in developing and sharing these extensions, sustainable approaches for evaluating these extensions were essential, yet there was little institutional knowledge or guidance from the field about which of these were of pedagogical value. This project sought to identify, categorise, analyse, trial and evaluate Moodle extensions in order to fully capitalise on the educational potential of the Moodle LMS.

Prior to the implementation, extensive research was undertaken to gather feedback from students and staff about what they wanted in the new LMS. A study into Student IT Experiences at the University (McNeill, Diao, & Gosper, 2011) provided clear guidelines about student priorities as flexibility in accessing content, opportunities for communication with their peers and teachers, feedback and convenience offered by online assignment submission. Amongst the key issues for staff were the potential to encourage student engagement with the learning process and efficiencies in managing delivery, assessment, administration and communication with students. Similar themes emerged from the research undertaken by Weaver et al (2005), who found that students who experienced a well-designed unit, with rich resources, timely feedback and good interaction with staff were more likely to report a positive experience with the LMS. These themes were used to inform the initial instance of Moodle, but also the evaluation process for determining which of the myriad of applications would be explored for subsequent integration.

The open source philosophy itself has led to a rapid increase in the amount and type of software available, and the Moodle Community itself actively promotes experimentation, development and sharing of new extensions to be added to the suite. Academics, teachers, instructional designers, system administrators and developers are encouraged by initiatives such as the Netspot Innovations Award to collaborate on developing their ideas. Books further promote these opportunities by inviting readers to ‘customize and extend Moodle using its robust plug-in systems…develop your own blocks, activities, filters, and organize your content with secure code’ (Moore & Churchward, 2010) and articles are available to guide the adaptation of existing Moodle tools (such as (Dodero, del Val, & Torres, 2010). Specific examples of extensions that have been reported in the literature include mobile extensions to increase flexibility of access to Moodle learning environments (Alier, Casany, & Casado, 2007); tools to expedite the addition of content to Moodle sites (; Wilson, Sharples, Popat, & Griffiths, 2009); augmentations to encourage and manage student collaborations (De Lucia, Francese, Passero, & Tortora, 2009; Pérez-Rodríguez, Caeiro-Rodríguez, & Anido-Rifón, 2009) and tools to streamline administrative functions such as managing lab bookings (Ferreira & Cardoso, 2005). Many of the publications about these extensions describe the motivations behind their development to meet the needs of a specific curriculum context and experiences of students or staff in using the tools, yet there is little evidence in the literature about how to evaluate the myriad of new extensions for their potential integration into complex university instances of the LMS, let alone empirical data that assesses their pedagogical quality.

Method

An adaptation of the Communications, ICT, and Organisation (CITO) Framework, developed by Gosper, Woo, Dudley, & Nakazawa (2007) was used as the overarching evaluation framework for the project. The evaluation process also incorporated an expert review dimension to harness the collective experience and insight of the review team.

The first section of the evaluation instrument asked respondents to identify the pedagogical strategies that the tool in question supported, and the ability of the extension to support those pedagogical strategies. The second section asked to rate the utility of the extension in terms of being able to “create connections between people and places”, “create efficiencies in access to content and resources (including improving usability)”, “create new ways to participate, interact, communicate and collaborate”, and “create opportunities to generate, present and disseminate knowledge”. The third section of the evaluation instrument asked respondents to rate the usability of the extension being examined, in so far as it “provides greater access to resources”, “is easy and intuitive to use”, “is reliable with no crashes, failed page-loads or visible faults”, “fast to load and doesn’t have connectivity problems”, “has a screen layout that is clear and intuitive”, and “has a design is modern and inviting”. Both the utility and usability section adopted a seven point Likert item response scale from Strongly Disagree to Strongly Agree. The final section asked respondents to indicate the environmental impact of the extension in terms of the technical skills it required, the breadth of applicability of the extension to the Macquarie context, and whether or not the extension should be included in the University’s new LMS.

The project adopted a five-phase approach to evaluation consisting of the following stages:

- Phase 1: Characterising Moodle extensions
- Phase 2: Identifying tools for further investigation
- Phase 3: Installing identified extensions and establishing system integrity
- Phase 4: Academic evaluation
- Phase 5: Analysing evaluations and forming recommendations.

This method is described in detail below, as it is considered as potentially as useful to the educational community as the results of the study.

Phase 1: Characterising Moodle extensions

This phase involved an initial analysis of the 749 extensions that were in the Moodle extension database at the time. Excluded from further analysis were any extensions that would not function with version 1.9 or later, which resulted in a group of 255 extensions to be more closely examined. Descriptions of the extensions were reviewed and a set of nine categories was developed, which reflected the intended pedagogical strategy of the extensions. These categories are outlined in Table 1, along with the number of extensions in each category.

Table 1 – Pedagogical categories for classifying Moodle extensions

Category	Frequency
Activity	5
Assessment	33
Collaboration	20
Communication	14
Content	13
Course Format	15
Integration	52
Productivity	22
System Administration	43
Usability	38
Total	**255**

In later discussions with technical staff at the University Learning and Teaching Centre, it was decided to exclude Integration and System Administration extensions from this evaluation as they were dependant on the adoption of other systems currently still under evaluation by other projects.

Phase 2: Identifying tools for further investigation

A cross-disciplinary reference group consisting of 41 academic and professional staff from across the University was formed by open invitation to identify the extensions worthy of further investigation and evaluate the extensions that were selected for review. The sorted and categorised list of 255 extensions was distributed via email to the reference group, along with a brief description of each of the extensions. The reference group members were invited on several occasions to identify their "top 10" preferences from the list. Sixteen responses were received and compiled. These responses in addition to insight gained from meetings with key members of the LTC, resulted in a draft short-list of 32 extensions. This list was further reduced to 27 during a meeting with leading representatives of the reference group.

Phase 3: Installing identified extensions and establishing system integrity

A key point of learning from this project is the instability of many community-produced Moodle extensions. Of the 27 short-listed extensions, only 10 could be installed on the evaluation Moodle server with enough stability to be tested. Much of this was owing to insufficient data in the Moodle extensions database; the description of the extensions often indicated that they were compatible with versions 1.9 and above, however they were not compatible with version 2.0. Issues with installation as well as with the initial establishment of the evaluation environment caused a delay of 5 weeks in making the extensions available to the reference group for evaluation.

Phase 4: Academic evaluation

The 41 members of the cross-disciplinary reference group were provided with access to the evaluation Moodle server at the end of October. The evaluation Moodle course provided basic instruction on how to use each of the extensions being tested within it, as well as examples of activities or content created with the extensions. Reference group evaluation occurred on the basis of their hands-on use of the extensions. Sometimes this was as part of small group sessions offered by the project team, but more often through individual experimentation. Feedback was gathered via a link to the online questionnaire. The questionnaire incorporated a utility component, a usability component, and an expert review component (as described earlier in the Methodology section). Feedback was also solicited through informal discussion and interviews.

As the commencement of this phase was delayed due the technical difficulties described above, evaluations did not begin until the end of October. This was a period when many staff were generally focussed on end of semester work such as finalising teaching, marking exams, attending conferences and starting annual leave. Another barrier to participation was the difficulty accessing the evaluation environments from off campus (as a VPN needed to be established). Several strategies were used to increase the number of responses, including lengthening the time the testing environment was available, offering facilitated evaluation sessions, and sending personal and video reminders.

The 82 responses recorded were from participants in a range of faculties and departments. They included:

- Faculty of Arts (1)
- Faculty of Business and Economics (4), including Economics (2)
- Faculty of Human Sciences (44), including Education (27) and Linguistics (2)
- Faculty of Science (7), including Statistics (5)
- Learning & Teaching Centre (22)

These responses included 29 from final year Education students. The participant group was of mixed-ability in terms of their experience with using Moodle. Apart from the Education students (none of whom had used Moodle before), only 4% of participants indicated they were beginner Moodle users. The rest were Intermediate (21%), Experienced (38%), or Advanced (37%) users.

Phase 5: Analysing evaluations and forming recommendations

Reference group responses to the questionnaire were compiled and summarised for each extension in terms of the perceived capability and usability of each tool. Response summaries also incorporated the pedagogical strategies that respondents felt each extension supported, and qualitative feedback about the ability of each extension to do so. Reported data also included the average likelihood with which respondents would use the extension in their units, and a summary of respondents' overall recommendation about whether the extension should be integrated into the University LMS.

Results

This section provides a summary of the cross-disciplinary reference group responses for each of the extensions that were evaluated. As the aim of this project was to determine the suitability of individual extensions designed for different purposes, direct comparisons between extensions have not been made. The following extensions were evaluated (number of respondents for each tool type in brackets):

1. OU Wiki (17)
2. Forum NG (14)
3. OU Blog (10)
4. Question Type: Concept Map (10)
5. Question Type: Drag-and-drop matching (9)
6. Team Builder (8)
7. Drag and Drop File Upload (4)
8. Progress Bar (3)
9. Course Format: Grid (1)
10. Checklist (1)

Feedback from the respondents is outlined below. A brief description of each tool is provided at the beginning of each section to foreground the responses. This is followed by respondent perceptions of the pedagogical strategies that the extensions supported, the ability of the tool to support the pedagogical strategies, and qualitative observations regarding utility and applicability. This is then followed by a graphical summary of respondent perceptions relating to the capabilities and usability of the extensions for tools that received eight or more reviews from reference group members.

1. OU Wiki

Created by the UK Open University, OU Wiki is a "simple, easy to use alternative to standard Moodle wiki."
In total, 17 participants reported on the OU Wiki. Respondents reported that the OU Wiki supported group-work and/or collaborative learning (17), peer-learning (15), creation and/or delivery of media rich content (8), formative assessment and feedback (6), summative assessment (2), differentiation of learning activities and/or outcomes (1), project work (1), online tutorial activities and discussion (1), create a personal or unit-based database (1). Of the respondents, 12 rated the OU Wiki as Excellent or Very Good for supporting pedagogical strategies and 16 recommended it for inclusion in the University's Moodle instance. Evaluators rated OU Wiki as being highly capable of creating opportunities to generate, present and disseminate knowledge as well as creating connections between people and places.

OU Wiki was also ranked highly in terms of usability, in particular for ease of use and intuitive interface. However, comments indicated evaluators found concurrent editing with other users problematic. Barriers to use indicated included lack of familiarity with the concept of a wiki and technical skills required by both teachers and students. Functional limitations noted included a lack of a left-hand navigation menu and the ability to comment on posts. Qualitative comments on OU Wiki ranged from "Great for exploring knowledge and problem solving and just general collaborative communication" to "it can only be utilized when students have the sufficient technical knowledge."

2. Forum NG

Alternative forum for Moodle with AJAX features.
Responses were gathered on Forum NG by 14 participants. Respondents reported that this extension supported group-work and/or collaborative learning (11), peer-learning (11), administrative efficiencies (7), reflection/reflective learning (6), formative assessment and feedback (5), simulation, case-base of problem-based learning (1), online debate (1), group projects (1), and peer assistance (1). A total of 11 participants reported that it was Very Good at supporting pedagogical strategies, particularly in terms of its capabilities to improve access to content and resources. Of the respondents, 12 reported that they would recommend it for inclusion in the University Moodle (4 conditionally).

Respondents' impressions of the overall functionality of Forum NG were largely positive and features. An example of a positive response included: "Allows better access to content for assessment: view by student; students can provide permalink to submit best posts. Better personal management of posts via flagging. Finer management control by Convenor". Forum NG was also ranked positively in terms of usability. However some reported dissatisfaction with layout and styling as well as some inconsistencies with how Forum NG functioned, for instance commenting that "Styling needs work. We had a problem where one thread was visible to some but not all. Print button for view by user would be useful". Two respondents provided negative feedback on reliability, indicating they may have experienced faults.

3. OU Blog

Created by the UK Open University, OU Blog is an enhanced user and course blog.
The OU Blog was evaluated by ten participants, who reported it as useful to support reflection/reflective learning (10), peer-learning (9), group-work and/or collaborative learning (6), creation and/or delivery of media rich content (6), formative assessment and feedback (5), simulation, case-based or problem-base learning (3), summative assessment (3), administrative efficiencies (1), and documenting processes (1). All ten of the respondents deemed it to be worthy of inclusion in the University LMS. Evaluators rated OU Blog and being highly capable of creating opportunities to create connections between people and places as well as create efficiencies in access to content and resources.

Respondents found OU Blog easy to use with a clear and intuitive layout; "Standard blog that is easy to use and hence attractive option for many academics". One respondent described how the layout was more like a "blog-like forum", rather than being similar to commercial blogs. The lack of export functionality was noted as a significant drawback. Another negative comment related to media upload, particularly: "I couldn't find a means of uploading imgs - could link to img URL."

4. Question Type: Concept Map

A new type of question for Moodle quizzes that requires students to create and submit a basic concept map as their answer.
The ten respondents who evaluated the Concept Map question type felt that the supported formative assessment and feedback (7), summative assessment (4), reflection/reflective learning (3), differentiation of learning activities and/or outcomes (2), simulation, case-based or problems-based learning (2), creation and/or delivery of media rich content (1), group-work and/or collaborative learning (1), visual formative or summative online representation (1), and critical thinking (1). The majority of people believed this tool was 'good' at supporting these pedagogical strategies. Participants did not rank the Concept Map Question Type highly in terms of collaboration capabilities, however 5 respondents agreed that it created opportunities to generate, present and disseminate knowledge. Qualitative feedback about the utility of the tool varied from luke-warm ("needs effort for limited return" to valuing the diversity it offered ("it's a different way to engage students").

In terms of usability, the Concept Map extension was ranked highly in terms reliability and speed, though some respondents rated its design negatively For instance respondent comments included "it is not obvious at first (at least to me) what to do, it needs more specific instructions at the top" and "there are better mind mapping interfaces about." Some experienced faults such as content created not saving or being recorded.

5. Question Type: Drag-and-drop matching

A new type of question for Moodle quizzes that creates the lists of terms to be matched by dragging and dropping one onto the other.
Drag and Drop Matching was evaluated by nine participants. Most rated is as successful for formative assessment and feedback (6), reflection/reflective learning (6), followed by summative assessment (5), administrative efficiencies (1). Overall, respondents rated the capabilities of the Drag and Drop Matching Question Type to be moderate, with around a third of respondents strongly disagreeing with its capacity to support any of the target capabilities. However all nine recommended it for inclusion in the University Moodle.

The Drag and Drop Matching Question Type was ranked highly in terms of usability, in particular for reliability and speed. Respondents reported minimal difficulties with using this question type but also indicated its value would be minimal, but potentially nice to have. Comments included "Allows students to review their knowledge. Does not rely on students typing and possibly misspelling a word" and "the exercise in itself is a formative assessment tool. It has the danger of being used for summative assessment."

6. Team Builder

Intelligently builds groups based on criteria specified by an instructor and responses given by students.
Eight of the respondents evaluated Team Builder These respondents felt Team Builder supported group-work and/or collaborative learning (8), peer-learning (4), formative assessment and feedback (3), creation and/or delivery of media rich content (3), administrative efficiencies (3), simulation, case-based or problems-based learning (2), reflection/reflective learning (1), summative assessment (1), differentiation of learning activities and/or outcomes (1), and group work assignments (1). Of these respondents, seven recommended it for inclusion in the University Moodle instance. Respondents indicated Team Builder was suited to collaborative learning and connecting people and places. Team Builder was ranked moderately in terms of performance, with the basic requirements of being reliable and fast to load being met.

Respondents found Team Builder difficult to use and were unsure about its ability to actually create teams. For instance, one respondent commented "seems more trouble than it's worth". However others could see its niche value, commenting "Not many people would use this, but for a select few it may make their life much easier".

7. Drag and Drop File Upload

Drag and drop one or more files directly from your desktop into a Moodle course.
The four respondents who evaluated Drag and Drop File Upload, felt that it predominately supported administrative efficiencies (2). One commented that "drag and drop is more administrative, than pedagogical… it is a workflow [tool]". One person felt it could be used to support group-work and/or collaborative learning, reflection/reflective learning. Of the respondents, three recommended for inclusion in Moodle.

As Drag and Drop File Upload is primarily an administrative tool, it was not ranked highly in terms of pedagogical capability. Respondents indicated functionality problems with using Drag and drop File Upload, with one not able to get it to work at all (“I could not get this to work using Mac OS 10.6.8 and Firefox 7.0.1”). However those who were able to use the tool rated it positively.

8. Progress Bar

A block that allows students and teachers to track student progress in all courses from the front page as well as from within each course via a graphic bar.
Three respondents evaluated the Progress Bar and rated it as supporting reflection/reflective learning (1), formative assessment and feedback (2), administrative efficiencies (1), performance monitoring (1), and motivation (1). All three recommended it for inclusion in Moodle. Feedback on the pedagogic capabilities of Progress Bar was mixed, owing to its predominantly administrative and motivational functionality.

Progress Bar was ranked highly in terms of usability, in particular for its intuitive interface. No specific faults or limitations were reported. Comments on Progress Bar included “I can see students really responding to the task oriented nature of the tool - "this is what I need to do next."

9. Course Format: Grid

An alternative course format that presents topics as images laid-out in a grid.
This extension was rated by only 1 respondent, an advanced staff user. Feedback provided was positive in terms of usability but largely negative in terms of pedagogical value. The respondent commented that “Since it is just providing an alternative interface option, then why not include it (as long as it is reliable).” In response to whether or not they would use it in their own teaching, the responded indicated: “Probably not, I like to be able to lay the content out directly so students can see the whole unit.”

10.Checklist

Allows student progress against a set of activities within a course to be tracked.
Only 1 staff response was received for Checklist, with 1 additional response from a student. Feedback was similar to that for Progress bar in terms of pedagogical application, however it was reported as less usable and with more limited functionality than Progress Bar.

Summary of Capability and Usability Ratings

Figure 1 presents a summary of the feedback on the evaluation of the capabilities of each extension, presented as an average for each. Those extensions with fewer than eight evaluations have been omitted from the table. OU Wiki, OU Blog and Forum NG were all rated highly for their capabilities to generate, present and disseminate knowledge, create new ways to communicate and collaborate, create efficiencies in accessing content and creating connections.

A summary of the responses relating to the usability of each extension types is included in Figure 2, again with average ratings presented. As with the Capability ratings, the more established collaborative tools (OU Wiki, Forum NG, and OU Blog) received the most consistent ratings, though the Drag-and-drop matching and Team Builder extensions rated highest in terms of speed and reliability.

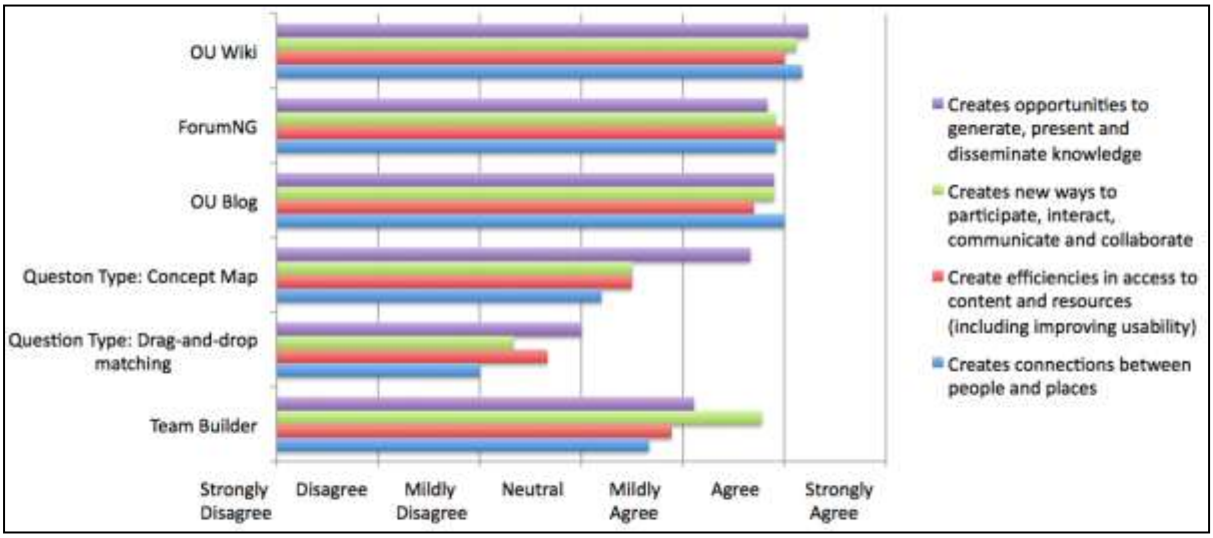

Figure 1: Respondent perceptions of the capabilities of evaluated extensions

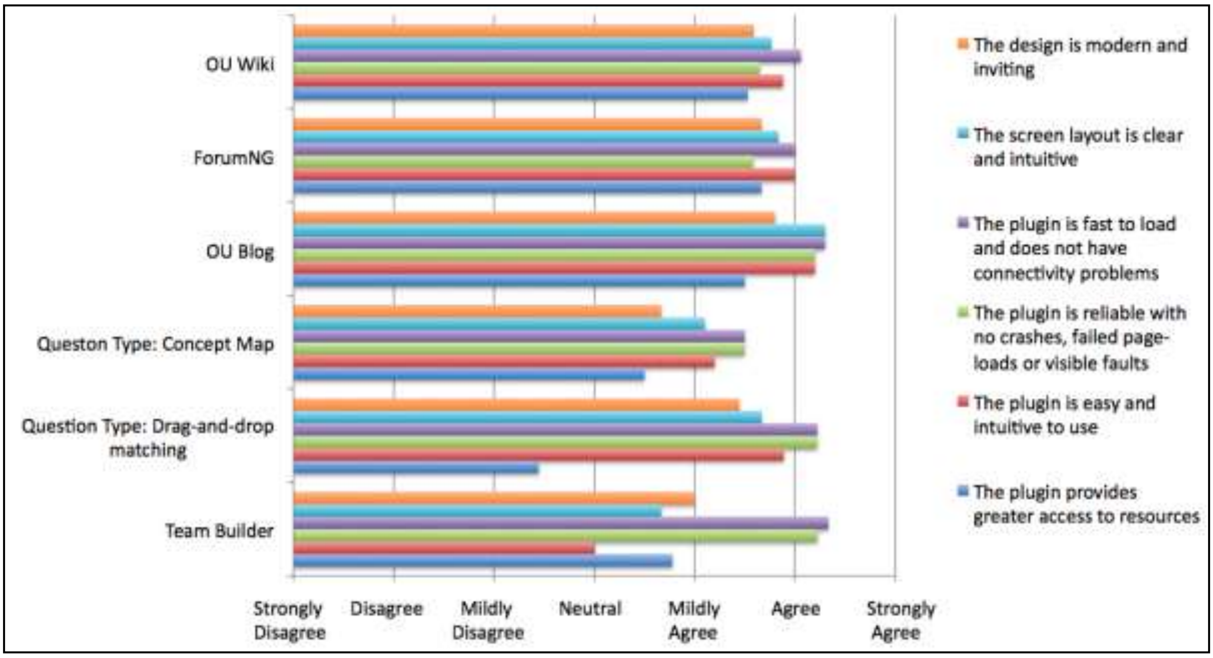

Figure 2: Responded perceptions of the usability of evaluated extensions

Discussion

Based on feedback from the cross-disciplinary reference group, Table 2 summarises the final recommendations for including evaluated extensions into the Macquarie University LMS. The extensions rated most highly by the participants were the tools most typically associated with LMS environments, such as wikis, forums and blogs and are useful in encouraging student communication and collaboration. These elements were rated as important in the University surveys on student IT experience. Given that the respondents were volunteers who needed to spend time out of their normal workload to evaluate the extensions, it might be that they selected tools according to their priorities and began with the most important. This could also suggest that the name of the tool can an issue; if the name did not provide a clear indication of what the tool did, then it may not have been prioritised.

Table 2 – Extensions recommended for inclusion in the University LMS based on respondent feedback

Extension	Would use in teaching	Average applicability score	Include in iLearn	Overall recommendation
1. OU Wiki	13 Yes 3 Maybe 1 No	78%	16 Yes (2 conditional) 1 No	**Include**
2. Forum NG	10 Yes 2 Maybe	90%	12 Yes (4 conditional)	**Include**
3. OU Blog	8 Yes 2 Maybe	78%	10 Yes	**Include**
4. Question Type: Drag-and-drop matching	5 Yes 4 Maybe	71%	9 Yes	**Include**
5. Question Type: Concept Map	4 Yes 5 Maybe 2 No	62%	7 Yes 2 No	**Include**
6. Team Builder	3 Yes 4 Maybe 1 No	69%	7 Yes (2 conditional) 1 No	**Include**
7. Drag and Drop File Upload	2 Yes 1 Maybe 1 No	73%	Yes (3 conditional) 1 No	**Include**
8. Progress Bar	2 Yes 1 Maybe	94%	3 Yes	**Include**
9. Course Format: Grid	1 No	100%	1 Yes (conditional)	**Include**
10. Checklist	1 Yes 1 Maybe	76%	2 Yes	**Do not Include**

Although there are several hundred extensions available on the Moodle Community website, only a small handful were deemed suitable for Macquarie University's Moodle 2.0 LMS. One of the attributes of community-based open-source software is that extensions are often not maintained or upgraded in step with the core system development cycle, which has serious implications for the sustainability of the extensions. Many are rendered obsolete when a new version is released. The Moodle Community website has recently reorganized their main extensions page to account for this, back-grounding outdated plugins.

This project only performed a pedagogical evaluation from the teachers' perspective. Participants rated the extension in terms of being able to "create connections between people and places", "create efficiencies in access to content and resources (including improving usability)", "create new ways to participate, interact, communicate and collaborate", and "create opportunities to generate, present and disseminate knowledge", with those most familiar tools such as OU Wiki, Forum NG and OU Blog being rated most highly, Further exploration is needed to capture student perspectives. Testing of the stability, scalability and technical environmental fit would need to be undertaken before any of the plugins identified as valuable were integrated into the University LMS. The technical testing should at least include a focus on:

1. Accessibility
2. Confidentiality and security of data
3. Intellectual property and development potential
4. Scalability for use large or small units
5. Administrative functionality
6. Quality of support documentation

There is also an inherent tension between the flexibility of the open source nature of Moodle and the complex and unique instances that are implemented in each university, providing a stark reminder of the need for comprehensive testing of open-source developed extensions before full release.

One limitation of this study was that the rate of participation from testers was lower than anticipated. This was owing to delays of establishing the evaluation environment that pushed the evaluation phase closer to the end of semester when fewer staff were available. Simplified off campus access to the testing and evaluation environment would also have helped improve response rates. A larger sample of responses would have enabled more reliable conclusions to be drawn and may have resulted in different recommendations being formed. The time-poor nature of academics and the high level of engagement required for them to explore new extensions and evaluate them for possible use in their specific teaching contexts is an ingoing challenge. While the notion of a community approach to developing and evaluating new tools is a noble principle, it is reliant to a large extent on the time and goodwill of busy academics. In addition to this exploration from within specific curriculum contexts, the effective evaluation also requires input from central units to ensure sustainability and scalability from a university-wide perspective. Add to this the technical input required to judge the feasibility of the implementation and the scale of the evaluation process becomes apparent.

This study has already informed the adoption of two extensions within the University's new LMS – OU Blogs and OU wikis. These were seen as valuable additions and after technical testing were installed for use in Semester 1, 2012. Apart from determining a range of pedagogically appropriate extensions for the University's LMS, the functional analysis tool is another positive output of this project. This built on previous evaluation tools and can be used as an evaluation instrument for other technologies in other projects. While the specific extensions analysed in the study will eventually become obsolete, the functional analysis tool can be used independently of particular LMS platforms or versions thus enhancing sustainable development of learning technology platforms. Another benefit of this project was the unification of the University's educational community behind the implementation of the new LMS. Over 41 academics expressed interest in this project and many combined forces to contribute to the evaluation. This team offers an ongoing working party to evaluate new extensions and feature requests as they emerge. The momentum of this network is being continued through the Macquarie University Learning Technology Research Cluster.

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Virtual worlds: Not the final frontier for games-based nursing education

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Virtual worlds present frontiers of promise for the ever evolving venture of pedagogical development, trial and embracement. Of late there have been large pushes into these worlds in terms of health-based education for students and early practitioners. Virtual worlds seem to be the next logical jump into nursing education and can offer a range of simulation benefits. But these worlds do not appeal to all students, can be complex and expensive to develop and interact within. Other game-like avenues exist though and have not been explored thoroughly enough to date. Such genres like puzzles games, management style games and surprisingly first person shooters already have titles and game mechanics which have been somewhat adapted to nursing education but could easily be more thought out and developed to suit. This paper outlines the two major gaming audience types to be considered and then explores a range of options for nursing education beyond virtual worlds.

Keywords: nursing education, serious gaming, computer-based learning; virtual worlds.

Introduction & purpose

Virtual worlds like Second Life and OpenSim have recently generated a lot of interest and developments concerning simulation and education across many disciplines. Their three dimensional environments, modern games-related interfaces and controls make them intuitive avenues of educational approaches for sections of the growing gamer student demographics. Universities just like ours, the University of Ballarat, have invested resources, time and effort into developing and evaluating virtual nursing education platforms with success and proving the educational viability of such approaches to both the student and lecturer (Miller, Lee, Rodger, Meredith & Peck, 2010; Meredith, Miller & Simmons, 2012). But virtual worlds themselves are somewhat expensive to develop from scratch and at times are daunting for both the developer to create and participate within (Eno, Stafford, Gauch & Thompson, 2011). Lost amongst all the hype of these newly embraced virtual platforms is the fact that other gaming genre platforms have existed for many years prior to the virtual genre. These existing genres could be equally beneficial and perhaps even more simply embraced by many student nurses in future educational games. Socially, culturally and technologically computer games have significantly impacted modern society, including education, and long established genres continue to influence this trend (Kapp, 2012). We wished to explore these existing and somewhat older formats because some of these genres already have marketed health and nursing related games that could be used as inspiration to build more developed, enjoyable and educational games and simulations for student nurses. The purpose of this paper is to outline a range of different player types to be considered when conceiving and designing educational games for learning in the future. This paper will also outline different gaming genres with existing nursing/health related games and to offer some related educational options beyond virtual worlds.

Catering to different audiences

Developers of nursing educational games, actually any games in general, have to consider the variety, skills and expectations of their audiences. Perhaps some nursing students rarely play video games, while others may own multiple video game consoles or operate a personal computer with varied game genre interests. By nature of preferred genre not all students are used to the standard controls and mechanics of a virtual 3D environment. Perhaps some enjoy quick bouts of Tetris on their mobile phone, while others enjoy huge immersive worlds with expansive narratives to explore on their high definition monitors. Perhaps some put in many hours a day gaming and others maybe little to no time per week at all. To help distinguish these two audiences, they can be classified under two very broad categories, the casual gamers and the core gamers. It is important to know the differences in broad gamer types in order to appreciate the common related genres and games styles preferred. It is also important to understand these gamer types in order to develop, trial and market related games.

Casual gamers tend to enjoy games that can be played in short bursts, on a wide variety of devices, such as the personal computer, notebook, tablets, pads, and mobile devices. Casual gamers often do not invest large amounts of time into a single title and often stop playing once bored or frustrated (Adams, 2010). These games are usually just a small download to the user's device ready to play in minutes, or can be played directly in the web browser using the Java application or Adobe Flash player (Kultima, 2009). These games involve less complicated controls and typically less complex game mechanics (Kuittinen, Kultima, Niemelä Johannes, & Paavilainen, 2007). A distinctive example would be Firemint's Fruit Ninja or Zynga's extremely popular FarmVille available as a Facebook application (Andersen, Liu, Snider, Szeto, & Popovi'c Zoran, 2011).

Core gamers, on the other hand, are a game audience that expect and require depth and hours of evolving game content (Bosser & Nakatsu, 2006). These gamers tend to take game playing seriously and spend large amounts of time and at times money dedicated to each game they play (Fritsch, Voigt, & Schiller, 2006). The games catering to this audience usually cannot be played in short bursts and often involve complex mechanics and rich branching narrative designs. Core gamers feel the need to spend time mastering the game's challenges and accomplishing set goals (Bosser & Nakatsu, 2006).

Instinctively each broad gamer type presents the developer and educator with a unique set of challenges and demands to consider. It cannot be assumed that all your students, in this case nursing, will be satisfied and intuitively understand a detailed virtual world environment to contend with. Next we will explore some different game genres that these two particular audiences enjoy playing, outline health related games within each and discuss how nursing education could be adapted to these alternative genres.

Alternative genres

Puzzle games

This video gaming genre emphasises the solving of puzzles and tends to focus on testing the player's puzzle solving skills such as logic, strategy, pattern recognition, sequence solving and word completion (E. Adams & Rollings, 2006,). Common puzzle games include Solitaire, Tetris and Mahjong (Thompson, Berbank-Green, & Cusworth, 2007). More recently Angry Birds has become a well-known commercially successful physics based puzzle game, available on a large variety of platforms and mobile devices (Cramer, 2011; Middleton, 2011). Many puzzle games with their short bursts of challenge and interest are very appealing to casual gamers.

The puzzle game genre lends itself to a variety of different styles of games that could be adapted for nurses as training tools. Tablets and mobile devices would pose interesting and convenient platforms for taking the blood pressure and monitoring the signs of a virtual patient. This could also be true for visualizing medical equipment monitors, and for the player/nursing student to assess what is going on. In a sense piecing together the feedback, signs and signals of a virtual patient and being then able to assess the scenario. Surgical nursing games would make great candidates for the puzzle genre, such as assisting surgeons, using the correct tools and keeping up with aseptic technique practices. An example of an existing game that could be adapted for surgical nursing is Pet Pals: Animal Doctor, developed by Legacy Games for PC and Mac (Legacy Games, 2012). In this game players must diagnose and treat animals in a realistic simulation using many medical instruments.

The puzzle genre would also be ideal for a nursing assessment game where the nurse has to do a full body assessment (cardiovascular, respiratory and reproductive as a few examples) to collect enough data for a diagnosis to be made, or to perhaps even work out drug requirements and calculations. Perhaps a player would be given the ability to ask questions of the patient to form a medical history. This game could focus on medical patients with different symptoms, or could be more specific such as the psychiatric patients for the mental health nurse.

Time management games

Time management games usually focus on time as a critical resource to be aware of and control other resources within. The player must spend their time wisely performing the tasks involved to complete each level, stage, or assignment for example. The player could be given a critical task that needs to be done immediately and also tasks that may be set aside for a more appropriate time. It is all up to the player to manage the time spent efficiently. Big Fish Games and GameHouse Games have a large variety of time management games. This would pose perfect scenarios for a student nurse learning how to manage multiple patients and critical tasks. These games could be crafted to suit either casual or core gamers depending on length and complexity of the task at hand.

More specific to nursing, Alawar Entertainment developed a game called "Hospital Haste" which is available on PC and in the iTunes store. In Hospital Haste the player must direct a nurse in diagnosis, treatment, and curing her patients. Time management is used to direct the nurse which patients require priority, in order to send all patients home healthy (Alawar Entertainment, 2012). Merscom, the developer of "Hospital Hustle", went a little further in that the player must manage the ward as well as a nurse. Placement of treatment devices and beds is as much a priority as directing the nurse to diagnose and treat patients. Adaptation of such a game could be made to suit specific and modelled needs of a real life hospital and style of ward.

Real-time strategy games

The typical real-time strategy game focuses on manoeuvring warfare units around a battlefield and engaging in combat with hostile opponents. They include building and defending structures which are capable of producing additional units, and using those units to destroy the opponent’s structures and units (Adams, 2006; Metoyer et al., 2010). This genre is where we move away from the casual gamer and start focusing on the core gamers. Rather than played in short bursts, the real-time strategy genre usually involves skill and dedication in order to master its many mechanics (D. Adams, 2006). The strategy involves managing resources to build structures and units, while playing both defensively and offensively to win the level.

While usually themed around war and combat, the genre design of real-time strategy could be adapted to fit well within the realms of a hospital or ward. The player would control nurses rather than warfare units, and build different medical rooms and place medical equipment, rather than combat structures. In this sense the patients become the nurse’s problem to fix, in the same way the combat units problem is this hostile opposition. There are many possibilities within this scenario, conceivably the player could play as the head nurse and manage a team of nurses on the ward in a real-time scenario. Or perhaps the player could control each nurse individually in a ward, able to change between them at will, on a real-time basis with each level getting progressively more difficult to manage. An example of this would be the early levels managing one nurse with few patients, and later levels managing multiple nurses with a completely full ward of patients. This genre would also suit the education on emergency medical teams quite well.

These suggestions have similarities to an older PC strategy game called "Theme Hospital" developed by Bullfrog Productions. In this game the player manages a hospital - building the layout, managing the doctors, specialists, nurses, and even janitors, in order to run a successful hospital.

First person shooter games

This genre would most likely be overlooked as something that could be redeveloped for nursing education, as at its core the genre involves the shooting of and the killing of people, aliens or monsters for example, through the eyes of the hero character (Cardamone, Yannakakis, Togelius, & Lanzi, 2011). But this genre has been used in the past by government bodies in producing training software, for example the U.S. Army created the promotional game called "America's Army" (da Silva Simoes & Ferreira, 2011). Could this be taken one step further to development of software that trains military medical staff for field-based exercises? Battlefield environments require a lot of medical care, and this game genre may be adaptable to that specific field of nursing, or perhaps a more generalised approach to simple exploring and interacting with a virtual hospital. Once again, this type of genre would cater to a core gamer, as the player usually requires good reactions and reflexes along with a multitude of input devices such as mouse and keyboard simultaneously in use by the player. In other words the learning curve is much more difficult than a casual game.

Moving away from the battlefield, the first person viewpoint could make an excellent immersive tool for a nurse, especially in a busy ward such as the emergency ward. In this the player must perform emergency nursing triage, with the objective of performing data collection and making the decision of the category the patients have to be seen in (1 = Immediate / Life Threatening, 5 = Less Severity). In this ward, the wrong decision can be fatal.

Conclusion

Although virtual worlds are currently highly fashionable to develop and research within at this moment in time in terms of education, in this case nursing education, it is clear that differing games-based avenues exist and have existed for a long time. Yet through all the hype these other existing genres and platforms have been largely overlooked. Overlooked options, yet they are long established mediums through which people have played and interacted with for many years. We conclude that more attention is required for nursing education purposes throughout avenues other than virtual worlds. Genres such as puzzles, strategy and time management lends themselves so cleanly to being adapted and thought out for health-based educational games. In the future, educators, researchers and developers need to spend more focus and attention to these alternate avenues to educate and train health professionals in perhaps ways which are more accessible, more intuitive and even more cost effective forms than what virtual worlds present.

Do not let hype and trendy focus dictate the direction of education, because in reality there have been such rich pedagogical avenues overlooked or at best lightly developed. We cannot expect a varied student audience to be highly effective within such a complex medium such as virtual worlds and this will hamper future directions of development and embracement of methods. We need to carefully understand the audience, their requirements and importantly their pre-existing experiences with gaming environments to be able to shape the future of health-related interactive education. Virtual worlds are an answer, but not the only answer and we should not be blinkered into believing so. We must continue to dream up, develop and explore future educational methods and worlds, but not at the expense of under developed existing ones.

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Early identification of students at risk of failing

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This paper outlines how teachers can use the learning management system (LMS) to identify at risk students in the first week of a course. Data is from nine second year campus based business courses that use a blend of face-to-face and online learning strategies. Students that used the LMS in the first week of the course were more likely to pass. For the rest of the course the pattern of usage is then largely similar for students who pass and those that do not pass. This paper identifies how a LMS can identify at risk students in the first week of the course and provides some strategies to motivate these students.

Keywords: At risk students, learning management system, early intervention, student success

Introduction

Tools are available to track participation in a learning management system (LMS). Teachers can get reports in a LMS on who has or has not used the LMS or some aspect of it. For instance Moodle keeps a log of each screen that the students visit. Teachers can then filter results by student name, date, activity and action. More sophisticated tools are available that allow the teacher to visualise clusters of student usage data that allow the teacher to look at student performance or behaviour (Hall et al, 2009; Hangjin & Almeroth, 2010; Lee, Chen, Chrysostomou, & Liu, 2009). Many of these tools are complex and are not easy for the teacher to use (Romero, 2011).

A number of papers have explored the association of LMS usage and student success. Cocea and Weibelzahl (2009) used data mining techniques to examine student behaviour that predicted disengagement. They found that student behaviour of time spent reading pages and taking tests were associated with student engagement. Altinay and Paraskevas (2007) found that those who rarely post to discussion forums are at risk of failure. Baugher, Varanelli, and Weisbord (2003) found that consistency of LMS use was a better predictor of success than total hits. Buglear (2009) found that some students who drop out do not use the electronic system so that this may also be a good indicator of students who are at risk of not completing the course.

A pilot study suggested that there was an association between students' use of the LMS and final grades. Students who use the LMS in the first week of the semester were more likely to pass. This paper aimed to test this association with data from another eight courses. Patterns of usage over the semester were examined to identify differences between students who pass and those who fail. This data is discussed using the student engagement literature of Kahu (2011) and Jeffrey, Milne, Higgins and Suddaby (in press).

Methods

The LMS logged students' usage over the semester for nine campus-based courses involving 703 students. The courses offered students campus-based lectures and tutorials with a LMS that had resources, forums, assignment upload and feedback facilities, and in some courses, online quizzes. The number of times a student downloaded a LMS resource or activity was recorded and the results summed for each week over the semester. The usage patterns over the semester are presented for students grouped by their overall course marks. Four groups were tracked based on final marks. These were students who achieved an A or B pass, C pass, fail, or did not complete. The distribution of marks across the categories was not even. On average across nine courses the percentage of students in each category is: 50% obtained an A or B; 30% obtained a C; 11% failed; 9% did not complete. The class sizes ranged from 23 to 147 with a mean of 78.

The data from the first week of the course for the students who completed the course was analysed. There were 658 students who sat the final exam. Those who did not complete were removed from the analysis because the wide range of non-teaching related reasons for withdrawing were considered to cloud the issue. Students who complete the course show determination and perseverance that were considered likely to respond to teacher interventions. The students were grouped by those that: did not use the LMS; used it for 1 to 5 page views; used it for 6-20 page views or for over 20 page views. The percentage who passed the course were identified in each category and associations tested by a chi square.

Results

The usage for the first week of the semester was compared to the number of students who passed the course (Figure 1). Successful students were more likely to use the LMS in the first week for both the pilot (ChiSq=20.4, 3df, $p<0.001$) and main trial (ChiSq=19.5, 3df, $p<0.001$).

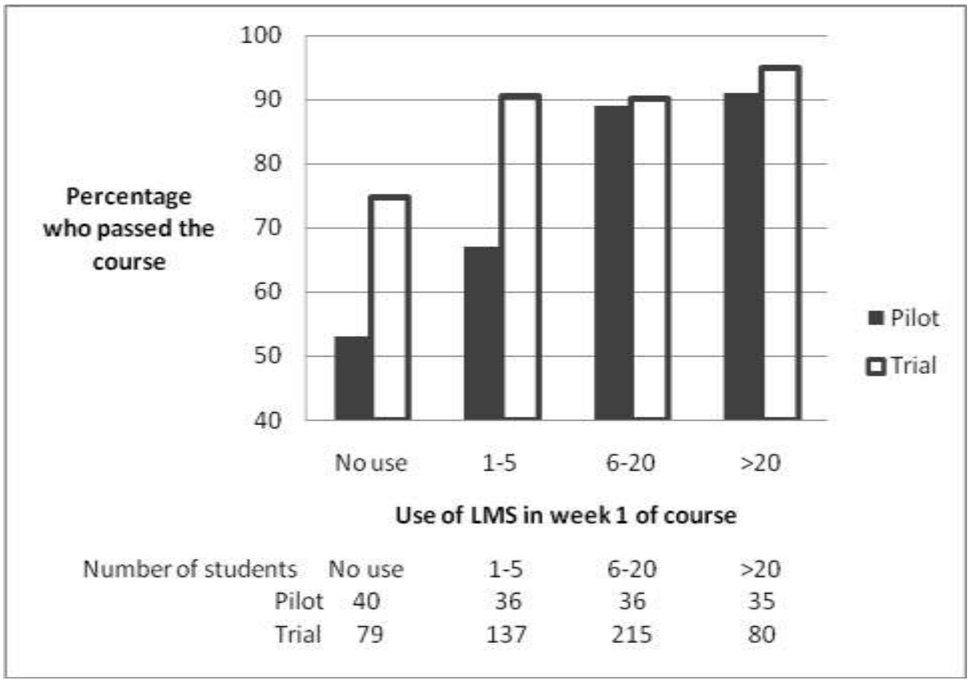

Figure 1: The number of students who passed the course grouped by use of the LMS in the first week of the Semester for the pilot and trial courses

The pattern of LMS use is provided in a sample of six courses (Figure 2). These graphs are characterised by peaks and troughs of activity with the peaks coinciding with the assessment. Week 7 and 8 were midterm breaks which did associate with a drop in activity in some courses but not all. Courses with assessment that is due immediately after the break had peaks of activity during the break. All but one course had a final exam that was associated with a final burst of activity. Course 5 (Figure 2) was internally assessed with a marked drop off of activity after the final assessment report.

The main difference in patterns of use between students who passed and those that failed relates to the very early stages of the course where students who fail are distinctively lower in online activity. It may be that after this stage, students are unable to catch up or that they have missed critical information or orientation to the course. This may mean that the first week, or the very early part of the course is critical to success and that later in the course measures such as total hits does not identify students who are struggling. Students who did not complete the course generally had lower use although some did use the LMS throughout the course.

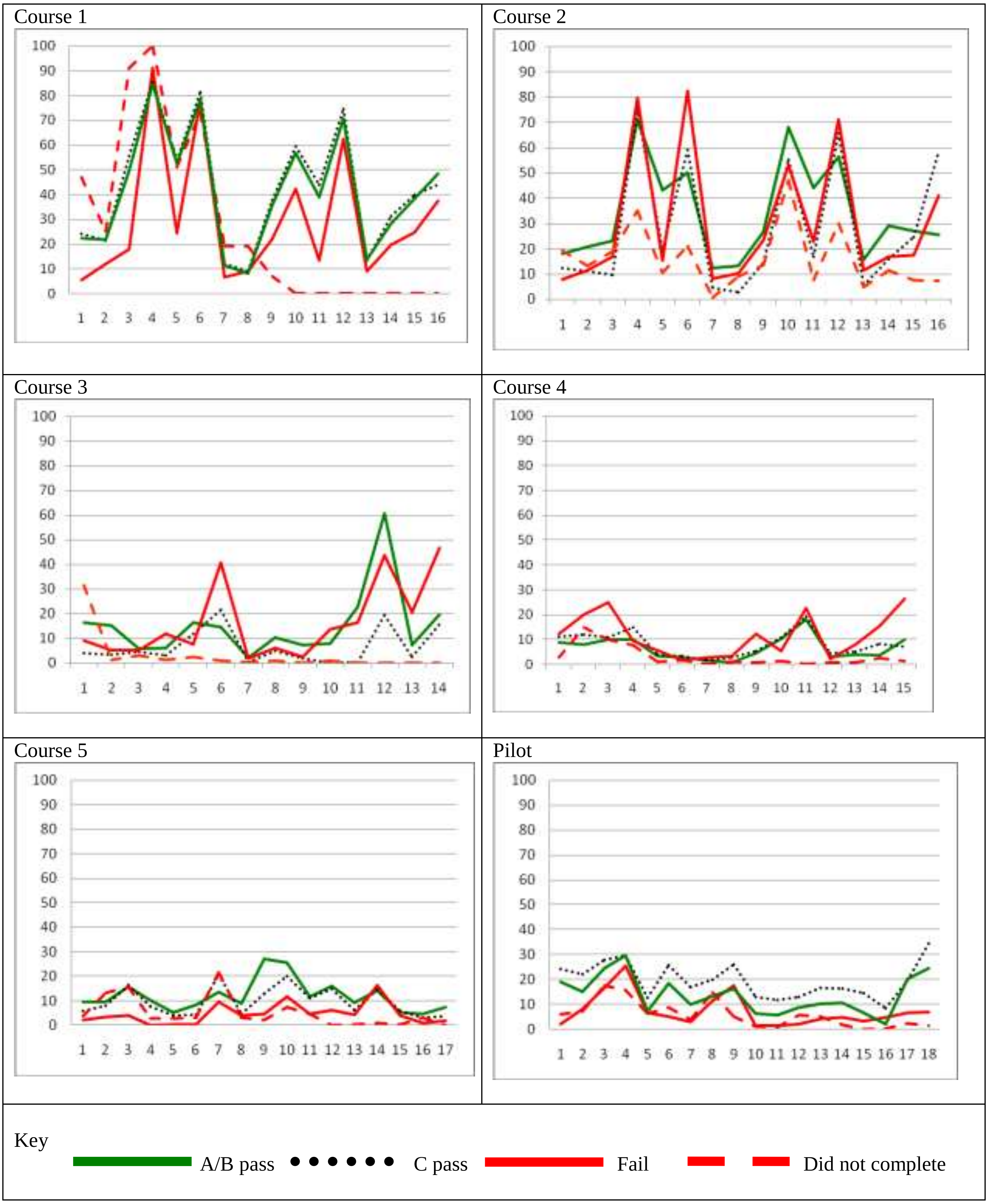

Figure 2: Graphs of students' use of LMS grouped by overall student success

Discussion

Successful students are purposeful and make good of use their learning time. This includes starting at the early stages of the course so they have enough time to learn. This paper has identified a simple approach that identifies students who are slow to start online activity. A significant percentage of this group (see Figure 1) will not pass and would benefit from some reminders to start work.

While there are a variety reasons for failing a course, such as student behaviour or subject choice (Trotter & Roberts, 2006), it is well established in the literature that successful students attend more face-to-face lectures than those who do not complete or fail (Fitzgibbon & Prior, 2003; Gracia & Jenkins 2002). The LMS offers lecturers an easy way to identify students who are may be at risk while there is still time to help the student. Ways to encourage at risk students to engage, or re-engage, include contacting them to remind them about getting started on the course, giving them information about time management and the support that is available including centralised learning support.

Engagement is the key to student success. There are a number of ways that lecturers can help students engage in their studies. Kahu (2011) provides a framework of engagement with three dimensions. These are Affect which is based on enthusiasm and belonging, Cognition based on deep learning and self regulation and Behaviour based on time and effort, interaction and participation. The identification of students who do have not logged in to the LMS in the first week involves using the behavioural dimensions of engagement and then reacting with strategies on the affect dimension to encourage students to become part of the group with the lecturer showing an interest in the student.

Lecturers need to understand how to improve retention and success. They can do this by understanding student engagement and use frameworks that Kahu (2011) and others such as Jeffrey, Milne, Higgins and Suddaby (in press) provide to alter student behaviour, cognition and affective elements of their learning.

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DeHub: Examples of some projects and models for future collaboration

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DEHub was established in 2009 at the University of New England (UNE) and, with the support of an Australian Commonwealth grant, has initiated a number of projects in the field of distance education. It is an academic unit for promoting knowledge transfer about best practice in distance education and supporting national and global collaborations on evidence-based approaches to effectively and efficiently employing new technologies in distance education. CQUniversity (CQU), the University of Southern Queensland (USQ), Charles Sturt University (CSU) and Massey University partner with UNE's DEHub in selected research activities, forming a consortium of Australia and New Zealand's largest and leading distance education providers. The Commonwealth grant supporting a range of projects emerging out of UNE's DeHub is drawing to a close in December 2012.

This presentation will firstly provide an overview of UNE DEHub's networking initiatives and other sector activity, including research conducted or supported by DEHub over the past three years. An update on outcomes from some of the DEHub research projects externally funded by the Council on Australia Latin America Relations (COALAR), the International Council of Distance and Online Education (ICDE) and the Office of Learning and Teaching (OLT) will be highlighted.

Secondly, this presentation also gives an opportunity to disseminate the findings of some of the large DEHub-funded research projects undertaken by partner institutions:

- *In their own words: Experiences of first-time distance learners*. (Massey University & Charles Sturt University)

This Massey University-led project in collaboration with Charles Sturt University was set against the backdrop of significant challenges facing distance education. The research objective was to help enhance services and resources available for distance learners. It undertook an audit of current support services and investigated the experiences of first-time distance learners in their own words through weekly video diaries. The research reports a number of key takeaways and lessons for institutions as well as for distance learners in terms of student success and engagement.

- *Learning leadership in Higher Education – the big and small actions of many people (*Charles Sturt University & Massey University)

This Charles Sturt University-led project in collaboration with Massey University found that learning leadership was enabled by the large and small actions of many people working individually and collectively in relationship to change. In addition, innovation in the case studies were fostered through – delegated leadership, distributive leadership model, faculty scholarship model, networked learning model and diffusion of innovation model.

- *Interacting E-learners: Analysing learner-learner, learner-teacher and learner-content interactions in five online courses in two Australian distance education universities* (Central Queensland University & University of Southern Queensland)

This Central Queensland University-led project crafted and trialled a forward-looking research approach in its use of learning analytics and qualitative methods to harvest and interrogate learning interactions in LMS courses. Five case studies were constructed, and a model for learning interactions produced. It is clear that learning analytics promise data-driven decision-making for the macro-level institutionalised strategic management of human and physical resourcing in universities. Yet it is equally clear that qualitatively rich data collection and analysis contributes significantly to understanding curriculum design and pedagogical practices that stimulate human interaction within virtual environments, corresponds with heightened student engagement with course content. It is the focus on human interaction and less so on content that results in more rounded interactivity and engagement in the course itself.

Finally, the presentation will discuss some of the lessons learnt about how to better foster collaboration in distance education academic activities. These will be shared with the delegates for discussion, with an agenda for further research and capacity development for the field highlighted.

Identifying key actors for technology adoption in higher education: A social network approach

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Higher education institutions are increasingly implementing strategies and practices aimed towards enhancing learning for the future by integrating educational technologies with classroom instruction. Despite the notable affordances these technologies bring to the learning context, there continues to be some resistance within the academy. Senior higher education administrators or leaders are frequently challenged with developing novel strategies to influence technology adoption. Prior studies relating to technology adoption and diffusion have emphasized the importance of collaboration, mentorship, and communities of practice in influencing the level of technology acceptance. Research in social networks has also shown that key actors within a network can assist with the dissemination of information. This case study investigated the relationship between the position of instructors within their departmental social network and their level of technology adoption to begin to identify strategic access points for facilitating technology adoption within higher education.

Keywords: technology adoption, social networks, higher education

Introduction

Educational technology has been readily available to enhance and supplement teaching and learning practice for the past several decades (Conole, 2010). From the drill and practice exercises in the early days of computer-assisted technologies in the 1970s and 1980s to the growth of educational video and audio during the 1990s, instructors have had a suite of learning technologies available to better complement their pedagogical approaches (Salaberry, 2001). Recent developments in web-based communication and mobile technologies, in particular, have further extended and added to the advantages technology integration can bring to education such as increased flexibility of access and student engagement (Chen, Lambert, & Guidry, 2010). In parallel, higher education leaders are now faced with the challenge of responding to the rapidly evolving global education market and learning needs of the contemporary student body and determining ways of extending educational opportunities beyond the traditional classroom (Hagel, Brown, & Davidson, 2010). For instance, the growth of technology mediated learning opportunities through the University of Phoenix and more recently Edx or MITx and coursera has forced the more traditional institutions to rethink their technology approaches and potential student market.

Senior higher education administrators and leaders have focused on technology integration as a way to meet the demands associated with a global education market and competition (Conole, 2010). Despite the strategic leadership and support, there continues to be resistance across many campuses (Roberts, 2008), an issue that senior higher education administrators and leaders are required to address by finding ways that technology can best be diffused and accepted by individual instructors (Abrahams, 2010). Numerous social, cultural, and socio-technical factors can influence an instructor's decision to use a particular technology for their teaching and learning practice. For instance, Mwaura's (2003) study, investigating technology adoption of faculty members who attended a technology workshop, revealed that collaboration and mentorship amongst instructors influenced their future acceptance of a particular technology. Similarly, Oncu, Delialioglu, and Brown's (2008) study of the factors that influence mathematics instructors to adopt technology, discovered that when instructors meet with colleagues who are technically advanced, they begin to relate the potential of learning technologies to their own practice. As Kopcha (2008) posited, instructors who are technologically advanced can act as mentors and advocates of technology by sharing materials and experiences with their peers. By acting as a role model to their peers, these innovators or early adopters of technology can help support and advance the strategic initiative of their institutions (Roberts, 2008).

While adopters of learning technologies can share and promote ideas and support amongst their colleagues, it is critical that their status within the peer network is perceived as a role model or educational leader. Instructors who do influence the teaching strategies of their colleagues are frequently regarded as leaders within their immediate network of instructors (de Lima, 2008). To better facilitate technology adoption, senior higher education administrators can therefore turn to the instructors with technology expertise and leadership or influencing qualities, to raise awareness of the affordances of educational technology and share strategies with their colleagues by establishing communities of practice. While, COPs have now long been in existence and promoted extensively in the professional development and learning and teaching sphere, there remains the complexity of readily identifying those adopters that demonstrate the potential for influencing peers within their social network and assessing the level and sophistication of their technology adoption.

Communities of Practice

A community of practice includes professionals who share a common concern or passion about a subject and who wish to interact with one another to share ideas and enhance their knowledge (Wenger, McDermott, & Synder, 2002). Learning about new concepts or strategies, such as integrating technology with teaching practice, can often occur when instructors come together and form a community of practice that involves both those who are technologically advanced and those who have less experience with technology. According to Lave and Wenger (1991), learning occurs when newcomers to a community of practice move from peripheral participation to full active participation at the core of the community. Hence, those who are at the center of a community of practice are involved in collectively learning and building upon previous knowledge as they continue to develop and refine their practice (Wenger, 1998). Either through self-selection or after being invited by a colleague, members of a community of practice meet to develop and promote best practices or to solve a problem together. While such interactions help foster the sharing of successful teaching practices, instructors also prefer to have such conversations with those who they have known for some time and with whom they feel comfortable (Roxa & Martensson, 2009). Trust between colleagues is critical for meaningful and open conversations to take place without negative judgment (Niesz, 2007), thereby prompting further collaboration and tacit knowledge creation (Hagel et al., 2010). A community of practice of instructors led by those who are technologically advanced and considered trustworthy by their peers can, therefore, help advance the integration of technology with pedagogy. In order, to enhance the integration of technology across an institution, education leaders need to easily identify not only the technology pioneers to lead such communities of practice, but also those who have also established trusting relationships with their colleagues that put them in a position of influence. Assessing individuals' positions in their community of practice may help identify the roles that different community members play in their network and the relationships they have with one another (Schlager & Fusco, 2003).

Social Networks, Emerging Leaders, and Thresholds

Social network analysis can act as an effective approach for identifying potential actors in a network that can facilitate the dissemination of information about new technologies and therefore seed and promote adoption. A social network is comprised of individuals who are tied to one another in a "mesh of connections" (Scott, 1988, p. 109). Such ties or connections represent with whom an individual interacts within a network while an individual's position in that network shows the degree that the individual acts as a vector of information from one side of the network to another. The professional social networks of the instructors therefore tend to include colleagues with whom they have a positive rapport and whose opinions they value highly. Identifying the ties between different members of an organization, such an academic department, can show which instructors emerge as leaders or who perform the role of transferring information across a departmental network. According to De Lima (2008), network centralization measures how much a social network is focused around one particular instructor who can emerge as the leader or hold an influential position. Instructors who are most central in a whole social network tend to have leadership qualities (De Lima, 2008), since others trust and value their opinions and approach them for advice or suggestions (Niesz, 2007).

While an individual's centrality in a whole or partial network indicates their potential importance in the department as a leading figure, their network threshold explains how likely they are to be influenced by the behaviours of others. A network threshold refers to an individual being influenced to change a behavior or decision based on the number of colleagues or connections in a network that behave a certain way (Chen et al., 2009). Individuals who are influenced to change a behavior after many others around them have modified their approach are considered to have a high network threshold while those who are less influenced by others have low network thresholds. Valente (1996) made a connection between individuals' network thresholds and their rate of technology adoption according to Rogers' Diffusion of Innovations Model. Rogers' (1995) model indicates that individuals fall within five stages of technology or innovation adoption: innovators, early adopters, early majority, late majority, and laggards. According to Rogers, the majority of individuals fall within the early or late majority of technology or innovation adoption. As Valente (1996) posits, these early and late majority individuals are influenced to adopt a technology after others have tried it and, therefore, have a high network threshold. Conversely, the innovators, a small proportion of the population, are less influenced by others and are keen to be one of the first to try out a technology. Hence, they have low network thresholds.

Situated in social network theory, this study investigated patterns in social networks to discover any trends between the positions of instructors in their departmental network, their tendency to adopt technology, and how information spreads across the department. Social network theory is most appropriate for studies that explore the relationships and connections between various individuals in an organization or department and the way that information flows among them (Haythornthwaite, 1996). Exploring the relationships between instructors and their network thresholds can determine the “overall web of influence relations that exist within their department” (de Lima, 2008, p. 166), which may help identify those instructors who have this influencing role or potential for it.

Methods

The design of this case study intended to identify the relationship between each instructor’s position in a departmental social network and their technology adoption decisions in order to determine how information flows between participants. A case study approach was used in order to gather and analyze rich and deep descriptions about the professional social networks of each of the participants in the study. In addition, since this study focused on discovering the social networks of instructors in one particular educational institution and who taught in specific academic disciplines, as discussed in the next section, a case study was an ideal methodology for this focus, in this context (Eisenhardt, 1989).

Research Setting & Participants

This study took place in a large higher education institution in North America with approximately 47000 students and 3700 faculty members. Instructors across three academic departments were invited to participate in the study. The three academic departments were situated in the language disciplines and were selected for the high level of educational technology evident in their classroom instruction. These departments had previously played an integral role in developing computer labs to assist students in oral and listening practice. They had actively used the learning management system, Blackboard Vista, for some years, to further extend students’ oral skill practice through improved integration of audio and video resources and activities. This preliminary study aimed to uncover any inconsistent or contradictory trends across the social networks of the three departments. In order to gain the most complete picture possible of the departmental social networks, all language instructors in the three departments (N = 75) were purposively invited to participate. There was an overall response rate of 31%, however, the rate was inconsistent across the departments with Department A having a significantly lower response rate (13%) than Department B (44%) and Department C (41%). The low response rate for Department A was considered when drawing broader conclusions from the study. In addition, some of the participants were course or program coordinators as well as instructors in their respective departments. Their role in the department was taken into consideration during the data analysis, to determine if it affected their overall centrality in the network analyses.

Data Collection

A combination of observational, pre-interview questionnaire, and interview data was collected in this study. In order to identify any behavioural trends across the departmental social networks and to calculate individual network threshold, it was necessary to determine the extent and diversity of technology adoption. Observational data, therefore, was collected from the learning management system course environments of the participants for all their classes taught at the one institution in 2010 and 2011. The data provided insight into the total number of technologies adopted and based within the learning management system by the study participants. In addition, in-person interviews were conducted with each participant in order to identify any further potential technologies that were not associated with the institutional LMS. Semi-structured interviews, rather than surveys were used to collect this data, since interviews provided an opportunity for the participants to elaborate on the reasons for their choice of other technologies, rather than some of the tools available through Blackboard Vista (Cohen, Manion, & Morrison, 2007; Rapley, 2001). The interviews were audio recorded and transcribed and transcriptions were sent to the participants to ensure the accuracy of the content prior to analysis.

In order to build a picture of the departmental social networks, participants were asked to complete pre-interview questionnaires to provide information about the colleagues that they speak to about technology and the frequency of such discussions. Following recommendations by Stork and Richards (1992), a roster of names of their fellow instructors in their academic department was provided to help reduce the likelihood of forgetting or overlooking certain relationships. Furthermore, the pre-interview questionnaire asked instructors to indicate how they perceived their rate of technology adoption according to Rogers' (1995) Diffusion of Innovations Model. The instructors' assessment of their technology adoption assisted with evaluating their network threshold. These data were later analysed in combination with the results of the instructors' network centrality to determine the existence of any statistically significant relationships.

Data Analysis

Observational and interview data were analyzed through content analysis which involved coding and categorizing concepts derived from the written data (Cohen et al., 2007) and developing an aggregation and tally of these (Stake, 1995). Qualitative content analysis software, Atalas.ti, was used to generate codes emerging from the observational notes and the interview transcripts and to create thematic categories. Information gathered from the pre-interview questionnaires concerning with whom the participants spoke regarding technology in their departments was analyzed through social network analysis. A social network analysis and visualization software application, Gephi, was used to determine the position of the participants in their department and develop network diagrams (sociograms) indicating the relationship ties and information flow between individual actors. Figure 1, below, illustrates a social network comprised of eight actors each represented by a single node. The lines between the nodes illustrate connections (relationships) between individuals, while the size of the node represents the number of relationship ties (degrees) they have established in the network structure.

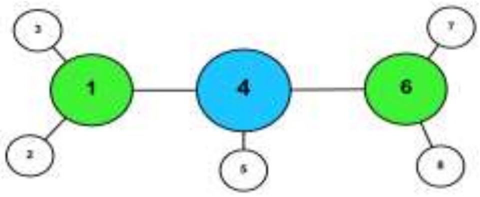

Figure 1: A Network View showing Betweenness Centrality

As seen in Figure 1, the large blue node (number 4) is positioned in the centre of the network. This individual connects with the actors on the left and right side of the network. In other words, information discussed between individuals on one side of a network can flow to those on the other side through this intermediary actor (number 4). According to Freeman (1978), individuals in such positions with high betweenness centrality can influence others by "withholding or distorting information in transition" (p. 221). Hence, analyzing and comparing the location or centrality of instructors in their departmental networks can uncover behavioural patterns prevalent amongst different groups of instructors. As part of the analysis, centrality measures were calculated based on the available network data and then correlated with the participants' total technology adoption, using the Pearson correlation, to determine the extent to which a participant's centrality was proportional to their technology adoption. Statistical software, SPSS, was used to measure the Pearson correlation and identify if the correlation was statistically significant.

Results and Discussion

Prior to investigating the social networks, data was collected through the interviews and observations of the participants' learning management system course environments to identify the extent of technology adoption within each department. This information would later be used during the social network analysis phase to determine patterns and centrality positions of individuals based on their level of technology adoption. The following section reports on the technology use of each participant. For the purpose of this study, technology refers to the specific tools available within the LMS, such as online discussion boards and quizzes, as well as other technologies including blogs, wikis, and digital media that may reside outside of the LMS environment.

Technology Use

Observational data from the learning management environments of the participants was used to indicate the tools each participant had adopted for their classroom instruction. A full mark was given to each type of tool that each participant had chosen to use at least once. Since observational data was limited to the LMS, interviews were required to reveal any other technologies the participants had adopted for their teaching purposes. These other technologies were coded and categorized to determine the total number of technologies that each participant used. Table 1 presents the observational and interview data concerning the total number of technologies adopted by each participant.

Table 1: Total Technology Adoption of Each Participant

Department A				Department B				Department C			
ID	Total	Vista	Other	ID	Total	Vista	Other	ID	Total	Vista	Other
c1A	8	6	2	c1B	4	3	1	i1C	9	7	2
i2A	12	7	5	i2B	6	4	2	i2C	6	2	4
i3A	4	3	1	c3B	5	3	2	i3C	2	1	1
i4A	3	0	3	i4B	4	3	1	i4C	9	6	3
				i5B	7	3	4	i5C	5	2	3
				i6B	8	6	2	c6C	5	4	1
				i13B	6	5	1	c7C	11	7	4
								i8C	5	5	0
								i9C	9	7	2
								i10C	8	6	2
								i11C	4	3	1
								i12C	9	8	1

As presented in Table 1, there is a broad range of technology adoption across each of the departments. Knowing where each participant falls within the technology adoption range will help to reveal any patterns or trends emerging from the social network analysis, the focus of the following section.

Centrality in Social Networks

Data collected on the pre-interview questionnaires was used to determine the partial social network within each academic department. This information, along with the data reported in Table 1 on technology use, was imported into the social network analysis and visualization software, Gephi, and the network centrality of each participant in their respective departments were calculated. Using the Pearson correlation, centrality measures were correlated with all of the participants' technology adoption scores. However, none of the centrality measures had any statistically significant correlation with technology adoption scores ($p > 0.05$). However, while the instructors in Department C were encouraged to develop their own LMS environments, selecting the technologies to adopt for themselves, the instructors in departments A and B tended, for the most part, to teach using the LMS environments created by their language coordinators. The centrality and technology scores for the participants in these two departments, therefore, were correlated together (N=11) as shown in Table 2.

Table 2: Correlation between Technology Adoption and Centrality for Departments A and B

	Closeness Centrality	Betweenness Centrality	Degree Centrality
Pearson Correlation	-.588	.641*	.407
Significance (2-tailed)	.057	.034	.214

***** Indicates statistical significance ($p < 0.05$)

As presented in Table 2, there is a positive significant correlation observed relating the betweenness network centrality with an individual's level of technology adoption. Betweenness centrality refers to the extent to which a participant in a network connects other parts of a network together. Betweenness can be seen to represent characteristics of a 'broker' or 'gatekeeper' of information (Scott, 2007). No significant correlation was observed between technology adoption and neither closeness nor degree centrality. Closeness centrality refers to the distance between the participants in a departmental network while degree centrality refers to the total number of colleagues each participant speaks with about technology.

When delimiting the data into specific departments the correlational trends did not hold true for the third department, Department C. No significant correlation between technology adoption and centrality was observed for the participants in this department (N = 12). Social network analysis of each department separately, as presented in the following section, will illustrate the trends between technology adoption and betweenness centrality and will shed light on different correlational trends cross the departments.

Betweenness Centrality and Technology Adoption

Individuals with a high betweenness centrality are commonly referred to as the “gate keepers” of information due to their linking position in a network. Burt (1992) describes this linking position as bridging a structural hole. In essence, if the individual were absent from the network, a gap in the overall network structure would exist. Hence, individuals demonstrating a high betweenness score tend to fill this void by brokering information across the network. Such individuals can control how information travels to others (Freeman, 1978) and, subsequently, have greater social influence over others in their network (Brass, 1984). To determine the possible influence of participants’ betweenness centrality on technology adoption, the social networks of each department, along with data on the technologies used by the participants, were analyzed. In addition, how the participants perceived themselves on Rogers’ (1995) Diffusion of Innovation scale and, therefore, their network thresholds was considered when determining the potential impact of their conversations. Each department is discussed in turn, followed by discussion of the overall results.

Department A
Figure 2 illustrates the betweenness centrality of participants in the social network of Department A. The nodes represent the four participants as well as the various colleagues the individual instructors mentioned that they talk to about technology. However, as mentioned earlier, several members of this department chose not to participate in the study. These non-participating members are indicated with an asterisk beside their identifying code. The number in brackets next to the participants’ non-identifying code represents the total number of technologies that they have adopted, as previously reported in Table 1.

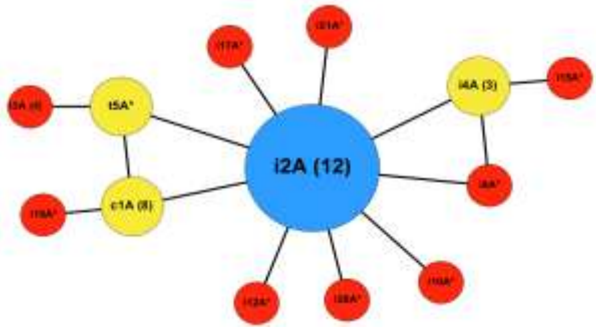

Figure 2: Partial social network of Department A

The lines between each of the nodes in Figure 2 illustrate a connection between each colleague. Since there is a lack of information regarding the types of conversations had by non-participants with those who did participate, there may be more connections than those illustrated above. The size and colour of the nodes visually represent the betweenness centrality of each node or instructor in the network with larger nodes representing higher betweenness centrality. For instance, i2A, represented by the large blue node in the centre of the sociogram has the highest betweenness centrality in this social network. This instructor talks to nine people about technology, three of whom have conversations with one other person. Hence, the conversations that i2A has with those represented by the yellow nodes could potentially affect the conversations between the yellow and red nodes. Moreover, i2A has adopted the most technology in this department, 12 technology applications or tools in total. As presented in Table 2 earlier, as a participant’s technology adoption score rises, their betweenness centrality score also rises. Two colleagues in the department, c1A and i3A, also support this correlation pattern. These two instructors have adopted proportionately less technology and also have a proportionately lower betweenness centrality as illustrated by the large blue node in the centre of Figure 2, compared to the smaller red node at the left. Participant, i4A, the yellow node at the right of the figure, however, represents an exception to the correlation trend, with a similar betweenness centrality to c1A, yet has adopted much less technology.

An analysis of the participants’ technology adoption from the observational and interview data collection and their betweenness centrality helps uncover the potential impact of the conversations between the different colleagues. For instance, i2A who, on the pre-interview questionnaire, indicated being the first to try a technology (i.e. an innovator) actively uses blogs. A colleague, i4A, who speaks with i2A and is an early adopter, and therefore has a higher network threshold than i2A, has also recently started using blogs. The conversations between these two colleagues, therefore, may have influenced i4A to consider using this technology. Similarly, i2A uses online discussion forums and speaks directly with c1A, and also uses discussion forums. Since c1A is in the early majority of technology adoption and thus has a much lower network threshold than i2A, the conversation between these two instructors may have influenced c1A to use online discussion forums. However, since c1A also has conversations with the educational technologist in the department, t5A, this instructor may have heard about the online discussion forums from both t5A and i2A.

Department B

Figure 3 illustrates the social network for Department B and the betweenness centrality of the participants. In this figure, the large blue node, i5B, represents the instructor who has the highest betweenness centrality in the department since this instructor connects the left side of the network with the rest of the nodes. This instructor has conversations with i13B, who in turn has conversation with three other colleagues in the department who, based on the data available, do not have connections with anyone else in the department. Hence, i5B seems to play the intermediary role of helping information flow between the left and right sides of the network.

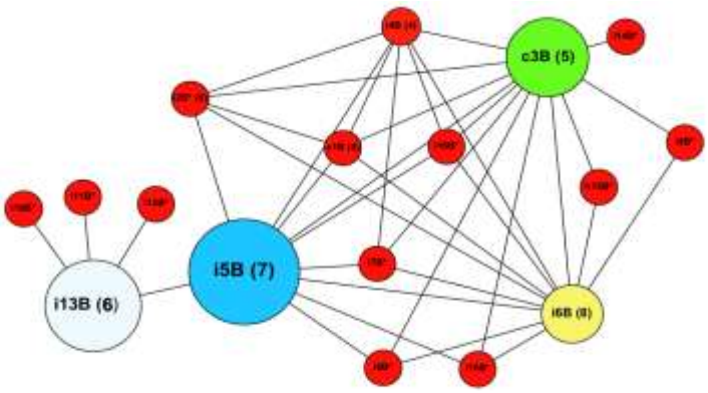

Figure 3: Partial social network of Department B

According to the interview and observation data, i5B is not only a high technology adopter in the department, but specifically uses digital media, technology that i13B also includes in teaching and learning. Furthermore, since i5B is an innovator and i13B falls within the early majority and hence, has a higher network threshold, the conversations between these two participants may have influenced i13B to explore digital media. Likewise, c3B and i6B also use digital media and a variety of other technologies that i5B has also adopted. Since instructors, c3B and i6B consider themselves to be early majority and early adopters respectively, their network thresholds are higher than that of i5B. Hence, conversations with i5B, and potentially with others, may have influenced their adoption of digital media. With respect to the correlation of technology adoption and betweenness centrality presented in Table 2, for the most part, participants in Department B, such as i5B, i13B, and c3B, who have adopted more technologies than others, also have greater betweenness centrality. Additionally, c3B is also a coordinator in the department, which may explain why this participant is more central than others who have adopted greater technology, such as i6B. However, i6B, represented by the yellow node at the far right of Figure 3, has adopted the most technology in the department, yet has lower betweenness centrality than i5B and i13B. This is due to i6B not being in an intermediary position to connect colleagues from one side of a network to another nor to facilitate the spread of information.

Department C

Figure 4, below, illustrates the betweenness centrality in Department C, which, as mentioned earlier, does not manifest the same trends as the other two departments. As illustrated in this Figure, the large blue node represents the participant with the largest betweenness centrality, c6C, who also has adopted less technology than others in the network (5 in total). The large white node represents the participant with the second highest betweenness centrality, c7C. However, unlike c6C, this participant has adopted the most technology in the department. These two participants are also the language coordinators in the department and therefore may have higher betweenness centrality than others, based on their responsibilities in the department. As noted earlier, the language coordinators in this department encourage the instructors to design and develop their own LMS environments. Therefore, their role in their department may explain their high betweenness centrality since they facilitate the spread of information across their department. However, the two green nodes represent the instructors with the next highest betweenness centrality scores, i10C and i11C, who do not have coordination responsibilities. One instructor, i10C, is a high technology adopter while the other, i11C, is a low technology adopter. Thus, a pattern of correlation between technology adoption and betweenness centrality does not emerge in this department.

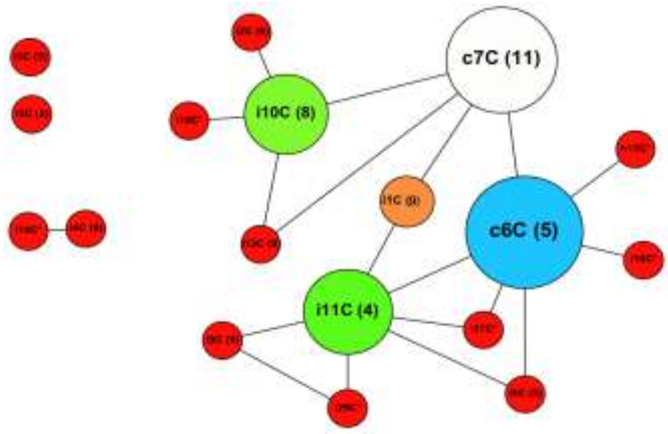

Figure 4: The partial social network of Department C

Investigating the types of technologies that the participants have chosen to adopt, however, shows that conversations amongst the participants may have had some influence on technology adoption. For instance, c7C is an early adopter and is a heavy user of PowerPoint Presentations and the online discussion board, which are both technologies that i10C and i12C also use. Since i10C is also an early adopter, the conversations between this instructor and c7C may have influenced both of them to use the technologies. The other instructor, i12C, is in the early majority group and, therefore, has a higher network threshold than the other two. Hence, conversations with i10C and c7C may have influenced i12C to consider using those technologies. In addition, i2C, represented by a small red node at the top of Figure 4, is also an early adopter and uses online discussions and digital media. This technology is also adopted by c7C. The intermediary position of i10C in the network, therefore, may facilitate the flow of information concerning online discussions and digital media between i2C and c7C. Likewise, i11C is in an intermediary position between i9C and i1C, who are the only participants who use the same vocabulary tool. Since i1C is an early adopter and i9C is in the early majority with a slightly higher network threshold, information about the vocabulary tool may have flowed from i1C to i9C through i11C.

Emerging Patterns

The analyses discussed earlier in this paper highlight two patterns. While departments A and B showed a positive correlation between technology adoption and betweenness centrality more than half of the time, a similarly significant relationship was not observed in Department C. However, analysis of the combined data such as with whom the participants spoke, which technologies they adopted and their network thresholds, showed that certain participants had an intermediary role, assisting with the flow of information across their departmental network and subsequently influencing their colleagues to consider certain technologies. This resonates with Burt's (1992) notion that structural holes create a gap in the flow of information between members of a network and a third person is needed to be an intermediary to fill this gap. Individuals near these bridges, therefore, have better opportunity to access new information that can lead to improving their social capital and influencing their decisions (Lin, 1999). Furthermore, there are parallels between this study and previous studies on collaboration and communication (Davis, 2005; Mwaura, 2003; Valente, 1996) in that there was also a trend in this study for conversations between those with lower network thresholds, such as the innovators, to have a potential influence on the technology adoption decisions of the participants with higher network thresholds, such as the early adopters or early majority. These findings also support the results of social network studies that have determined that communication amongst instructors can influence their decisions to use a particular teaching approach (Roxa & Martensson, 2009). The role of the participants with high betweenness centrality and the potential flow of information and technology adoption across the network also justify social network theory as a theoretical paradigm to explain technology adoption decisions.

The trend that emerged in two of the departments in this study begins to show that the technologically advanced instructors may also have positions of influence in their department networks since they tend to have an intermediary role that assists with the spread of information valuable to their colleagues and thus enhances overall social capital (Lin, 1999). It is likely that such spread of information and enhanced social capital is the result of key actors in the department networks developing trusting relationships with their colleagues (Niesz, 2007).This is of particular importance for senior higher education administrators and leaders since the success or failure of technology acceptance depends, to some extent, on their ability to identify the trail-blazing technology adopters who can help implement change and transform their institutions (Hagel et al., 2010). After these adopters have been identified, the senior administration can enlist these key instructors to help promote the integration of educational technology by leading technology-related communities of practice (Kopcha, 2010; Roberts, 2008) or spreading information about new technologies through informal conversations with colleagues in their departments. One way for the senior administration to discover the influential instructors would be to identify the instructors who have adopted a high number of technologies as suggested by the trend revealed in this study. Since senior higher education administrators and leaders do not readily have access to information concerning which instructors at their institution have adopted the most technology, technology support units can play a critical role in obtaining such data and providing reports to senior administration. Information concerning the types and number of technologies that instructors use can be extracted from various technical systems, such as the learning management system, assisting educational institutions with implementing technology diffusion strategies (Dawson, McWilliam, & Tan, 2008). By leveraging the data supplied by the technology support units, senior higher education administrators can recruit the high technology-adopting instructors to help increase technology acceptance across their institution. Such technology diffusion strategies can assist educational institutions to better meet the demands of the global education market (Conole, 2010) by increasing access to online learning opportunities and enhancing student engagement. While this study discovered a potential correlation between network position and technology adoption, which can help identify key instructors to assist with technology diffusion, future studies, as discussed in the following section, are required to further determine its significance and applicability to the broader community.

Summary and Future Directions

This study investigated the social networks of academic departments and discovered a potential correlation between technology adoption and instructors' positions in their departmental networks. As reported, social network analysis of two departments showed that instructors who have adopted a greater number of technologies tend to be in an intermediary position in their department network and, hence, assist with the spreading of information across a departmental social network. Furthermore, this study revealed a tendency for instructors with greater betweenness centrality to have a lower network threshold than others, and therefore, the potential to influence adoption decisions of their colleagues demonstrating a higher network threshold. Both the instructors' particular intermediary role in their departmental network together with their ability to influence peers with higher network thresholds may be a result of the trust they have gained from others in their network. Future studies with a greater number and diversity of participants across disciplines are required to substantiate or refute the trends observed here. Further research can also help advance understanding of the factors influencing technology adoption amongst instructors, in particular the role that trust plays in certain instructors being in a position of influence in their professional social networks. In addition, since the social network analysis in this study was focused on ties between colleagues in academic departments, future studies can specifically investigate instructors' online social networks, such as Twitter and LinkedIn, to determine how they can be leveraged for enhancing technology adoption. Identification and recognition of factors influencing instructors' technology adoption decisions can assist with the provision of the resources and support necessary for higher education leaders to develop strategies for the integration of appropriate technologies within current teaching and learning practices. This study is merely a commencement point for discussion on the insights that social network analyses can bring forward, to aid and inform strategic initiatives designed to promote the use of learning technologies in the education context.

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Benchmarking Open Educational Practices in Higher Education

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Open Educational Resources are widely discussed in higher education circles and open education practices are being upheld as the second generation of OERs that have the potential to make education freely available to all students. The OERu is a collaborative initiative between 12 institutions globally that is intending to offer courses free of charge to students using only OERs and open practices. This poster presents preliminary results from a research study conducted with 110 representatives of higher education institutions around the world, of which 12 were official; members of the OERu. The study was aimed at identifying the extent to which higher education institutions are currently implementing open policies and practices as well as explore the challenges faced by institutions when considering implementing open initiatives. Results from the study indicate that although higher education institutions are aware of and interested in open education resources and initiatives such as the OERu, there are a number of challenges that need to be overcome before these initiatives are sustainable and more widely adopted.

Keywords: Open Educational Resources, OERs, Open Educational Practices, Open Educational Resource University (Oeru)

Introduction

At first glance the Open Educational Resources (OERs) movement and increasingly open educational practices seem set to change the future landscape of higher education. The successful implementation of open education practices, which includes OERs, has the potential to make education opportunities freely available to all students, particularly those previously excluded from formal learning (Mackintosh, 2012). Interest in OERs has increased exponentially as a topic of research and debate since the term was first adopted in 2001 when MIT became the first institution committed to making all of its course materials freely available through its OpenCourseWare (OCW) program (Baker, 2008). Since then, over 270 organisations and educational institutions internationally have adopted the "opencourseware" concept and have incorporated the principles underlying openness into their policies and practices (http://ocwconsortium.org).

Increased emphasis on the development of OERs and avenues for open learning represent a growing critique of traditional, institutionalised systems of education. According to Taylor (2007), existing education platforms are unable to meet the growing demand for higher education within the limited increases in resources. While to this point in time most of the focus has been on the creation and development of OERs, there are now a number of initiatives to create formal credentialing of studies undertaken using OERs which will result in recognised qualifications. These initiatives and other open educational practices are emerging as the second phase of the OER movement (Ehlers, 2011), which will challenge institutions to consider new delivery models, curriculum development, pedagogy and sustainable business.

The OER university (OERu) (Taylor, 2007) is one of these initiatives that signifies a step towards developing a feasible framework for integrating available OERs into assessable online courses. The OERu is based on a conceptual framework that provides a structure for enabling free learning opportunities for students who lack the means to access traditional higher education. The ultimate outcome of the OER university collaboration is to ensure that OER learners can achieve credible qualifications from formally accredited participating institutions (Taylor, 2007).

A number of studies (e.g. Ehlers, 2011; Bossu, Bull, & Brown, 2012) have pointed out that the potential of the OER movement to transform education practices has not been realised, largely because of a lack of focus on the policies and practices required to promote the concept of openness within higher education institutions. Despite research conducted to date, however, there is still limited evidence on how to successfully integrate OERs and principles of open education into the policies of educational institutions and limited research has been conducted on the resulting impact of open educational projects on institutional policy and practice. The aim of this project is to identify the extent to which higher education institutions around the world are currently implementing open education policies and practices that support the successful implementation of formal assessment and accreditation services for informal learning based solely on open educational resources.

Research Method

An OERu compatibility survey was developed as a collaborative initiative between the author, Gabi Witthaus from the Beyond Distance Research Alliance (University of Leicester) and Wayne Mackintosh from the OERu Foundation. Many of the questions were derived from a series of interviews carried out with individuals from institutions participating in the OER university (OERu) network as a component of the Toucans project (Witthause, 2012) and input was provided into the survey questions by OERu network members. The survey was programmed and hosted using an online survey tool and a link to the survey was disseminated using social media such as Twitter and Facebook and through newsletters and discussion forums. On completion of the survey all respondents received a PDF of their responses which they will be able to use as a benchmarking tool to map the compatibility of their organisations with the OERu concept against the final results.

A total of 110 representatives of higher education institutions around the world completed the survey. Participants included 12 higher education institutions that are officially members of the OERu network (also known as the OERTen partner institutions) and 98 that are not partner institutions. The final outcome of the study will be a compatibility indicator for the OERu concept based a comparison of the findings from the two groups. Institutions from across the world participated in the study with the majority originating from the United Kingdom (40%), North (17%) and South America (15%), and Australia / New Zealand (9%).

Discussion of Results

The results of the study indicate that the majority of participants in the study (88%) were familiar with Open Educational Resources prior to participating in the study and 67% were familiar with the OERu (option 4 or 5 on a five point scale from not very knowledgeable to very knowledgeable). One of the most predominant themes was the high awareness of OERs and the OERu in comparison to the low involvement of institutions in open practices that support the development of OERs. Three in ten (29%) participants represented institutions that were published OERs, yet only 24% were using OERs developed by other institutions or organisations. Only 24% were involved in the collaborative development of OERs with people in other institutions and as few as 8% were presently providing courses based solely on OERs (option 4 or 5).

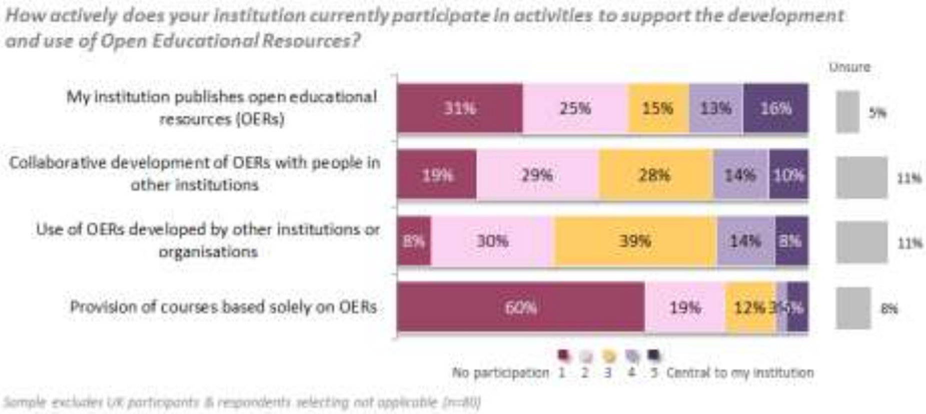

Figure 1: Institutional participation in OER development activities

Participants were requested to rate the factors that hinder the successful implementation of OER based courses on a five points scale from not at all (1) to a large extent (5). The greatest barriers to participation in the development of OER based courses (option 4 or 5) were leadership support, cost and time. Between over 60% participants considered the lack of availability of volunteers (66%), lack of support at the senior leadership level (61%), cost of redeveloping courses (66%), lack of availability of committed staff members (67%) and lack of integration with current workflows and obstacles (67%) to have a large impact on the successful implementation of open education courses and processes.

It appears that although the concept of courses conducted using only open educational resources is a topic of interest and discussion in higher education, it is a concept that is still in its infancy. There remain a number of challenges at an institutional level, particularly with regard to support from senior management that will need to be overcome before wider adoption is possible.

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Development of a framework for evaluating the impact and sustainability of mobile learning initiatives in higher education

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The field of mobile learning is becoming more capable of supporting high quality learning experiences and students are increasingly demanding greater mobility and flexibility. As a result, Higher Education Institutions are increasingly considering the implementation of institutional m-learning strategies. We present the aims and approach of a three year project to be conducted by the Australian Digital Futures Institute to develop an m-learning evaluation framework (MLEF) that will aid the selection and justification of m-learning initiatives. The framework will be encapsulated in an easy to use online evaluation toolkit which will consist of: a standardised evaluation framework, resources and guidelines; an m-learning maturity model; a database of m-learning exemplars; and an interactive mobile user model. The project is a collaborative initiative between USQ, ANU and UniSA and is supported through the Australian Government's Collaborative Research Networks (CRN) program. Participatory monitoring and evaluation (PM&E) methods will be used to develop outputs and deliverables.

Keywords: Mobile learning, m-learning, mobile learning, evaluation frameworks, sustainability

Background: Evaluating Mobile Learning Initiatives in Higher Education

As mobile technologies have evolved and become more capable of supporting learning experiences in both blended and stand-alone contexts, the field of m-learning has emerged as a new learning paradigm and become a focus of research and development activities (Kukulska-Hulme et al., 2011; Engel et al., 2011). Over the past ten years, a number of pilot or experimental research studies have been conducted across sectors to investigate the impact of mobile technologies on learning and teaching (e.g. Elias, 2011; Biggs & Justice, 2011; Wong, 2012). One of the most consistent conclusions of these studies is that there are still a number of barriers that influence the adoption of m-learning initiatives in education, both at an institutional and at a user level. HE institutions are cautious about investing extensively in mobile technologies because of the rate of emergence of new models and the speed with which devices become obsolete. Few HE institutions have therefore implemented well-financed and highly visible m-learning initiatives that are operationalized within policy and practice.

A report conducted for the JISC e-Learning programme in late 2010 indicated that the most prominent issue in the field of m-learning is the lack of full scale evaluations of mobile technology in Higher Education (Wishart & Green, 2010) and the absence of a stable platform from which to effectively research the role, drivers and impact of mobility on learning (Park, 2011). A significant challenge facing most HE institutions is identifying strategic and operational priorities for investment in m-learning capabilities within a rapidly changing field, while maximising the educational outcomes for students and minimising institutional costs. This poster describes a three year project to be undertaken by the Australian Digital Futures Institute that will address this gap by developing an effective assessment mechanism that can be used to evaluate whether m-learning initiatives are successful, scalable and replicable.

Project Aims and Approach

The aim of this project is to develop a framework for mobile learning or m-learning that will enable Higher Education (HE) institutions, learning designers and educators to evaluate the impact and sustainability of m-learning initiatives within a range of learning contexts. The m-learning evaluation framework (MLEF) will be developed to facilitate and support HE institutions in the assessment, development and embedding of m-learning policies and/or practices to enhance the learning experiences of students and support long-term planning for improved learner and institutional outcomes. The framework will be independent of specific technologies and therefore will remain relevant despite the emergence of new devices.

The focus of the project on building an evaluation model that is sufficiently flexible to accommodate the current and future needs of students and educators for m-learning initiatives. For this reason an iterative approach will be used to ensure that each commencing stage is built from the insights obtained in the previous stage and allow the inclusion of new insights and innovations in the field as the research project matures. Participatory monitoring and evaluation (PM&E) methods will be used as the project involves the development of artefacts, such as the toolkit, which are aimed at being responsive and relevant to the needs of the education community.

The project will be undertaken as a three-year collaborative initiative between three participant universities; USQ, ANU and UniSA. Three levels within higher education will be examined as recommended by Quinton and colleagues (2010): pedagogical, technical and organisational. The following groups that represent each layer will be consulted during this stage to identify the needs, expectations and challenges of each level when considering the implementation of m-learning initiatives:

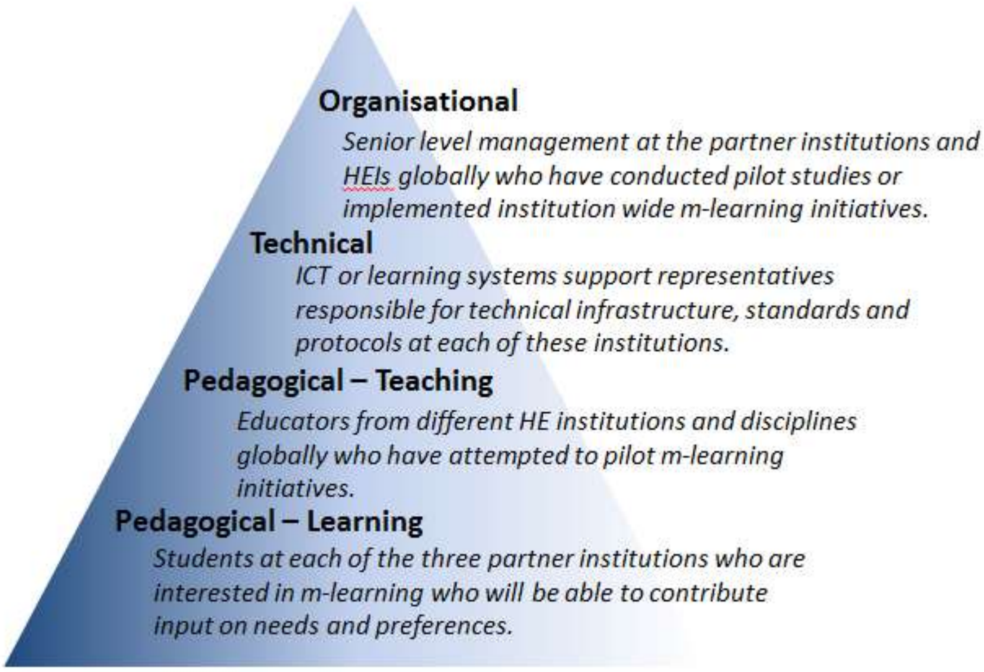

Figure 1: Groups to be consulted in the development of the MLEF

Outputs and Deliverables

The primary deliverable of the study will be an online m-learning evaluation toolkit that will provide a set of procedures, guiding principles, methods and examples to be used by HE institutions and educators when evaluating m-learning initiatives for inclusion in policy and practice. The m-learning evaluation toolkit will consist of the following components:

- *A conceptual evaluation framework and evaluation resources* consisting of a set of evaluation criteria and standardised assessment instruments as well as checklists, guidelines and step-by-step tutorials for the evaluation of m-learning initiatives within various contexts;
- *A m-learning maturity model* that will enable HE institutions to assess the maturity of their m-learning capabilities and provide best practice recommendations for policy development and institution-wide co-ordination and communication;
- *A database of m-learning exemplars* in the form of case studies and resources that have been demonstrated to contribute to high quality learning experiences; and
- *A mobile user model* consisting of normative data compiled from the research component of the study that provides insight into the context, background, needs and learning styles of students and enables benchmarking of the role, drivers and impact of m-learning within various learning contexts and environments.

The project will result in a rigorous and transferable conceptual framework for m-learning evaluation that will enable higher education institutions to consider the impact of new m-learning strategies within the context of current capacities and the future impact on the quality of the student learning experience.

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Following the Sun: Sustainable conferencing in a climate of change

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This paper reports on a new initiative in online conferencing that has resulted from the collaboration between three tertiary institutions on three continents and across three time zones. The paper describes the role of the Follow the Sun Online Learning Festival in revitalising professional online learning and networking events in a similar manner to the way in which e-learning revitalised tertiary education. The paper also discusses the evaluation of online conferences and introduces the new learning methodology as an alternative method for evaluating online conferences. The methodology used to evaluate the Follow the Sun Learning Festival is discussed and some preliminary findings are shared. Initial results suggest that online learning events have the potential to engage and connect professional peers and facilitators across traditional geographical boundaries. The potential for the Follow the Sun conference to result in new learning is however still unresolved.

Keywords: online conferencing, collaboration, evaluation, new learning

Introduction

Computers and the internet have long been attributed with revolutionising and revitalising teaching and learning within the tertiary education sector (Selwyn, 2007). Advances in internet based communication technologies have been noted particularly for improving distance education. Furthermore, online instruction enables the interaction and exchange of information between learners based on physical campuses or in distant or disadvantaged locations (Johnson, Aragon & Shaik, 2000) and has as a result been attributed with improving access to educational opportunities and promoting interactivity and collaboration between learners.

Conferences and training events have for many years been perceived as a primary tool for improving professional knowledge and networking, resulting in improved competence and performance in practice (Anderson & Anderson, 2012). With the increasing economic and environmental costs associated with long-distance travel, many organisations have implemented environmental policies to limit meetings that involve travel and professionals are required to be more restrained with the number and range of professional development opportunities they engage in. Anderson and Anderson (2009) identified that although many organisations have overcome these restrictions by using online communication technologies for meetings, few organisations have committed to delivering traditional face-to-face conferences or training events wholly online.

Online professional learning conferences or events offer the potential to combine the e-learning models developed for online tertiary education with the needs of participants prevented from attending conferences as a result of time or travel restrictions. Web conferencing software enables synchronous internet-based collaboration and communication and is therefore ideally suited to enabling the interaction between facilitators and participants so valued in traditional face-to-face training or conference proceedings. Online conferences by themselves are not a radically new concept, but as online conferencing technologies continue to become more inexpensive, ubiquitous and advanced, there is greater potential to leverage these resources to enhance the future of learning for students and professionals. The challenge for learning organisations that are preparing to move towards hosting or facilitating online conferences is to develop events that will attract and sustain the engagement of online audiences, rather than simply repurposing the processes and formats followed in the past.

This paper reports on an attempt to offer an online conference synchronously in a new and innovative manner. The format of the conference was intended to capture the attention of a global, multi-disciplinary audience, facilitate the development of digital communities within disciplines and present new ideas for using digital technologies for learning within these disciplines. The conference was hosted over a period of 48 hours in three continents and time zones and connected more than 300 participants in over 40 countries. A comprehensive evaluation of the conference was conducted to determine the extent to which participation in the event resulted in new learning and the sustained effect of these learning's over time. The aim of the evaluation was also to determine whether the format utilised was suitable for engaging and sustaining the attention of attendees participating at their desks from personal computers across time zones and was able to meet their learning expectations.

Follow the Sun Online Learning Futures Festival

The University of Southern Queensland is committed to excellence in applied research as well as the utilisation of innovative technologies for the future. A significant event supporting this research strategy has been the conduct of a non-stop, 48-hour online global conference, the Follow the Sun Online Learning Futures Festival, now in its second year of offer in this format.

In 2012, the event was organised by the Australian Digital Futures Institute at the University of Southern Queensland (USQ, Australia), Beyond Distance Research Alliance at the University of Leicester (UK) and Athabasca University (Canada). The festival was held entirely online, delivered through the web conferencing system, Blackboard Collaborate. It ran non-stop for 48 hours, held over six shifts of eight hours each, with consecutive handovers between Australia (USQ), United Kingdom (Leicester) and Canada (Athabasca). Australian Digital Futures Institute and Beyond Distance Research collaborated in 2011 to host the conference using Adobe Connect. The 2011 conference focused on educational technology, whereas the aim of the conference in 2012 was to examine knowledge development and exchange across disciplines.

There were 266 registrations for the conference in 2011 but over 750 registered across 35 countries in 2012 (see Figure 1 for a graphical representation of the countries of all registered delegates). The festival was free to all participants and recordings of all sessions were made available after the event, supporting the concept of open educational resources. The decision to make the event free in 2012 was consistent with the University's mission to enable broad participation in higher education and to make a significant contribution to research and community development.

Figure 1: 'Where are you?' Map created of delegates who registered for Follow the Sun 2012

The festival featured keynote speakers from across the world representing a mix of disciplines including Engineering, Computer Science, Sports Psychology, European Politics, Nursing, Midwifery and Ethnomusicology. The primary goal of the conference was to move beyond the theme of educational technology and bring together university staff and students within these disciplines from across the globe to share new ideas, exchange information and explore knowledge development. The festival was split into four-hour sessions containing presentations, keynotes, interviews and panel discussions, with each session focusing on the possible digital futures of a particular discipline.

The second goal of the conference was to present an online learning event in an innovative and sustainable manner. The event was designed to be flexible and accommodate time pressures experienced by participants by allowing delegates to log in and out as they pleased and to have access to session recordings. As the registration was free, the conference was designed to be openly accessible, regardless of geographic location or economic restrictions. Lastly the conference drew on the potential offered by technologies such as Blackboard Collaborate to enhance the learner experience and facilitate collaboration through the use of features such as two-way audio, multi-point video, interactive whiteboard, application and desktop sharing, rich media, breakout rooms, and session recording. The conference supported the university's mission of offering quality professional education opportunities that are accessible, flexible and borderless.

Dickinson (1992) stresses the importance of finding new ways of communicating and working together "to confront the problems that threaten the lives of human beings, countries, even the planet itself". Events such as the online Learning Festival can be energy-efficient and sustainable. These events contribute to a reduction of an institution's carbon footprint by being low cost, no travel events that allow participants to attend at their convenience. The conference was therefore also aligned with USQ's Sustainability Pledge, a list of objectives put in place to ensure the University is 'carbon neutral' by 2020.

Evaluation of Online Conferences

Anderson and Anderson (2012) maintain that the evaluation of the effectiveness of professional conferences in achieving improved learning and performance is greatly lacking and focus mostly on the immediate reaction or satisfaction of participants. New learning (NL) is primarily a qualitative methodology proposed by Chapman Wiessner, Storberg-Walker, and Hatcher (2007) as an alternative way of evaluating conferences. Users of this method focus on asking participants to provide information on new learning they have experienced or new questions that have occurred to them as a result of the conference. The question is a reflective question that is intended to prompt participants to provide deeper information on their perceptions and experiences (Chapman et al., 2007) and is ideally suited to professional conferences where new learning is an intended outcome. Making the data collected available to stakeholders is considered to be an essential component, as this enables participants to reflect on divergent perspectives and experiences of conference attendees.

Few studies have been reported using the new learning approach to evaluate conference attendance and no studies, to the authors' knowledge, have been reporting using similar methodologies to evaluate the effectiveness of online learning events. The evaluation approach used for the Follow the Sun Online Learning Festival in 2012 was developed according to the key principles of the new learning approach but was modified to be more manageable within the fast paced online festival environment. The purpose of conducting an evaluation was to not only provide information on the value of the event at its conclusion but to provide insights into the long-term impact of new learning's and information gained.

Evaluating the Follow the Sun Online Learning Festival

The aim of the evaluation of the Follow the Sun Online Learning Festival was to enable a comprehensive and multifaceted analysis of the experiences and perceptions of participants. The evaluation was developed to obtain insight into not only the satisfaction of participants and reactions to the conference but also to capture the benefits and limitations of the event as experienced by participants and identify whether any new learning occurred as a result of participation.

Due to the fast paced nature of the conference and the dispersed geographical location and time zones of participants, it was not possible to fully integrate the evaluation into the conference proceedings as participants would have little time to reflect on learning's and provide detailed responses. As a result, it was decided to use a summative online survey as the primary evaluation instrument. The evaluation was further supported by short evaluation questions after each session posted using Backboard's survey features and the information provided by participants was immediately available to facilitators. These results are not presented in this paper.

Methodology

An online survey evaluation questionnaire was distributed at the end of the conference to all participants who registered for the Learning Festival event. Participants were requested to complete the survey regardless of whether they attended the event or not. A number of directed questions were included that would allow the research team to identify reasons for registering but not actually participating in the conference. This enabled the identification of preferences for formats that may attract attendance and make future online events more accessible and convenient.

The survey consisted of a range of closed and open ended questions that sought demographic and background information, conference participation information including access trends and frequency, familiarity and usage of social media, feedback on experiences and preferences for future online learning events. None of the survey questions were compulsory so that respondents did not need to answer questions they were not comfortable with. As a result some of the samples sizes for questions may differ.

The section that focused on participant experiences moved beyond simply indicating satisfaction with events and resources. Questions were targeted at finding out detailed information on the benefits and limitations of the conference to participants during the conference as well as the impact of the conference on personal learning and potential future practice.

To identify the extent to which any new learning obtained during the conference had a long term impact on individuals and organizations, respondents could opt in to receive reminders about the new learnings and intended actions they identified in future surveys to determine whether they were able to implement them. These reminders were sent out with detailed feedback on the responses to the evaluation surveys at 3 months, 6 months and 1 year after the event. As the evaluation is in the final stages of analysis, the data has not been fully analysed and only preliminary findings are reported in this paper.

Findings and Discussion

A total of 192 completed the survey of which 115 participated in the conference and 77 did not. The majority of respondents described their role as either an academic (n=58, 33%) or an educational designer (n=44, 25%) with 17% describing themselves as professional staff (n=29), 10% as researchers (n=17) and 8% as students (n=14) or other (n=12, 7%). Females formed the majority of the sample with 66% (n=108) participating in the research and only 34% males (n=56). Respondents were from a range of age groups with the majority between 50 and 59 (n=57, 35%) and 40 to 49 (n=49, 30%). Ten percent (n=17) were over the age of 60 and 25% under the age of 30 (41).

Learning festival participation trends

The festival reached a dispersed audience with only 27% from the three partner universities that hosted the event and the remaining 73% from other organisations. Approximately one in three (28%) respondents attended the previous Follow the Sun Festival in 2011 which suggests that the event is attracting a larger and more diverse range of participants year on year.

Respondents were requested to provide some information on participation trends to assist in identifying reasons for registering but not attending the conference or for only attending a few sessions. Although the goal of the conference was to move beyond discussions about learning technologies and result in the development of digital communities within disciplines, the primary reason why participants were attracted to the Online Learning Festival was because of a particular interest in learning technologies (44%). Very few were attracted to the event as a direct result of the relevance of the content to their discipline (18%) (Table 1).

The majority of respondents indicated that the primary reason for not attending more sessions or for not attending at all was because they were unable to take more time away from work (52%) or as a result of previous commitments (37%), with only a small percentage not attending as a result of lack of interest (10%) or technical difficulties (11%) (Table 2). This suggests that the time available to professionals for participation in digital communities and online learning is limited and should be taken into account when designing online learning events to maximize participation and value.

Table 1: Reasons for interest in Online Learning Festival

What is the primary reason why you were interested in attending the Follow the Sun Learning Festival? (Select one)	Total	Participants who attended	Participants who did not attend
Particular interest in learning technologies	44%	37%	55%
General interest in the topics presented	19%	20%	16%
The content is directly related to my discipline	15%	17%	12%
Relationship with one of the participating host organization	11%	14%	5%
Opportunity to network	5%	3%	7%
Interest in a specific speaker	2%	2%	1%
Interest in a specific topic	2%	2%	1%
Other	4%	6%	1%

Table 2: Reasons for not attending more sessions

What were the primary reasons why you did not attend more sessions? (Select all that apply)	Total	Participants who attended	Participants who did not attended
I was unable to take time away from work to attend further sessions	51%	53%	49%
Previous commitments	35%	38%	30%
The time of the sessions I was interested in were inconvenient / outside my working hours	31%	30%	32%
Technical difficulties prevented further access	10%	8%	14%
The sessions were too discipline specific	9%	13%	3%
There were no other sessions that I was interested in	9%	9%	8%
Other	8%	7%	9%

Respondents who attended one or more of the Festival sessions were asked to describe their participation styles during the sessions. The large majority of respondents were actively engaged during the session and either asked questions or communicated with peers (41%) or listened closely without asking questions (28%). It appears that few participants only listen while working (19%) or drop in and out of sessions (5%) (Figure 2).

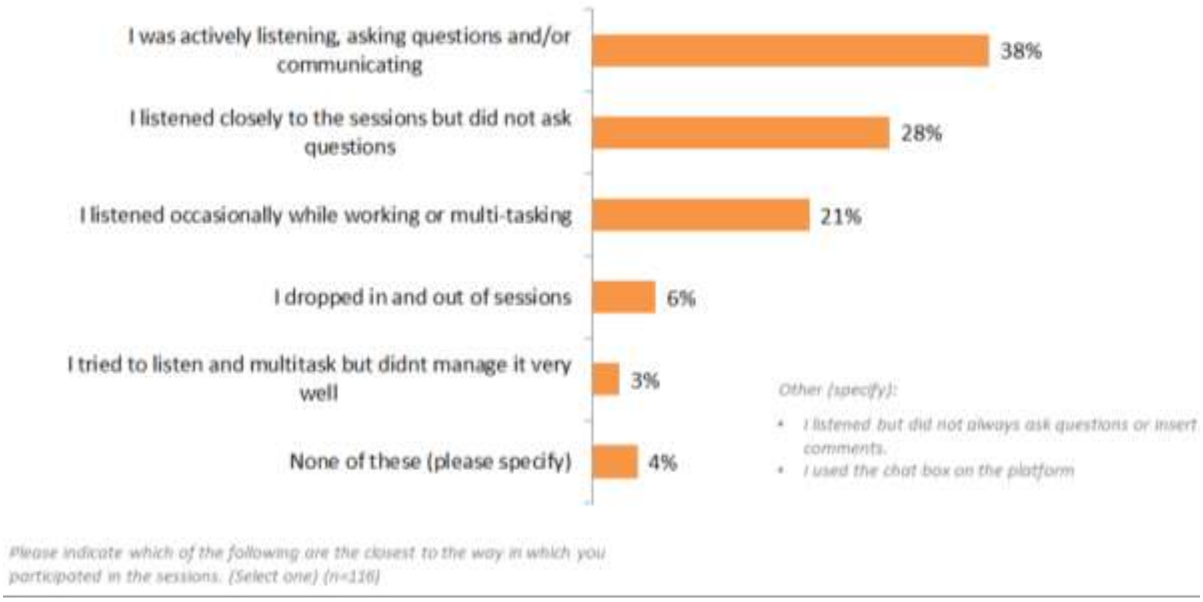

Figure 2: Actual trends for participating in sessions (Participants in Online Learning Festival, n=106)

Perceptions of the value and impact of the Online Learning Festival

Respondents were asked to provide insights through a series of open questions on their perceptions of the value and impact of the conference as well as their personal learning expectations. Preliminary analysis of the comments indicate that participants were intrigued by and valued the collaborative online experience offered by the Festival. Comments from the raw data include:

> This year was a truly collaborative endeavour. I was intrigued by the 24-hour format and the calibre of hosts and presenters. Excellent speakers and panels, who know how to conduct themselves in synchronous environments, and well trained moderators. Enlightening and thought-provoking.
>
> This has been extraordinary and probably the best single experience in my 10 years in Higher Education. So much breadth and depth and such a sense of connectedness.

Respondents have indicated that online learning events in this format are an attractive avenue for exploring new learning ideas, remain up to date with the latest trends in educational technology, feel a sense of community and network and connect with peers in similar fields. This suggests that the format employed for the Learning Festival does meet the needs of potential participants and is able to provide a sense of collaboration and community that participants value.

New learning that occurred as a result of the Online Learning Festival

As mentioned previously, the primary rationale for the evaluation of the Festival was to determine the extent to which new learning occurred . Respondents were requested to provide insight into any new learning they experienced or any new questions that have occurred to them as a result of participation in the conference. Forty one participants indicated that they experienced new learning as a result of the conference and twenty were interested in tracking the actions identified from these learnings in future surveys.

A large number of new learnings were focused on technology specific issues and were presented as broader thoughts rather than specific learnings or actions. Examples of these include:

> A high level understanding of the direction technology is taking in learning and a stepping stone into further studies.
>
> I learned a lot about virtual worlds, professional virtual learning, e-pedagogies and technology-enhanced learning. I also discovered how Blackboard worked and found it was a wonderful tool.
>
> I thought about the use of technologies in new ways. Also, I had a greater insight into the challenges facing some disciplines.
>
> Specific approaches for developing learning materials; better understanding of teaching practices internationally.

These findings suggest that either the evaluation instructions were not sufficiently clear or that the summative online evaluation tool was not the appropriate method for identifying learning and action as a result of the conference. Further probing into the responses of participants who agreed to participate in future surveys may provide a more detailed response.

Preferences for future formats of online learning events

Participants were asked to describe the barriers that they experienced most in attempting to attend online events in general. Difficulty in scheduling time off from work was the number one reason provided by nearly all respondents (80%). This suggests that there is scope to alter online learning events, particularly lengthy conferences, to be more flexible and more easily accommodated within busy work schedules.

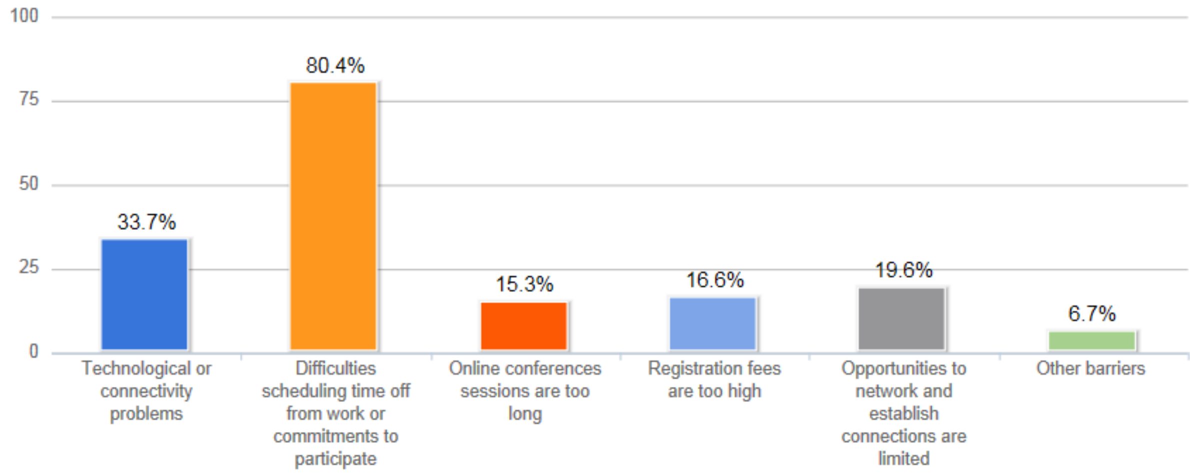

Figure 3: Barriers experienced in attempting to attend online events in general

The answer to this concern may lie in the development of online conferences that utilize both synchronous and asynchronous features. Respondents were requested to select their preferences for alternative formats for online conferences and a large proportion (34%) preferred events that included asynchronous components such as pre-recorded videos but also included synchronous features such as access to the presenter for questions in real time. Events that follow this format may satisfy the requirements of conference delegates to interact and collaborate with peers yet still enable flexibility by allowing them to watch the pre-recorded sessions at an earlier stage in their own time.

Figure 4: Preferred approaches for future Online Learning Festivals

Conclusion

Higher education is changing rapidly to address the imperatives of digital futures. Developing knowledge and experience of how to effectively lead and support online learning experiences and interaction as well as develop digital communities is critical to enhance skills and practice that can be applied across diverse contexts, despite geographical boundaries. This paper has provided an overview of a partnership between three tertiary institutions located across the globe that have collaborated to provide new opportunities for facilitating online learning, access to digital communities and networking for professionals. As the education landscape and learning needs of future students and professionals evolve and change, learning institutions will greatly benefit from joining together across global boundaries to provide unique and effective learning experiences. The paper also presents an overview of the methodology and preliminary findings of an evaluation conducted to assess the value and impact of these initiatives in stimulating new learning.

The results from the evaluation suggest that the Festival format presented in this paper has the potential to engage and connect participants in geographically dispersed locations and encourage future collaboration and communication. The potential for these events to create New learning as defined by Chapman et al. (2007) is however still uncertain. The findings further suggest that there is scope for improving the format of online conferences particularly lengthy sessions that require extensive time commitments from participants. The manner in which participants engage with online sessions, including the extent to which they actively participate and collaborate with peers synchronously requires further insight. This will assist conference developers in identifying formats that are able to capture the attention of participants for the full session time and result in new learning's and a tangible impact on practice. Online conference technologies have the potential to contribute significantly to enhancing professional conference experiences. However, additional research into participant behaviour and further innovation in delivery formats is required.

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Using e-readers to increase access to course content for students without Internet access

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There have been mixed reviews about the potential of e-readers to enhance higher education. At first glance, e-readers appear to have significant potential to provide students with access to course content and learning materials. There are a number of considerations and obstacles to be addressed, however, before these devices are ready for widespread adoption. This paper reports on a pilot study using e-readers to provide students without internet access, with access to electronic course content. Course readings were converted into ePub format and were made available to a cohort of 16 incarcerated students via e-readers. This paper provides an overview of the steps undertaken as well the challenges and obstacles encountered in converting the readings to ePub format.

Keywords: e-readers, diversity and inclusion, ePub, incarcerated students, digital divide

Project context and background

Since the release of the Amazon Kindle in November 2007, the popularity of e-readers and e-books has increased rapidly and a growing number of publishers are producing content in multiple formats to service the e-reader market (Stone, 2008). E-readers are low-cost, energy efficient devices capable of storing a large number of journal articles, course readings, dictionaries and other course resources. They also enable students to bookmark, search and take notes. Consequently, these devices have the potential to overcome a number of challenges within the higher education (HE) context including the rising cost of textbooks and the increasing demand for mobility and flexibility in learning. Research has identified a range of challenges and barriers that hinder the widespread uptake of e-readers in HE (Gerlich, Browning & Westermann, 2011) including difficulties in obtaining copyright permission to replicate materials, and difficulties in converting documents from pdf format to ePub.

This paper reports on the processes, challenges and successes experienced during a pilot project to provide a small cohort of incarcerated students with access to course materials in ePub format on e-readers. The increasing reliance of distance learning institutions on elearning has resulted in greater challenges for incarcerated students attempting to participate in HE, as offenders are excluded from enrolling in any programs that require learners to consult resources on the internet (Mortimer, 2008). Formal education and training delivery to prisoners is currently provided in non-digital forms using large volumes of printed copies of the course materials (Dorman & Bull, 2003). This is costly for universities to assemble, print and post, and cannot incorporate all of the learning support resources of the course. The aim of the pilot project was to attempt to overcome some of these challenges as well as provide opportunities for incarcerated students to develop critical e-literacy and e-research skills (Farley & Murphy, 2012).

Conversion process for course materials to ePub format

Course materials from a Tertiary Preparation Program (TPP) course *Studying to Succeed* at the University of Southern Queensland (USQ) were made available in ePub format to 16 incarcerated students on two types of e-Readers; the Sony PRS-350™ and Sony PRS-300™. The majority of the course materials were originally only available in PDF format. PDF does not display optimally on some eReaders and users cannot resize and reflow the content to meet their preference. As previous research has indicated that functionality and ease of use are particularly important to students (Mealer, Morgan & Williams, 2011), it was decided to convert the PDF documents to ePub (via an intermediate RTF conversion step).

Table 1: Overview of the process for conversion of PDF documents to ePub

Obtaining copyright permissions	The use of a number of the published journal articles required negotiation with publishers to make the readings available on the e-readers. Permission was obtained for all but two of the readings. These readings were not included in the e-readers.
Conversion to ePub format	Apple Pages was the software utilized for content conversion. A template was set up in Pages and the course content embedded. Content styles such as headers and captions were applied to the text and images resized as appropriate. An issues log was created to record problems along the way. All ePub files were uploaded onto the Sony eReaders. Cumulatively, 79 ePubs were created of which 61 were course readings, 17 module guides (the study book divided up), and the course introduction book. If printed onto A4 the course material would amount to approximately 750 pages. In this trial that would amount to 12,000 pages of printed text.
Formatting	A Pages template “ePub Best Practices” was customised and adapted to USQ style. The use of ePub allowed the students to resize and reflow the documents.
Use of images and tables	Larger tables and images did not always display correctly on the e-readers. This may be a limitation of the device and Pages output. Images were resized and, screen grabs of the tables were taken from the original PDF and embedded into the tables.

Challenges experienced and early successes

In using Pages most content was relatively easy to convert into ePub format, however a number of technical challenges were experienced and solutions sought.

- Some materials e.g. Learning Activities materials required extra mark up (such as a Horizontal Line) to distinguish them from the main body copy. This is due to the homogenous nature of ePub and whilst this advantageous in terms of allowing the reader to reformat and reflow the content to meet their own preferences, some control over how specialised content is formatted is lost.
- Direct conversion to ePub from Open Document formats (ODT) proved impossible. The solution was to convert materials to Rich Text Format first.
- Some text sizing was inconsistent following conversion and required a manual sweep of the document to fix. A better solution is to check the HTML markup in the ePub against the corresponding style sheet using a tool such as Sigil, although this wasn’t done in this project due to the lack of appropriate expertise of the person converting the materials.
- Readings were initially intended to be in a single large ePub file. However, the Pages software became slow and unstable due to the sheer size of the file and files were broken up into individual ePubs. The final checking of materials is time consuming and any future work needs to look for efficiencies. It is anticipated that as conversion software matures this process will be a lot easier.

Early feedback from pilot participants has indicated that the e-readers have contributed significantly to increasing satisfaction with learning and accessibility of course materials. Students received initial training and support from prison education officers in the use of the devices and the learning curve and time required to adjust to the device was less than anticipated. Initial feedback from incarcerated students is that the e-readers provide access to learning materials during times of lock down and are convenient to use for study. The e-readers have also had the added benefit of introducing long term incarcerated students to mobile technology devices.

Conclusion

Initial indications suggest that course readings made available in ePub format on e-readers to students will assist in overcoming some of the challenges experienced by students without internet access. E-readers preloaded with course materials and additional learning resources can be posted to students without internet access at minimal costs and is more cost-effective than posting large quantities of printed materials. E-readers can also be preloaded with a larger number of additional resources such as dictionaries, including multilingual dictionaries and open educational resources. More advanced e-readers even allow the inclusion of audio and video resources. Within correctional centres, e-readers are a viable alternative to expensive textbooks that are often a barrier to participation in HE and also assist in overcoming the restrictions on physical space available for textbooks in cells. A number of challenges need to be overcome before the use of e-readers is sustainable. These include the availability of readings and journal articles in more user friendly formats such as rich text or html and the development of dedicated software and automated workflows to enable bulk conversion of documents to ePub format. Copyright considerations are the greatest obstacle to the success of these initiatives due to the restrictions imposed by publishing houses regarding the formatting changes that may be required for effective conversion to ePub or lack of permission for conversion altogether.

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Sustainable learning through formative online assessment: using quizzes to maintain engagement

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Due to pressure to deliver more Chartered Accountants, the pass-rate of first-year accounting students had to increase. Students who did not take accounting at school particularly needed extra tuition and support to reach the required standard. Poor success rates could be attributed to insufficient theoretical learning and poor time management characterized by cramming before tests. The intervention that aimed to redress those problems was weekly online quizzes that students could complete in their own time that contained feedback and easily understood explanations. In order to create and sustain an adequate database of suitable questions, the tutors who facilitated additional work sessions and understood the pitfalls in the theory, helped the lecturers to compile the questions and participated in quality control. Quizzes and feedback helped students to pace themselves, understand the terms and prepare for tests. The pass-rate increased from 57 to 75%.

Keywords: Financial Accounting, online quizzes, feedback, tutors

Introduction

Universities have a dual role in serving their communities: in the first place to produce knowledgeable adults who are flexible life-long learners, who can solve problems that do not yet exist, as well as very specifically trained professionals who meet the standards and ethics of their profession and serve a well-defined niche in the economy. Chartered accountants (CA) fall also into both categories. The University of Pretoria is under enormous pressure to meet their target of delivering a certain number of qualified students to this profession, irrespective of the quality of the first-year intake. At the same time, demand for chartered accountants increased and started to exceed the supply, while the professional body determined and maintained the standards and curriculum. Students were also entering university without adequate preparation. Recently the school curriculum has changed to outcomes-based education contributing the first group of scholars to tertiary education in 2010. One of the main objectives of the new school curriculum was to focus more on skills such as group-work and less on subject content. Numbers of matriculants who met the selection criteria of subjects and performance level to meet the demand, were dwindling. This university decided to allow students with enough credits into the CA stream, even if they did not take accounting at school and increase the student throughput.

The research questions for this paper are the following: Can online quizzes effectively stimulate engagement of students to study a theoretical subject? The second question is: Do students benefit from doing online quizzes in their own time?

Literature

Dewey (1938) criticizes traditional education for lacking in holistic understanding of students and designing curricula overly focused on content rather than context. If this approach is taken too far, students have inflated self-confidence that is not based on real abilities and knowledge of the subject. There is ample evidence that students master material ineffectively if they do not receive any guidance. “Instructional approaches that place a strong emphasis on guidance of the student learning process” (Kirschner, Sweller, & Clark, 2006, p. 75) are believed to be superior in preparing students towards acquiring sufficient prior knowledge to pace their own learning. While students perform best in situations where they are tutored individually, this is not feasible in very large classes.

Human individual tutoring is both the most effective and most expensive way of improving student learning, making it unsustainable when resources are limited. Bloom (1984) found that mastery learning in a class allowed students to learn the material as well or better than the individually tutored students when they received the same instruction as a standard class, followed by formative tests with feedback and corrective procedures. He showed a 2 sigma improvement in learning over a standard class who did not do the mastery learning (Bloom, 1984). According to Frick (2008), students value tutored classes to the extent that they derived benefits from them. The different roles of tutors are consistent with Schmidt & Moust (2000) who propose that the goal of a tutor is to encourage critical thinking, help the students to organise their knowledge, clarify any misunderstandings and explain difficult concepts, providing quality and sustainability in the support of the learning process.

Using LMS-based discussions to provide a first line of communication between students and tutors, makes better use of the scarce resource of personal tutors. Online discussions can provide a platform for higher-order thinking, if the right leading questions are posed and suitable facilitation accompanies the discussion (Bhagyavati, Kurkovsky, & Whitehead, 2005; Meyer, 2003). The greatest limitation to using online discussions in large classes is time, both from a student perspective, if they have many other subjects to tend to, and facilitator capacity, having to fulfill the roles of social and pedagogical facilitator, manager, and technical specialist (Liu, Lee, Bonk, Su, & Magjuka, 2005). Class sizes can be prohibitive, as the ideal facilitated online groups is somewhere between 12 and 30 (Arbaugh & Benbunan-Finch, 2005; Orellana, 2006; Tomei, 2006). The larger a facilitated group becomes, the less engaged students become as they do not feel they have a voice (Roberts & Lowry, 2006). Online discussions are therefore unsustainable when resources are insufficient, or classes to big.

It is important that newly acquired data should be transformed into retrievable knowledge that is stored in long-term memory through rehearsal, retrieval and metacognitive monitoring. Metacognitive skills are responsible for setting learning goals, determining learning strategies, monitoring progress, and making adjustments as needed. Due to poor school instruction (Spaull, 2012), many South African students have been taught erroneous concepts and are unaware of their own misconceptions. Learners with poor metacognitive skills, who do not know what they do not know, profit from support in monitoring their learning. (Clark & Harrelson, 2002). For example, frequent skills tests to assess knowledge help these learners spot topics that require additional study (Clark & Harrelson, 2002). Diagnostic assessments early in a course also show students whether their knowledge and study efforts are sufficient, providing timely warnings to adjust their learning strategies (Campbell, 2006). Online quizzes with automated feedback provide students the means to perform better than they would on their own (Corbett, 2001). When classes are too large for using one on one tutoring or even facilitated discussions to pinpoint and correct knowledge gaps, online quizzes might fulfill the same function in a way that is more sustainable towards the future.

Context

Who are the students

Financial Accounting is one of the four core subjects in the studies for Chartered Accountancy (CA), a highly challenging, but rewarding course for which students are selected on merit of school grades. Proficient students, who obtained more than 60% for accounting at school, were eligible to enroll for the mainstream accounting subject FRK 100 in the CA stream. According to Thijs, van der Vlier & Zaaiman (2003) the validity of matric results can influence the effective selection of suitable candidates for higher education institutions. Teaching standards at the majority of South African schools are deteriorating, as only 38% of children who started school in 2000 passed matric in 2011, largely due to not acquiring foundation skills at school (Spaull, 2012). Students were therefore becoming less prepared for University study.

Over the years it also became evident that some students who were allowed into the CA stream on the basis of good school grades, were often not equipped to pass financial accounting. In order to identify more accurately the students who were at risk, the Department of Financial Accounting implemented a proficiency test at the beginning of 2012. All students who had passed accounting at school with an average of more than 60% had to write a very basic accounting proficiency test. This “screening” process categorised the students on the basis of their *actual* abilities.

The University of Pretoria is currently the only institution in this country that allowed students into the CA program without taking accounting at school. In 2001 it instituted FRK 101, a special course in accounting that offered supplemental instruction to students who did not attain 60% for accounting, but otherwise qualified for selection, as well as those with merit that did not take accounting at school. Students who did not get the required marks in the proficiency test from 2012 on were also encouraged to transfer to FRK 101.The number of students increased steadily from 75 in 2006 to 132 in 2012 (figure 1). These students needed individual attention and additional help as they had to cover both the basic school accounting curriculum as well as the standard first year curriculum in one year. This differs from bridging programs in other faculties, like Engineering, where students could spread the first years of their studies over an additional year.

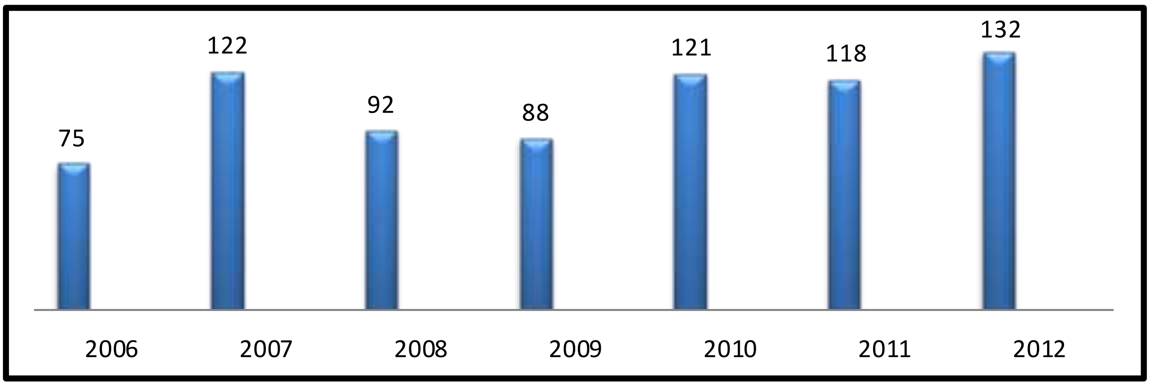

Figure 1: Number of students enrolled for FRK101 over 7 years

When throughput rates in first-year courses came under scrutiny in 2009, financial accounting was identified as a High Impact Module (HIM) due to high student numbers and a pass rate of less than 70%. The department therefore launched a project at the end of 2010 to improve the performance of the students. The project included focus group interviews with students stratified according to their semester marks, to shed light on their poor performance. The reasons mentioned most often were: underestimation of the amount of work, their inability to plan their time, underestimation of the importance of the subject for continuing to the second year of study (a pass grade was required for accounting), poor understanding of the importance of this subject in the overall qualification, and not studying the theory before attempting problems, as well as poor metacognition (Nagel & Oberholster, 2011).

Based on the findings of the focus group interviews a number of interventions were proposed for implementation in 2011 (Nagel & Oberholster, 2011, p. 382), namely

- a clickable mind-map of all the courses in the 4 years of study, explaining how they articulate horizontally and with the next academic level
- a scrolling banner and pop-up windows reminding students to study their theory before attempting problem-solving
- online glossaries of terms explaining subject terminology in lay language
- a weekly multiple choice test with explanatory feed-back
- an Accounting board game (not discussed in this paper).

The first three interventions were implemented immediately in the LMS for the benefit of all the CA students and required only maintenance thereafter. The latter two initiatives were earmarked for piloting in FRK101 (no accounting at school) during 2011, as their group was smaller and more manageable than the other group.

Teaching and learning

When the students were asked in the interviews in 2010 whether they would prefer to spread the workload of the first year over an additional academic year, they rejected it as a solution, as the total course already took so many years. They preferred a concentrated approach that was subsequently introduced. In order to cover both the school curriculum and catch up with the mainstream students, the FRK101 students had 12 lectures per week during the first quarter and 8 lectures per week during the second, third and fourth quarter, whereas mainstream students had only 4 lectures per week throughout the year. In addition they had 2 work sessions (tutor classes) of 2 hours each per week that was a problem-based discussion session. Much of the extra work was limited to the first semester. The FRK 101 students took the same formal tests as the mainstream students and wrote an additional 16 class tests during the year.

The board game required much time and effort during the first quarter of the academic year, and although it was perceived as very beneficial by the students, it will need streamlining to improve its sustainability before it can be rolled out for the mainstream class, and is therefore beyond the scope of this paper.

Compiling and implementing the quizzes

In this paper we focus on the multiple choice tests (quizzes) with the feedback that were initially rolled out in 2011for the hundred and thirty-two FRK 101 students, who faced the greatest learning challenge. The ongoing quizzes were aimed at sustaining students' engagement with the learning content, forced them to study the theory on time and to keep up with the pace of the course. Each of the 17 quizzes contained 5 randomly allocated questions with randomized options addressing the current week's theoretical classes, had to be completed in 10 minutes and was available for a period of six days. The quiz was selectively released only to FRK 101 students who received two attempts which they could complete at a computer of their own choice, whether on campus or elsewhere. The highest grade of two attempts was captured in the LMS grade centre, and the average of the quizzes would contribute 20% of the semester mark which also included class tests and formal tests.

The challenges regarding the creation of the questions were to have adequate numbers of high quality and relevant questions; to identify concepts that the first-year students had trouble understanding and to include questions that reflected the newest legislation. The last aspect was the lecturers' responsibility. Each test was compiled in two languages. The goal of the quizzes was to be a learning exercise for the student through the explanatory feedback associated with each question that elevated the quizzes to an important learning event. Feedback mostly contained clear explanations of the correct answer and the key concepts, or explained formulas for calculated questions. Care was taken to identify the "catch" in each question. The feedback was aimed at the majority of students because it was formulated in easy to understand language at the level of the students, did not repeat the textbook or the class notes, and would help those who did not know sufficient subject terminology. Lecturers did not have the time to compile such extensive questions; therefore the help of tutors were enlisted.

Tutors were selected from the previous year's FRK 101 class, and their prime task was to facilitate the twice-weekly work sessions. During these work sessions/tutor classes the tutors engaged in problem-based learning. They presented a problem that initiated the learning process, followed by discussion in a group of 15 - 25 students. The students came to the work session with only the knowledge that they obtained during formal lectures, while the tutors had a thorough preparation. At the beginning of the year the selected tutors received extensive training in how to set high quality valid questions and feedback. The tutors remembered which concepts were difficult for them and were up to date with the current first-year content through the work sessions, and knew which sections of the work were problematic. Being mostly second-language English speakers, they shared the linguistic challenges of the majority of the students. Tutors whose first language was Afrikaans were bilingual and translated the English questions into Afrikaans. Before each quiz opened for the students, the question bank on the topic was uploaded into a training course on the LMS (WebCT Vista in 2011) where the tutors and the lecturer had to answer all questions. After checking on the question statistics, overly difficult or ambiguous questions and feedback on which consensus was not reached, where corrected, after which the adapted question bank was exported to the student course. When some enterprising tutors used commercial questions obtained from textbook question banks, it was very difficult to match them with the current week's topic and their feedback did not meet the criteria, hence they were not used again. Tutors were therefore an excellent and sustainable source of valid questions.

Quizzes not only encouraged students to revisit notes before writing, teaching also improved due to the question statistics that were drawn from the LMS. The quality control before the students took the quizzes minimised mistakes and poorly formulated questions. When students consistently chose a wrong option in a question it rather indicated poor understanding, misconceptions, or unclear instruction, all of which could easily and quickly be remedied in class, instead of having to wait months for results of a semester test. Salient questions could be included in revision tests at a later stage to monitor the improvement in understanding.

Methodology

We followed a development research approach (Reeves, 2003), as the problem was ill-defined and needed a holistic approach towards improving the educational situation in a case study consisting of a first-year Accounting course. Numerous interventions were proposed to address specific aspects of the problem, which were then evaluated and refined, before further interventions were implemented. In 2010 we conducted focus group interviews with a total of 58 purposely selected students and after analyzing the data, interviewed the lecturers on plausible innovations. We also investigated the quizzes in the LMS in 2011 and obtained the grades of the students who participated in the 17 quizzes and the semester and final examinations over three evaluation periods. In this paper we report on how 91 of the 118 FRK101 students experienced the online quizzes in 2011 as captured by a survey with objective and open-ended questions in the LMS. The objective items consisted of statements with 3 options ranging from affirmative, somewhat affirmative and negative, depending on the question wording. Quantitative feedback of 26 of the students who repeated the course were separated from and compared to those of the 65 first-time first-year students. The differences were analyzed using SPSS, and Pearson's R values and Chi square were calculated. We present only results of questions where highly significant results were obtained.

Findings and discussion

The suitability of using online quizzes was confirmed when students indicated that they all have access to computers to take the quizzes, and nobody said it is too much trouble, even in the light that they already had many more sessions and assessments than the mainstream students.

The initial interviews indicated that students underestimated the importance of studying the theory in financial accounting, a problem that was then addressed on several fronts (Nagel & Oberholster, 2011). According to Frick (2008) the new National Curriculum Statement for schools (grades10 - 12) places the emphasis on developing certain skills rather than focusing on content knowledge. Students were thus not used to studying, understanding and applying the theory, which forms the basis of accounting. It also became apparent that the students struggled to keep up to date with the work and they found the volume of work daunting. The quizzes were introduced to FRK 101 (students who did not take accounting at school) in 2011 to address these problems. The feedback from the students regarding the quizzes were overwhelmingly positive, with the exception of about 6% of the respondents, they indicated affirmatively that

- they studied the theory before the first or second quiz attempt
- they benefitted from the quizzes and the immediate feedback on each question
- quizzes and feedback helped them to learn for this subject and
- quizzes confirmed how well they understood the work
- they regarded the scope for every week's quiz as suitable (not too much or too little work), as the test covered a limited section corresponding to a topic that was completed before the next one was started. This helped students to manage the large volume of work required for semester tests.

These results showed that, except for a small group of students, practically everybody found the quizzes beneficial. The results show that the quizzes do address the two main problems that students face, namely realizing the importance of theory and learning to manage the large volume of work. In order to gauge the benefit of the quizzes to different profiles of students, we separated the responses of students who repeated the course (26) from those who were first-time first- year students (65). The repeaters was a valid "control" as they had not experienced the quizzes or any of the other learning innovations before. Dividing the data thus exposed three patterns: for some questions, there was no difference in responses between the two groups, while for some questions there were significant differences, some aspects of the quizzes reportedly being more beneficial to one group, while others benefitted the other group more.

For the question regarding the scope of the work covered by the quizzes, the responses were similar in the two groups, with about 92 % of both groups finding it suitable. This was important, as previously students only studied large chunks of work for semester tests that were spaced far apart, and the previous year's unsuccessful students indicated in the interviews that they could not master such vast amounts of work. On the question about the spacing of the tests, 70% of both groups thought that the spacing of the quizzes was suitable, while 30% would have preferred them to be further apart.

One of the core issues in the course had been their lack of studying theory, and students being unable to catch up after the first semester test when they realized the importance thereof (Nagel & Oberholster, 2011). The feedback on the quizzes indicated that both repeaters as first-time students now studied theory for the quizzes after they have been bombarded with slogans to study theory before attempting problems. There was no difference in the distribution of how diligently they studied. Of the repeaters, 46% *usually* studied the theory, while another 46% *sometimes* studied theory. The non-repeating students indicated that 48% usually and 44 sometimes studied theory. Likewise there were no significant differences in the pattern of studying theory before a second attempt at the quiz. Significantly more of the students who studied the subject for the first time

(86%), wished to have a second chance to complete each quiz, compared to the repeaters' 76%. Even though the quizzes contributed only 20% to their semester mark, this might indicate that the first-time first-years aimed at higher grades than the repeaters. The class average grade for the 17 quizzes was 61%, which was higher than any of the averages for the written tests. Considering that they had two attempts at a quiz on each subject, and they could consult any supportive documentation as they wished, the quizzes were still challenging, but provided an opportunity to perform quite well. This was less so in the written tests, as FRK101 wrote the same tests as the students who had accounting at school and were at a distinct disadvantage up to the final examination. As quizzes provided about 10% of the final mark, where students performed about 20% better than in written tests, it was not enough to account for the nearly 20% improvement in pass rate in the class who wrote the quizzes.

Highly significant was the perception of 81% of the repeaters who *generally* found the quizzes useful while only 64% of the first-time students found them *generally* useful, and 32% found them *sometimes* useful. This was an important finding, as the quizzes were aimed at students who were at risk of failing, and the repeating students could compare the quizzes' usefulness with what they experienced the previous year when they could not pass the subject. Judged by the student opinion, the quizzes as intervention were on target to support at-risk students.

Students also had divergent perceptions of the usefulness of the feedback, with 84% of the repeaters and 69% of non-repeaters finding the feedback *generally* useful, and 29% of non-repeaters only *sometimes* finding it useful. This is likewise an important finding, showing that the feedback that is aimed at the less successful students, is perceived as important by them. The two groups studied feedback with similar frequency.

When asked to rate whether the quizzes helped them to prepare for formal tests, 38% of repeaters replied affirmatively and 38% reckoned that it helped *somewhat*. Quizzes *generally* helped 50% of the non-repeaters and *somewhat* helped 33% in preparing for tests. From these findings, it seemed that the first-time students were unsure about what kind of questions to expect in tests, and the quizzes ameliorated their anxiety, whereas the repeaters who had previously written the formal tests and exams, were less reliant on quizzes to prepare them for this aspect of assessment.

Qualitative analysis of the open-ended responses to the surveys, confirmed the findings of the survey items. In addition, students requested to have more questions in the quizzes, or have them more frequently, like twice weekly. Requests from a number of students at the end of the year for more challenging questions indicated that the standard of those students had increased to a level where they were not merely concerned about passing the subject, but really wished to improve their grades further. Another request was to include more calculation-type questions. These findings were heartening, as these students already took many more class tests than the mainstream students, and nevertheless valued the online quizzes so highly, as to request more.

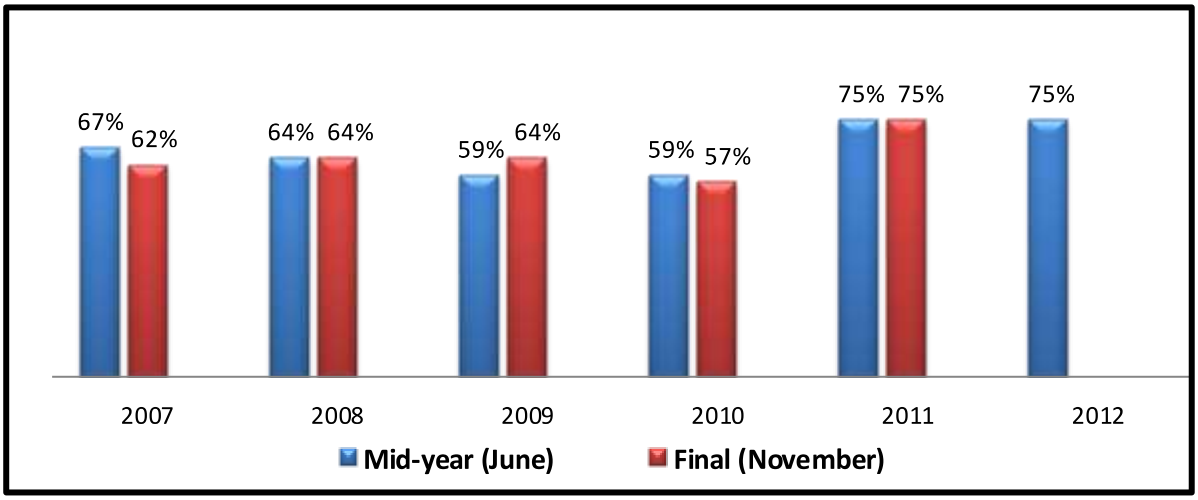

Figure 2: Pass rates of students without accounting at school

Students' self-reported opinions of the usefulness of an intervention could not be taken as only proof that the objective of improving a low pass-rate was attained. Figure 2 shows the mid-year or semester mark as well as the final mark of this class over five complete years and the first semester of 2012. It is evident that there was a highly significant improvement in pass rate after the implementation of the online quizzes in 2011. Preliminary grades from 2012 confirmed that the present students are likewise benefitting from the interventions. From the pass rates shown in figure 2, it is evident that students who did not have accounting at school, were in a good position to pass Financial Accounting in the chartered accounting stream, and the University could expect a 75% pass rate from this course. The subject should not be classified as a high impact module after the current year.

Conclusions

This paper showed how an integrated and responsive approach utilizing simple online quizzes in an LMS can improve first-year students' engagement with the theoretical side of accounting, leading to improved outcomes. Students who did not take accounting at school were at a grave disadvantage when they enrolled for financial accounting in the chartered accounting stream. Interviews with unsuccessful students revealed that the students underestimated the importance of studying theory, in part due to outcomes-based school education that focused less on mastering content. Students also had poor study habits that consisted of cramming large amounts of work just before tests. The effect of these habits was that they could not master such huge volumes of work simultaneously. As intervention, the department instituted informal online tests that paced the students and encouraged them to study the theory before attempting to solve problems..

Feedback from the students at the end of 2011 showed that students found the quizzes appropriate in frequency (weekly) and scope (covering the current week's work). In contrast to the previous year, practically all students reported that they studied their theory before attempting the quizzes, even before a second attempt, which was also highly valued. The students who had failed the subject the previous year found the concomitant feedback that explained the concepts behind the questions in easy terms, of more benefit than the first-time students did. More of the repeaters also felt the quizzes helped them to master the work than the others. The high value the quizzes had for the repeating students, (who did not have such quizzes during their first attempt at this subject), showed that the quizzes specifically benefited students who were at risk of failing, while more than 90% of all students benefited to some extent. The first-time first-year students particularly found the quizzes beneficial to prepare them for writing formal tests. We can conclude that students across the board benefited from the quizzes, not only to pass the subject, but to increase their grades, a finding that was confirmed by open-ended responses wherein students requested greater numbers of and more challenging questions.

The benefit of the quizzes was evident in the increased pass-rate of the group who did not have accounting at school from 57% to 75%. The sustainability of the improvement is seen in the following year's half-year mark that promises a similar pass rate. It is further seen in the up-scaling of the quizzes from a class of 118 in 2011 to the whole CA stream consisting of 581 students. Increasing the database, updating of questions to reflect changing legislation and controlling quality is totally sustainable, as the tutors are a readily available resource doing an admirable task. The nature of the formative assessment that provided feedback enabled many more students who were at a great disadvantage, to catch up with a challenging subject and complete it successfully.

Based on the success of this intervention, the question database is currently being expanded and students in the mainstream accounting course are also writing weekly online quizzes. There are also plans to extend the quizzes to the (more than 2000) students in the commercial stream of Bachelor of Commerce in an attempt to increase their engagement with the subject and improve their success rate. The intervention was sustainable as it made optimal use of the limited people-power in the form of tutors, tapping into their own experience as students and facilitators. Sustained engagement prepared students also for the future as life-long learners.

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Engaging students in writing: online blogs versus conventional paper – insights and considerations

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This research paper explores the difference between conventional composition writing and writing of composition on online blogs by 224, 6 classes of Grade 5 students in an elementary-level future school in Singapore. Students in this study are savvy information communication technology (ICT) users who have been exposed to one-to-one computing since Grade 1. A total of 4 written assignments were given to the students – two conventional paper and pencil and two online blogs written assignments. No significant difference was found in students' scores on the four written assignments and their penmanship. The submission rate for the conventional paper and pencil composition written assignments was 93.75% as compared to 75% for the online blogs entries. Although interviews with teachers seem to suggest that the ICT mode could facilitate the learning of higher-order type of learning, the significantly lower submission rate for the online blogs is of concern and interest.

Keywords: English writing, blogs, one-to-one computing

Background

This research study is situated in one of the three elementary-level future school in Singapore. The school adopts a one-to-one computing learning environment for its students from Grade 1. School supplies the computing devices for Grade 1 to 3 and students procure and have their own computing devices from Grade 4 onwards. The school's mission is to nurture and inspire its students to the best of their potential through innovative approaches in an engaging environment, leveraging on technologies and research.

Purpose

The main purpose of this research study is to look into the quality of students' writing in conventional paper and pencil mode and online medium. This study also looks into the quality of students' handwriting to ascertain whether students' penmanship would be significantly altered after prolong exposure and usage of computing devices.

The study resulted from a series of professional discussions based on simple anecdotal observations by the English Language teachers of the classes concerned that their pupils were writing freely, without inhibitions, and with greater pride when using their class blogs. The team of teachers decided to investigate if these observations were valid and could be supported by data. A working team comprising the head of information communication technology (ICT) and research, one of the ICT champions in the English department and the Primary 5 English language teachers was formed to discuss and conceptualise the plan for a study on pupils' writing habits, both on paper and the online blogs. It was decided that the team would ride on the expository text types that pupils had already been exposed to in Term 1 of 2012 and four journal topics would be explored. The ICT champion put together a simple work plan, which included the time line for the various assignments and some resources to trigger the class discussions for the topics identified. The English Language teachers then discussed the implementation plan before embarking on the project. The entire process lasted about 10 weeks; about 2 weeks for the initial discussion and conceptualisation, about 4 weeks for the implementation of the assignments and about 4 weeks for the evaluation and data processing.

Literature Review

Blogs are online personal journals which allow regular updating to take place. They share a common theme and content can be posted by one or more authors. Readers are given the choice to comment on the posts, promoting exchange of ideas between users. Besides its convenience and usage as open source, the outreach of blogs extends beyond physical interactions and provides opportunities to publish immediately. They are especially useful in language classes (Campbell, 2004; Grewling, 2004). Blogs can potentially bring, such as skills of communicating, sharing, analysing, reflecting and writing. Many other research studies have reported positive and encouraging findings on blogs and language learning (Boiling, 2008; Holliway & McCutchen, 2004; Izquierdo & Reyes, 2009; Merchant, 2005; Torrance, 2007).

Context

The whole cohort of 224 Grade 5 students from 6 classes took part in this research study. The classes were streamed according to their general academic abilities with the students' Grade 4 end-of-year assessments, inclusive of English, mathematics, science and their mother tongue language (i.e., Chinese, Malay and Tamil). 5-1 having students from the highest academic abilities and 5-6, the least. These 6 classes were taught by 4 different English language teachers.

The students were all given four written assignments with similar genre (i.e., argumentative type), two conventional paper and pencil ones and two that required them to write on blogs provided by the school. Each assignment was introduced through a simple class discussion of the topic which allowed the pupils to understand the various issues and implications of the subject matter. Pupils explored topics such as should smoking be totally banned, is it our responsibility to protect marine life, will our Mother Tongue languages (i.e., Chinese, Malay and Tamil) eventually die and if schools were the only places to learn. These topics were selected as they provided the context for the pupils to practise expository writing skills, a skill that they have been working on from the beginning of the term through their main English language curriculum, and were age-appropriate for the pupils. Choice of topics for the pen and paper assignments and the online blog assignments were random selections by the teachers. The topics on smoking and learning in schools were done on paper whereas those on marine life and mother tongue languages were done online. After the class based discussions, pupils were tasked to write their views either on paper or on the class blog. Each written assignment had to be completed within 30 minutes. Pupils could do any appropriate research or planning required, to organise and present their views, with supporting evidence, within the 30 minutes allocated for the task. The assignments were then graded by the teacher who taught the class according to a set of rubrics designed by the teachers. The rubrics included 3 main descriptor classifications-the issues, facts and content – with 5 marks for each category and a total of 15 marks.

This cohort of students had outperformed their counterparts in the country according to the University of New South Wales ICT skills assessment in both 2011 and 2012 and the differences were found to be statistically significant with the following statistics respectively: t (213) = 5.024, $p < 0.05$ and t (216) = 2.301, $p < 0.05$.

Preliminary Findings

Students' performance for the written assignments

The mean scores of the four writing assignments are presented in Table 1. Mean score for writing assignment 1 and 4 were done in conventional paper and pencil mode and the respective mean scores were 7.510 and 7.406. For writing assignments 2 and 3, they were done via blog postings and the mean scores were 7.224 and 7.748, respectively (see Table 1 for details).

A one-way repeated measures analysis of variance (ANOVA) was used to compare the 143 Grade 5 students who had submitted all four of their writing or journal assignments. $F_{max} = 1.542$, demonstrating homogeneity of variance and Mauchly's test indicated that the assumption of sphericity was not violated, Mauchly's W = 0.983, $p = 0.798$. The ANOVA results show that the students' scores differed among the four written assignments – two paper-based and two online blog-based, F (3, 426) = 3.296, $p = 0.020$, partial $\eta^2 = 0.023$. Pairwise comparison revealed that students' scores for writing assignment 2 – online blog-based (M = 7.224, SD = 2.749) differed significantly from assignment 3 – online blog-based (M = 7.748, SD = 2.896). No other statistical significant differences were found with the other writing assignments. The paper-based and online blog-based assignments students' scores did not differ significantly.

Submission rate of the assignments

Of the 224 students, 143 of them submitted all the four assignments, with 81 who had not submitted at least one of the assignments. For the conventional paper and pencil assignments 1 and 4, a total of 20 students did not submit their writing assignment 1 and nine did not submit assignment 4. In comparison, for the online blog writing assignments, 66 students did not submit assignment 2 and 46 students did not submit assignment 4. Table 2 shows the details of students who did not submit their writing assignments according to class and teacher. The chi-square statistics of χ^2 (3, N = 141) = 56.248, p = 0.00. As an index of effect size, Cohen's w was 0.632, which can be considered as large; suggesting that the non-submission rates amongst the four assignments vary significantly.

Conclusion

This research study aims to explore the quality of writing assignments via the conventional paper and pencil and online blogging modes. Although no significant difference was found in the quality between the conventional and online modes in the students' writing assignments, the study reveals an interesting phenomenon that is associated with online teaching and learning – lower assignment submission rates as compared to the conventional ones. In the follow up to this study, a more in-depth analysis of the interviews with the teachers and interviews with students from the various classes could reveal deeper insights into this phenomenon.

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Taming the devil: A game-based approach to teaching immunology

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Immunology is a complex field requiring rapid memorisation of numerous components. An in-depth understanding of cellular and molecular biology is required before even moderately advanced concepts can be taught. We sought methods that actively engage students and help develop new knowledge and consolidate existing concepts to support lectures. We created an interactive and entertaining prototype immunology computer game as a tool for learning and revision, with the ability to interactively cover course content outside of class that modern learners expect. Our prototype appears to be a successful study aid when used additionally to attendance at lectures. We seek to continue the development of the game in a higher education context, but also produce a modified version for a secondary school context, in an effort to raise the profile of this key health area and promote learning for the future through the study of the sciences prior to students entering higher education.

Keywords: immunology, computer game, educational gaming, serious gaming

Introduction

Computer games have made a significant cultural, social, economic, political, and technological impact on society and are no longer used simply to entertain (Newman, 2004; Kapp, 2012). Computer game-based learning strategies are a useful tool in primary, secondary and tertiary-level education (Begg & Dewhurst, 2005). In 2001, the Federation of American Scientists (FAS) began gathering research about how technology could be used to transform education. Such technology is useful in complex, high content curricula that are difficult to grasp for a variety of legitimate reasons (FAS 2009). Effective learning and teaching systems that engage next-generation scientists often include an element of computer gaming. Such systems include pedagogy and instructional design, building physically correct interactive simulations, dialogue and question management, learner modeling, and tools for assembling and constructing learning systems from these components. The current literature indicates that learning through game-based approaches results in higher rates of knowledge retention and comprehension as opposed to the traditional paper-based pedagogues (Ke, 2009; Sitzmann, 2011).

The inherent difficulties in the study of immunology have been encompassed by Tanne (1990) with her quote:

> Immunology is an invention of the devil, who is making it up as he goes along because he's not too clear about this stuff either.

The immune system is a collective process of cellular and molecular interactions within an organism to protect it itself against negative outcomes. It is an essential element of many human body-associated studies including medicine, physiotherapy and alternative therapies. New terminology, interactions and reactions, systemic relationships and staged approaches for complex cellular insults (autoimmune diseases, pathogenic organisms etc) complicate mastering the concepts of immunology (study of immune system).

In 2004, secondary school teachers in the United States expressed a desire for assistance with teaching strategies specific for immunology curriculum. In 2004, The Federation of American Scientists lead a collaboration with immunologists (scientists studying immunology) and graphic art experts to design a computer video game to address this missing literature in learning and teaching for the future. The FAS (2009) developed program, Immune Attack™ has subsequently been downloaded by 9000 secondary school educators and has moved into an evaluation phase: measuring the impact and effectiveness of the game in controlled school environments.

Although there are divergent streams of game learning (game-based versus game-informed), the key is to ensure that learning remains fun and is an effective tool in helping students understand new sets of skills and knowledge that are applicable in related disciplines (anatomy, physiology, infectious disease etc)(Begg & Dewhurst, 2005). Game-informed learning places the participant not only at the decision making level, but also reinforces strategies, concepts and interactions within the context of the curriculum. Medical students are regularly exposed to such interactive programs that focus on curricula (simple game role-play) but also disease simulation (complex game role-play), which requires pertinent and correct decision-making skills to collectively meet the desired learning objectives (Kato, 2010).

Research goal

The aim of this research was to develop a computer game to teach immunology concepts and facts to students in an integrated fashion by incorporating theory, stimulating visuals and a hands-on approach. Our approach should promote learning for the future both in its methods of delivery and by appealing to a large student audience, being based around easily recognizable components which are fundamentally user friendly, yet achieve the desired learning outcomes.

Game prototype design and implementation

The prototype game that we have developed consists of three sequential levels, each of which introduces several new immunological concepts. The division of the material between levels reflects the order in which these events occur during the immunological response to an infection occurring in the body, thereby reinforcing students' understanding of the chronology of these events. Each level involves interactive gameplay inspired by some fundamental aspects of the immunological system – this is augmented by further detail supplied by pop-up notes and animations that occur in response to key events in the game.

Level 1 (Figure 1) covers the role of neutrophils in the initial response to an infection. The level uses Pac-Man™ inspired gameplay, with the student controlling a neutrophil as it moves through a maze-like environment of epithelial cells, consuming pathogenic (disease-causing) bacteria. The level ends when the neutrophil itself dies after consuming a large number of bacteria.

Level 2 (Figure 1) is based on similar gameplay to the first level, but covers content related to macrophages. It introduces the concept of Natural Killer cells, and the role that they play in increasing the activity of other macrophages – this is introduced via text notes, and then emphasized through gameplay by increasing the speed of the player-controlled macrophage when it encounters a Natural Killer cell.

Level 3 (Figure 1) covers the concept of macrophage rolling, and macrophage binding with selectins and integrins. This level uses a different gameplay approach based around a pseudo-3D visualization of the bloodstream. The student must steer the macrophage towards particular molecules (selectins) in order to interact and slow its progress before stopping completely by binding to a different molecule (integrin). This must be done whilst avoiding red blood cells, contact with which disrupts these bonding interactions and interfere with the slowing process. This game ends when players successfully slow the macrophage to the point that it can escape from the bloodstream.

Figure 1: Neutrophil response maze structure, protagonist and enemies (left), and the 'macrophage rolling' game (right).

The game prototype was implemented using Adobe Flash software. This enabled the production of script and animation assets to be performed in parallel, thereby shortening the development lifecycle. In addition the cross-platform, widely-adopted nature of Flash and the ability to embed it within a website maximizes the potential range of situations in which the game can be accessed, thereby increasing the likelihood of its uptake.

Methodology

To test the effectiveness of the prototype computer game, the research team recruited volunteer subjects from a second year undergraduate course in Immunology. Students were given a lecture on the 'innate immune system' that covered topics contained within the computer game. This group of students was then randomly divided into 2 subpopulations – those who would engage in 30 minutes of private study (tutorial) from the textbook, and those who would have 30 minutes to play the computer game. To ascertain the baseline knowledge prior to private study and the computer game session, both groups were asked to fill in a basic survey of knowledge with a series of short answer format questions based on content from the lecture. This same basic survey was repeated immediately after the conclusion of the private study (tutorial) and computer game session. The course coordinator graded the survey responses and student performance was ranked based on total score. The research team also examined volunteer groups of students without previous biological education: one group of first year biomedical science students who had not studied immunology, and one group of computer science students with no background in tertiary biology. These cohorts were used to judge the effectiveness of teaching difficult immunological concepts to those with minimal or no biological science background as a preliminary step towards modifying the material for secondary school audiences. The study design is shown in Figure 2.

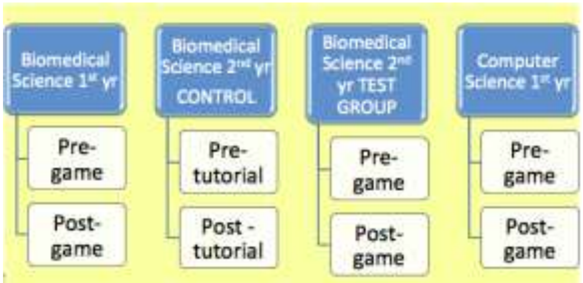

Figure 2: Study design flow chart

Discussion of findings

In the cohort of second year students studying immunology we observed equal increases in knowledge gained after playing the computer game as we did for private study (Figure 3). The increase in knowledge in each group was significantly greater than that obtained after lecture alone. We believe that this is an important finding as it provides statistical evidence for the effectiveness and further exploration for the efficient use and development of computer gaming in tertiary learning environments. It also indicates the ease in which carefully crafted and designed games-based learning tools can be incorporated into education to assist with tutorial and home-based supplementary study in an efficient manner (Ambrosio, 2012). The benefits that such an approach and extended learning environment can have to private learning could be immense as they provide a kinesthetic approach as well as the more traditional text-based and visual learning approaches, appealing to a wider variety of learners in an innovative way. Furthermore, we observed significant increases in knowledge in pre-game and post-game settings for the cohorts without the exposure to immunology lecture material. The capacity for the game to teach basic immunological principles to learners without a background in tertiary biological sciences is clear; this work paves the way for the introduction of the game into secondary schools to teach and promote the study of sciences at university.

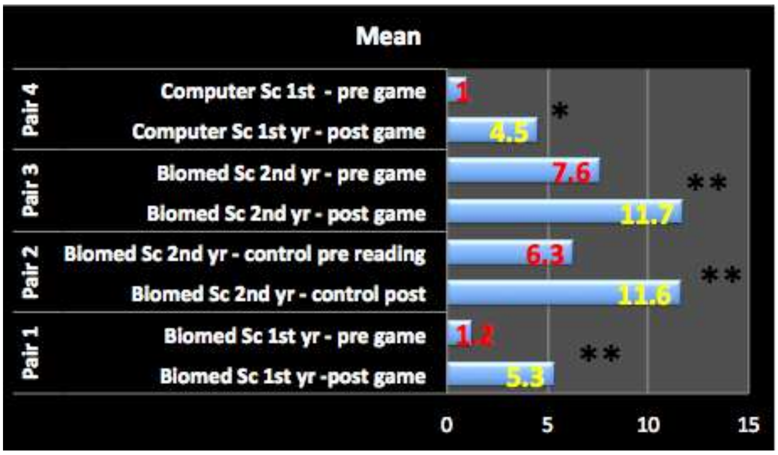

Figure 3: Mean student scores: pre-game and post-game scores (Pairs 1, 3 and 4), and control pre-reading and post-reading scores (Pair 2); * indicates significance at *p*<0.05, ** indicates significance at *p*<0.01.

Further dissection of the results revealed interesting correlations between the use of private study (tutorial) versus computer game learning style tools and their impact on test scores. There were very similar, strong correlations between the use of private study/computer game use and the improvement in test score evident in this study (Table 1). Conversely, only moderate correlations were observed between game use and improved test score in the computer science and 1st year biomedical science cohorts who lacked significant underlying biological knowledge. These correlations reinforce the notion that the use of the computer game in this study has contributed to improved test score, equivalent to the contribution of private study from the prescribed text-book.

Table 1: Correlation scores reflecting equivalent contribution of private study/computer game play to improved post-game test score

Cohort	Correlation
Biomedical Science 1st year	0.56
Computer science 1st year	0.44
Biomedical science 2nd year control group	0.90
Biomedical Science 2nd year game group	0.93

Limitations & conclusion

The key limitation in this study is a number of participants. We recognize the limited data obtained from the present study and consider this a pilot study for the future development of the game and research into its effectiveness. Population numbers in any given study group was not greater than 8 participants, and was just 5 participants for the targeted 2nd year undergraduate cohort. We will continue to research the effectiveness of the game as a study aid as new cohorts of students undertake the biomedical science program in an effort to boost the statistical significance of our findings. Despite these limitations we strongly advocate for the continual development, design and assessment of games-based approaches to teaching science related topics through all levels of education. We believe that innovative learning and teaching pedagogy approaches need to be relevant and add value to current student cohorts in an effort to build capacity learning opportunities in this health domain. With a national shortage of science-based healthcare professionals, educators need to be more innovative to attract potential secondary school leavers into this field and maintain their interest by further enhancing their learning capabilities within the higher education sector. A new era of learners should demand a blended new innovative approach to enhance the learning and teaching experiences for all future generations.

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Authentic learning and Web 2.0 – Completing the equation

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While new technologies are explored as a way of creating authentic learning environments for the learner, for example, creating simulations and web-quest, there is little research on the potential use and application of Web 2.0 tools and technologies in enhancing the learning process in an authentic environment. The participatory nature of Web 2.0 tools, amplified by portable mobile technologies, empowers users by enabling the ability to create, co-create, collaborate and communicate, and has the potential to bridge the gap between authentic learning activities and the learner's interaction with the surroundings (context), self (cognitive and meta-cognitive) and peers. This paper outlines the findings of a one-year-long project where authentic learning formed the underlining platform for learning and teaching in a Boat Building course (Certificate in Applied Technology, Level 4) where Web 2.0 tools and learner owned mobile devices were integrated to enhance the learning process.

Keywords: Authentic learning, Web 2.0, social constructivism, student-centred, pedagogy 2.0, portable mobile devices

Background

The Certificate in Applied Technology (Boat Building, Levels 3 and 4) courses at Unitec Institute of Technology were always taught within an authentic context. The authenticity of the tasks students completed and the context within which it happened were driven by two main student learning activities over two semesters. In this year-long course, the students build (i) a small dinghy in the first semester and (ii) a medium sized racing yacht in the second semester. While the authentic learning environment offered plenty of opportunity for learner-centred learning and teaching, the role of the lecturer and students in the process however proved to be the main obstacle in capitalising on the opportunities that arose.
The lecturer played the role of spoon-feeding the students at every step of the process with information and knowledge he thought was appropriate for his learners to have prior to starting any stage of boat construction. While the authentic learning environment was productive, the apparent "transfer of knowledge" model limited student ownership of boat building and their own learning.
The students in the course submitted a portfolio at the end of every semester that outlined the boat building techniques learnt, elements of teamwork and collaboration, and their weekly reflections. The students used a book to keep a log of the events that transpired during each day of the week. The lecturer assessed this logbook at the end of the semester and the peers in the class provided feedback on the collaborative aspect in the course by filling out a peer assessment form. An outline of the old marking schedule is available at: https://docs.google.com/document/d/1O-cpTCfPwwP16C7o0M5apyCntOxKAWwFKgKV6o7snOE/edit

Literature

> Authentic learning typically focuses on real-world, complex problems and their solutions, using role-playing exercises, problem-based activities, case studies, and participation in virtual communities of practice (Lombardi & Oblinger, 2007, p. 2).

In a teacher-centred environment, activities students undertake as a part of their learning are seen as a way to clarify and practice, with an assumption that if these activities are designed and structured well, effective learning will take place. They are designed to measure competence and to assess whether the student has gained the skills and content knowledge, or not (Reeves, Herrington, & Oliver, 2002). In a student-centred constructivist-learning environment, learning activities are designed to allow students to plan a project or task from start to finish. The course is not designed in a linear fashion, rather it is taught to students in small 'chunks' to 'give a purpose and meaning to the learning that will occur without predetermining and limiting the scope and sequence of the inquiry' (Reeves, et al., 2002, p. 563). Because the learner is taking charge of their own learning, the role of the teacher in providing feedback and guidance in the process is extremely important. Even more important is the collaboration between students to make the task achievable and engaging (A. Herrington & Herrington, 2007; J. Herrington, 2006; Reeves, et al., 2002). Herrington (2006) espouses that authentic learning is at the heart of situated learning (Lave & Wenger, 1991) and that it revolves around collaborative social learning thus making interaction between the learners a critical element in the process. Herrington (2006), in outlining the characteristics of authentic learning states,

> problems are set within an authentic and realistic context, they are ill- defined and complex, they require a significant investment of time and intellectual resources, problems require examination from multiple perspectives, they require collaboration and reflection, they are integrated with assessment, and supported by scaffolding (p. 5).

Web 2.0 is defined as:

> a second generation, or more personalised, communicative form of the world wide web that emphasises active participation, connectivity, collaboration, and sharing of knowledge and ideas among users (McLoughlin & Lee, 2007, p. 665).

According to Churchill (2005), 'technology amplifies our intellectual and physical capacity' (p. 347) and thus has the potential to support higher order learning. However, technology is being used to recreate the same pedagogical practices present in current classrooms that date back to the nineteenth century (J. Herrington & Kervin, 2007; McLoughlin & Lee, 2007). The transmission of content (using PowerPoint, PDF and Word files) to students is seen as effective practice for emerging technologies. Herrington (2006) states that rather than using new technologies as a medium to transfer content to the students, 'technologies can be used by students as intellectual partners, and as tools to analyze and interpret their understanding' (p. 219). While new technologies are explored as a way of creating authentic learning environments for the learner, for example, creating simulations and web-quest, there seems to be little research on the potential use and application of Web 2.0 tools in enhancing the learning process in an authentic environment (A. Herrington & Herrington, 2007). The participatory nature of Web 2.0 tools, means user empowerment such as the ability to create, collaborate and communicate has the potential to bridge the gap between the authentic learning activity and the learners' interaction with the surround (context), self (cognitive and meta-cognitive) and peers (Dunlap & Lowenthal, 2010). Vygotsky (1978, 1986) espoused the zone of proximal development (ZPD), where he outlined the development the learner can undergo by him/herself and further development is made possible by providing appropriate scaffolding by a person with higher expertise. In a collaborative environment augmented by Web 2.0 tools, the scaffolding in the ZPD can be provided by peers in class, the teacher, or any other expert from around the world (Borthick, Jones, & Wakai, 2003). Borthink and Co (2003) suggests that peers working collaboratively on a problem are able to create a higher level of intelligence in the process. The Web 2.0 tools can amplify the rate of interaction between the learners and thus the enhance exchange of ideas. In the process of exploring each others' ideas, exchanging tacit knowledge (know-how) and explicit (know-what) (Brown, 2006), and by comparing experiences and disputing the differences between them, the learners create higher levels of meaning and understanding that benefits the ZPD of all involved in the process (Borthick, et al., 2003; Hansen, Dirckinck-Holmfeld, Lewis, & Rigelj, 1999).

Design

The design of the project took into consideration the context in which the learning was already situated. The students over the duration of this one-year-long course were to build two boats. In the first semester, the task was to build a small dinghy and in the second semester a racing yacht. In other words, the learning was structured around students completing authentic learning tasks such as planning and building boats, and working in teams throughout the course, with access to experts in the field for advice and support. While the course itself and learning were underpinned by appropriate pedagogies, the learning process and facilitation however were embedded in traditional teaching practices, hence negating the benefits of authentic learning. The design of the project (Figure 1) aimed at shifting the facilitation towards learner-centred approaches through the use of learning technologies situated within the authentic learning tasks of building boats.

The researcher started a collaborative project with the lecturer teaching the course in the second semester of 2010. By negotiation, a Netbook computer was made a minimum course requirement; students were given a choice of buying any other device as long as it had a camera and was WiFi capable. The students who could not afford to buy a Netbook computer or similar due to financial difficulties had the option of borrowing a device for the duration of the course from the institutional pool.

The students in the class were introduced to Google applications, mainly YouTube, Picasa, Google Docs and Blogger. As a part of course orientation, students were taken through the steps of creating a Google account and setting up a blog using Blogger. All the students in the class were provided hands-on tutorials on how to use these tools on the computer and on their mobile devices. A departmental flip camera was also made available to the students for use in class when needed.

To improve learner engagement in the learning process and to transform the learner role into being a 'content creator' from a 'content consumer', learner-generated content was made an explicit course outcome. The students were to use their blog as an eportfolio for the course to collate all the digital artefacts (pictures, videos, posts and conversations) they had created in the process. It was envisaged the ecology of tools surrounding the creation of an eportfolio, for example, Blogger, YouTube, Picasa and Google Docs would help create a dynamic and an interactive platform for the lecturer and other peers in class. The lecturer also established a blog to drive the learning, model effective practice and provide feedback to the students by posting comments on the student blogs.

Methodology

A participatory action research (PAR) method was used in this study (Kemmis & McTaggart, 1988). The participatory (collaborative and communicative) nature (McNiff, 1988) of PAR helped build a community with the students and staff over the duration of the course. This allowed the researcher to provide pedagogical and technological support to the lecturer within the context of the study and technological support to all the students on a weekly basis. The participatory nature of the research also afforded the researcher to collect relevant data on a weekly basis and also provided an opportunity to consider the feedback given by the lecturer and students on elements that needed improvement. The feedback from the students, and the lecturer's own reflections, informed the approach for the following week as part of an action research cycle. The students and the lecturer signed a consent form to participate in this research. The institute's research committee granted ethics approval for this research.

Data collection

The data for the study was collected via a voluntary pre-project survey. Data was also elicited from student and staff blogs. The researcher also kept a log of feedback and observations from the weekly meetings with the students and staff for the duration of the study. A post-project focus group was held with voluntary students and at the end of the course an interview was conducted with the teaching staff. The pre-project survey was administered to ascertain the types of devices the students had access to, the web tools students had used and what they were using them for.

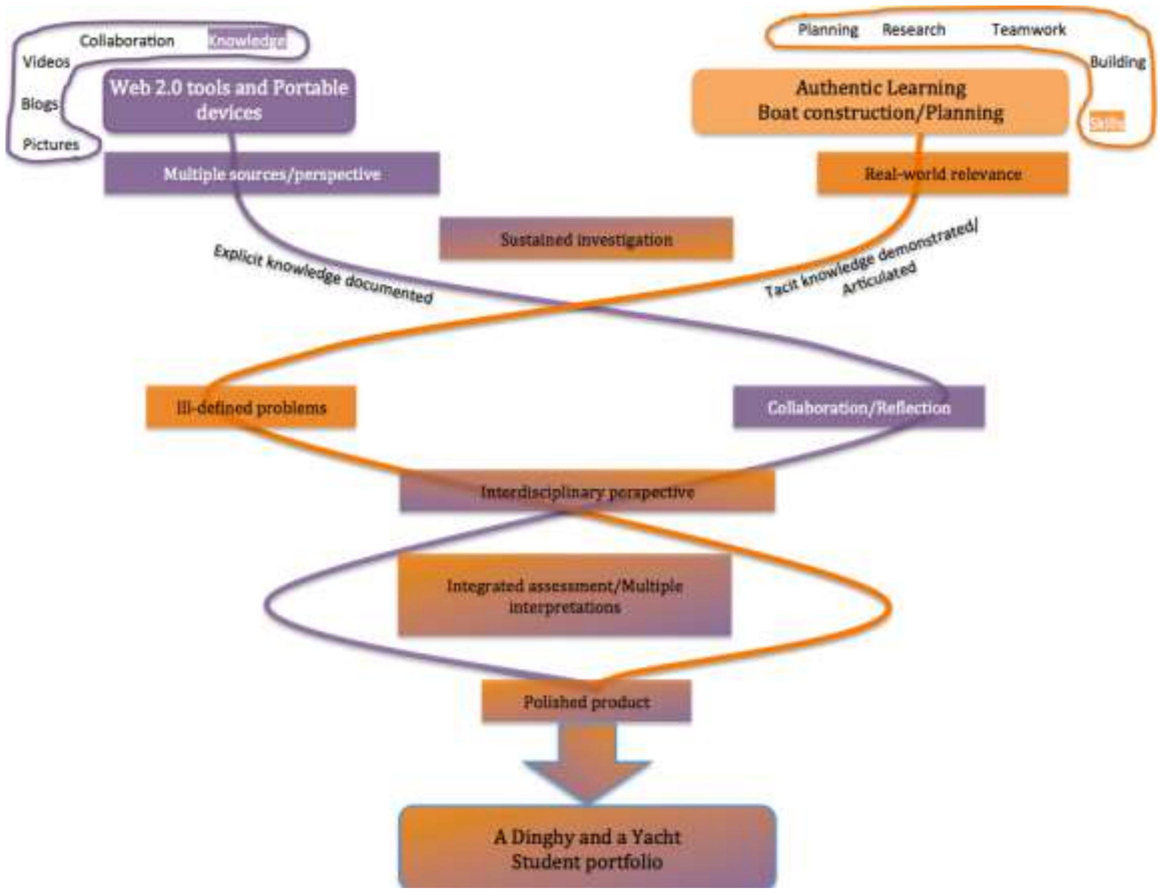

Figure 1: Concept map of the use of Web 2.0 tools in Authentic learning

Results

Pre Project Survey

A voluntary pre-project survey in semester one elicited data from the students on the type of technology and web tools they had access to and had used prior to starting the course. A total of ten students (n=19) participated in the survey. Figure 2 provides an overview of the types of web tools students had used. While the students had accessed a variety of tools, the use was mainly driven by the need to access data. The students were mainly content consumers, not producers. For example, only two students had used an online document editing service while almost all students who took part indicated that they read a blog or viewed a YouTube video. Only one student out of the participating 10 had an active blog. All students in the class (including those who did not take part in the pre-project survey) indicated they had a laptop with wireless capability and three indicated they had a Smartphone.

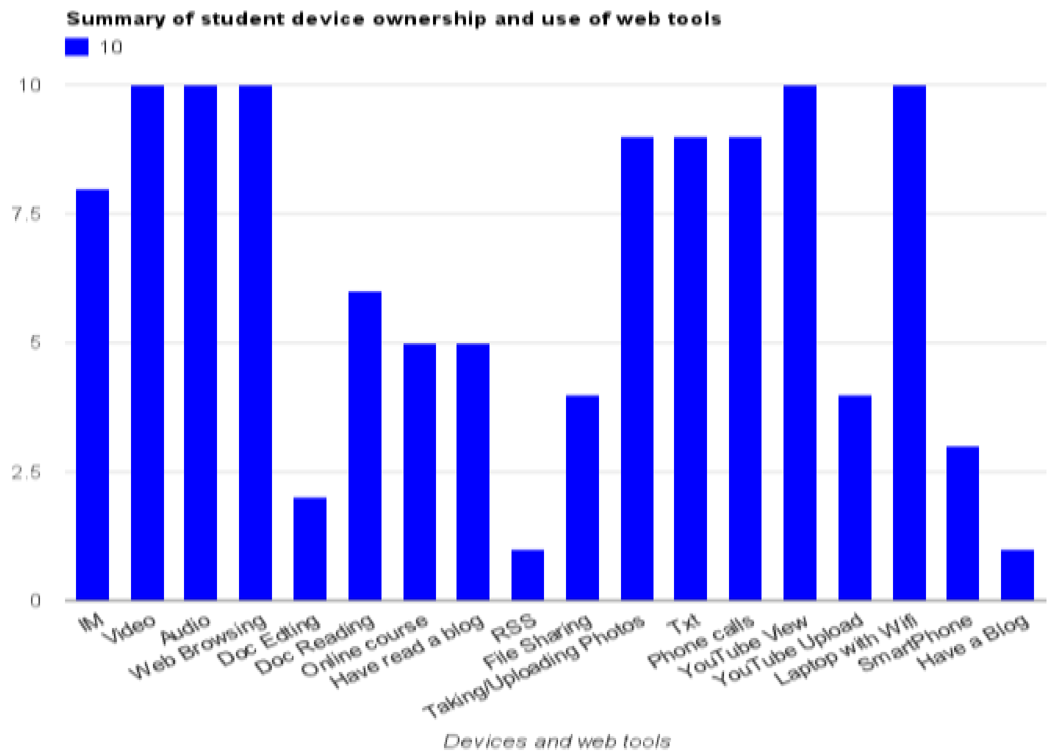

Figure 2: Tools students had access to and had used before

Student blogs and observations

Student blogs – student-generated content

In the length of the course, in excess of 81 videos were created by all the students in the class (n=19). This number excludes videos that were kept private or where students had disenabled embedding. The playlist of all public or accessible videos created by the students is accessible at:

http://www.youtube.com/playlist?list=PLE62CEEE97758F29E**.** While students used videos frequently to enhance their portfolios, pictures were more common. Almost every single student blog post had made use of pictures to inform the writing process. An average of 23 blog posts were made by the remaining fifteen students of the nineteen that started the course; the highest being forty blog posts and the lowest, seven. The class blog bundle can be accessed here:

http://www.google.co.nz/reader/bundle/user%2F04444936209981325189%2Fbundle%2FMarine_2010**.**

The videos created by the students documented the process of boat building for both of the boats. Upon analysis, the videos could be broadly categorised in four groups, (i) brainstorming and planning, (ii) documentary and evidence, (iii) reflection and (iv) mixing and remixing of existing videos. The videos under the brainstorming and planning category outlined collaboration between students. The collaboration included brainstorming and conversations between groups and individuals, in order to validate and plan for the task ahead, in the presence of the lecturer for feedback and guidance. The documentary and evidence category includes videos that captured footage of students discussing the agreed ideas and techniques and then applying them to complete a task. The reflective category captured the outcome of the processes and the reflections on what went according to plan and what processes needed improvement. The mixing and remixing category is where the student(s) edited multiple videos to tell a story for learning purposes. These videos, when used by the students to compose blog posts, were complimented by an in-depth narration of the processes and outcomes. At times, when appropriate, the students also used pictures to inform the narrative passage and process outcomes.

Researcher observations

To begin with, the students were skeptical of the approach even when the rationale behind the design was explained. Some students voiced their concern that building a boat and gaining that knowledge was their priority, not blogging. However, after a couple of weeks having used the tools in the process the students started to see the value. An early observation in the class was the early shift in preferred choice of device for use in class from a laptop to student owned mobile devices. Over the duration of the course the number of smart devices (tablets and Smartphones) slowly grew to a point where almost every student had one. They were frequently using these devices to capture pictures, videos and to upload them to appropriate hosting services such as YouTube and Picasa. The students preferred to work on their blogs in their own time, mostly overnight and at home.

The students seemed highly motivated and engaged in the process, taking control of the situation when needed, collectively coming up with solutions, supporting each other and taking control of the learning space. For brainstorming and planning sessions, the students took charge of the blackboard, pinned pieces of paper on tabletops for drawing and made use of the lecturer's computer while searching for information and resources. Some advanced learners mentored and guided the students who needed help. One advanced learner created a set of instructional videos and uploaded them on his blog as a scaffold for other students who needed help with computer drawing. Almost every student's blog had a unique feel and look to it. The students customised their blogs with pictures (mostly boats), added additional structure to their blog to make posts more visible and easier to access, and kept their profiles updated. While the blog posts did not trigger a lot of conversations online (commenting on blog posts), they did create lots of face-to-face discussions and conversations in class. The atmosphere in the class was one of openness and collaboration. The students welcomed questions from others and were willing to help peers when approached.

The lecturer initially needed guidance and support to make the transition and to make sense of the Web 2.0 tools. However, after four weeks of being engaged in the project, he started to see results and began to actively seek resources and information on effective use of Web 2.0 tools in learning and underpinning pedagogies. As a result, he explored and blogged about social constructivism, authentic learning and Laurrilard's conversational model (Laurillard, 2007) for learning and teaching. The lecturer's role in the process was observed to have changed to a facilitator and a guide that students called up when they needed advice. The lecturer was observed to have moved from computer-based applications to cloud-based collaborative services.

Student focus group

The feedback from the focus group with five volunteering students indicated that the use of Web 2.0 tools in the learning process benefitted them in various ways. According to the students in the class, the integration of Web 2.0 tools and mobile technologies did not pose a steep learning curve. They were already using the tools but lacked focus for use in their learning. The students also highlighted the fact that the approach certainly provided them with flexibility:

> ….. the concept of Web 2.0 initially sounded complicated or specialized however this new educational approach actually uses daily computer software and program, online applications and resources, and other IT technologies we use everyday, such as 3G network on our mobile, recording video and taking pictures with camera or smart phone, etc. (Student W)

The students also commented that the design of the course and use of the Web 2.0 tools made them more responsible for their own learning. It provided them with the opportunity to 'write down what they had done, what they were thinking, and what kind of help they needed' (Student T). The setup created a collaborative environment where peers in class could read a blog post and comment on it. At the same time, it provided the lecturer with a mechanism to assess the students' current knowledge and provide additional support and guidance when needed. The combined effect of Web 2.0 tools and mobile devices provided students with an opportunity to access information, and to network with each other at any time. This also provided continuous connectedness and an opportunity to create a context for their own learning, because learning was no longer situated within the four walls of the classroom:

> … it improved communication between students and tutors with little or no limitation to time and place. When compared with face-to-face meeting and communication, students and tutors now can communicate online. You can post your ideas, thoughts, suggestions or comments at anytime, anywhere. You do not have to be in the workshop in order to discuss with your peers and the tutor. (Student C)
>
> The tutor was able see how each student was doing throughout the course. This gave the tutor an opportunity to make more comprehensive and flexible assessment of the student on the basis of their learning and not only on the basis of the final outcome. (Student W)

When the students were asked to reflect on their experience on the course and if it was motivating and engaging they stated that when compared to other courses they had enrolled in, their personal experience and observations of the peers was that they drove the learning as the learner. Because of this they were willing to put in the extra effort when needed.

> I think my colleagues in class and I myself were motivated. Well for me as a student, if your assessment and portfolio will be based on what you put on your blog it makes you pay more attention to your daily study. Moreover, you can also help other students if they posted any questions on their blog and made comments on your work. And remember, other students can do the same for you. (Student T)

The students also reflected on the artefacts they had created, the process and how it helped them and peers in class. For them it was a collection of resources that they could refer to when looking for information but to also use it for reflecting on their role in the process 'you can log what you are doing and you can go back and look at yourself' (Student C). The collection of artefacts also became a scaffold for other students who needed help 'And it kept helping not just me but other people as well and vice versa' (Student Y). A collection of student reflections is accessible at: http://www.youtube.com/watch?v=oqo3lx0zAd0.

Staff Interview

The lecturer, reflecting on his journey argued his role in the process and agreed that feeding information to the students was not an effective pedagogical practice in an authentic learning environment. When questioned what had changed when compared to the old setup, he stated:

> Probably me more than anything, I am more inclined towards student-centred learning rather than teacher-centred teaching as before. I am a learner with my students and where possible I try and model the use of Web 2.0 tools for learning.
>
> During this time I was transforming myself, with the aid of my students and the support staff. The transformation was from being an objectivist to becoming a constructivist. As I read papers and books on journeys others had taken along this path, I resonated them. I really enjoy conversations with students and in most cases the topics are in context with learning, so, when I came across Diana Laurillard's conversational model, the lights turned on even more. This pedagogical approach was to become my main model for teaching/learning.

The lecturer reflects on the impact this change has had on student learning:

> The students took more responsibility for their learning in the process meaning they were responsible for the quantity and quality of the output for themselves and others in class.

According to the lecturer, the students were more communicative in the course and they asked more questions when compared with other times he had taught this course. The students also demanded help when they needed it. "I think they asked a lot more questions and demanded help from me right then.' The Web 2.0 tools enabled student-generated content and allowed the lecturer to work with students at a deeper level:

> The student content enabled me to see the things they were working on. In the past, this was like a concept in the students' brain. Before, I was not able to see what the students were thinking about but now I can watch their videos, read their blogs, look at their reflections and comments and this gives me an idea for where the student is. I can now support the student in the process by making a comment on their blog or discussing it with them in class.

When asked about what he had observed with the students in the class with regards to student portfolio and student-generated content, he reflected;

> It was exciting for them because it is them, it is theirs. In the past we used to give them workbooks and it was all ours. I could see how boring it was for the students. The portfolio is theirs and they are putting a lot more into it, a lot more energy and a lot more emotion. They had a sense of ownership over it because they knew they were going out of here with it. It gave them a sense of pride and confidence. I could sense that they were not interested in their grades so much as they were more interested in what they had created and what they owned.

The content created by the students helped almost every time. It encouraged collaboration and reflection. The video and pictures taken by the students in the process were uploaded and shared with others in the class. Other students made use of the same resources, however they used it to compare and reflect on their own learning. This gave the students an opportunity to improve on their understanding and knowledge. The interview video is accessible on YouTube at http://www.youtube.com/watch?v=qoJEggkvygw&NR=1

Discussion

Learner-driven scaffolding for enhanced learning

The videos and pictures taken by students, coupled with reflective blog posts and other student-generated content, formed the base for embedded assessment that effectively took the form of an eportfolio. In order for the learner to develop, scaffold within the learners ZPD is seen as a critical ingredient. In this study, the student-generated artefacts (videos, reflective videos posts, blog and pictures) were found to be effective scaffolds within the ZPD that the students and lecturer found useful. This was not necessarily limited to these artefacts. The conversations that followed online and offline among the students and between the lecturer and students added further benefits. The students who used their own smart devices appreciated the fact that they were able to create a context conducive to their own learning that was further enhanced by connectedness, ubiquitous access and collaboration. While traditional scaffolding methods are seen as the learner seeking help or support from the 'knowledgeable others' (peers, the lecturer or any other expert) in order to grow its own understanding and knowledge. The pedagogical use of Web 2.0 tools and mobile devices in this study provided the students a platform to collectively negotiate ideas and disagreements; in the process creating new understanding and knowledge that benefitted all the participating parties (Borthick, et al., 2003; Brown, 2006; Luckin, 2008). The mixing and re-mixing of videos and pictures by students to suit their needs or the team's need, the reflections in groups and as individuals on a method or process, and collaboration between the students online and offline all resulted in a scaffolding ecology; a learning ecology that was driven and nurtured by the students and benefitted all who participated beyond the limitations of time and geographical location. The teacher in this process acted as a facilitator or a guide, stepping in when requested by the students or when there was a need.

The underpinning Web 2.0 tools and mobile devices that the students used to create, update and maintain their eportfolios encouraged students to articulate their explicit knowledge in relation to the tacit knowledge. The artefacts captured by the students while carrying out a task/activity and uploaded as a blog post along with reflective narrative enabled the students to bridge the two elements 'knowing' and 'doing' which enhanced understanding. This also allowed the teacher an opportunity to continuously assess the understanding and growth of a student. This change outlines the pedagogical transition from assessment of learning to assessment for learning when compared to teaching practice prior to this project.

Authentic learning and Web 2.0

The integration of Web 2.0 tools and mobile devices in this study was observed to have 'gelled' the characteristics of authentic learning. The linkages between the characteristics were enforced by the collaborative, communicative and participatory nature of the Web 2.0 tools. The mobile devices further enhanced the process by enabling learning-generated content, connectedness and ubiquitous access to resources and information. These factors combined gave the students a sense ownership in the process and enabled them to take charge of the process and their own learning.

Prior to this project the students were still engaging in authentic tasks and context, but the learning process and student role were arguably different. More importantly, in the previous model, the context even when it was authentic (students were still building boats) did not ensure effective learning. In this study the teacher's ability to craft the environment to enable student engagement, openness and participation through the use of appropriate tools, was found to be the key.

Conclusion

This study outlines the important relationship between authentic learning, Web 2.0 tools and portable mobile devices. Authentic learning is at the heart of situated learning and Web 2.0 tools and mobile devices enhance the social, participatory and active engagement aspects of the approach. By augmenting the authentic learning environment with Web 2.0 tools and mobile devices, the learning process was enhanced as it gave learners choice and flexibility over their own learning and also acted as a pedagogical change agent. The use of Web 2.0 tools and mobile devices in this project promoted learner-generated content, context and a participatory and collaborative environment that made the core elements of authentic learning function as a single unit, hence the title Authentic learning and Web 2.0 - Completing the equation.

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Using Online Environments to Provoke Student-Enquiry

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This paper is intended for researchers and practitioners interested in using online environments to provoke student enquiry in any discipline in higher education. Using a Community of Enquiry model that tackles the pedagogical weaknesses in constructivism, we explain why online environments are so effective in engaging students actively in a learning process that meets the requirements of an academic context. From this perspective, we are able to offer concrete advice on how to design an online environment that will provoke student-enquiry. We explain why a social presence is important in the establishment of a Community of Enquiry and we also align particular web technologies to the various stages in the enquiry process and the students' achievement of a unit's learning outcomes. The reader will develop a better understanding of community of enquiry in higher education, and how to use web technologies to provoke enquiry in an online environment.

Keywords: online Community of Enquiry, higher education, constructivism

"Learning for the future" is a refrain that defines the purpose of higher education for most students; higher education institutions prepare students to engage productively in professional work and community service opportunities that presently do not even exist. "Digital media literacy continues its rise in importance as a key skill in every discipline and profession" and constitutes a "top challenge" for tertiary education (Johnson, Adams, & Cummins, 2012, p.3). This is coupled with increasing desire for flexibility in education: "people expect to be able to work, learn and study whenever and wherever they want" (Johnson, Adams, & Cummins, 2012, p.3). Sustainable and pedagogically sound educational models enable the provision of flexible learning environments that both reflect and prepare students for their future professions and community commitment in the digital age. Creating collaborative online communities of enquiry that engage, challenge and support students, is a means of meeting the expectations of students for flexible learning environments, while prioritising the pedagogical requirements of the academic context. This paper explores the practicalities of designing and facilitating an effective online community of enquiry.

The Online Community of Enquiry Model

Enquiry based learning is "a broad spectrum of pedagogical approaches that ground the learning experience in a process of self-directed scholarly investigation and research" (McKinney & Levy, 2006). In online educational research, there is an influential Community of Inquiry (COI) model which "embraces a constructivist orientation in which the emphasis is on how we construct knowledge" (Akyol, Garrison, & Ozden, 2009, p.15). The learners are defined as "collaborative knowledge builders" in their online COI (Akyol, et al., , 2009, p.78). This emphasis on the students' construction of knowledge can be problematic in higher education. In response, we are proposing a new model, the Re-constructivist Online Community of Enquiry (ROCE) that strives to address the pedagogical deficits of the constructivist approach for the higher education learning context. Constructivist online COI tend to focus on the students' generation of meaning and knowledge that is relative to them and their specific learning community rather than relative to the history of ideas in the academic discipline. Re-constructivism reasserts the centrality of the existing, disciplinary body of knowledge and focuses on engaging students in a robust process of presenting and testing knowledge claims within the online community of enquiry.

Similar to other online models, the ROCE enables students (and their teachers) to engage in learning processes that are asynchronous, student-driven and flexible. In order to participate actively in the ROCE, students must be prepared to engage in academic research, communicate their understanding and interpretation of the literature, defend their analysis in an argumentative, evidence-based discourse, reconsider and extend their arguments in the context of the voices in their community and finally produce a knowledge artefact that has been tested by their peers. Having participated effectively in this robust and challenging learning environment, students will have explored the disciplinary content in ways that equip them to progress in their program of study and ultimately enhance their potential to advance research and knowledge in their future professions.

The ROCE model is applicable to any content area and this paper demonstrates how the various stages in the enquiry process can be supported in an online environment. Design, Cognition and Knowledge are the three core elements in the ROCE model - design and cognition drive the pursuit of knowledge. The design of the unit and the learning space enable cognition based on community-led enquiry, which results in knowledge embodied in the community discourse and digital artefacts.

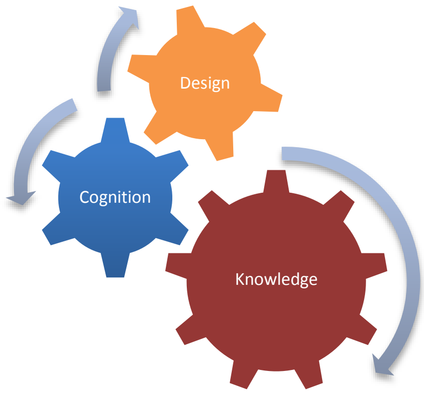

Figure 1: The Re-Constructivist Online Community of Enquiry model

Designing the unit and learning space to provoke enquiry

When implementing the ROCE model, designing the learning space requires considering which technologies can best assist students in participating actively in the enquiry process. The enquiry process involves several levels of understanding such as identifying, describing, comparing, contrasting, explaining causes, analyzing, relating, applying, theorising, generalising, hypothesising and reflecting (Biggs, 2003, p.48). "The ability to carry out a rigorous, systematic process of inquiry and the capacity to apply the skills so acquired in a range of different contexts," is important for students completing their higher education (Brew, 2003, p.16). If students have participated in an enquiry process in which they are required to define and express their own evidence-based voice in their academic community, they will be well equipped to contribute to and ultimately move beyond this community of enquiry. Web technologies such as forums, databases, videos, blogs and wikis can be used at various stages of the enquiry process to support students in their learning and to initiate, sustain and provoke further enquiry. These web technologies are readily available and compatible with most learning management systems. We also suggest including digital artefacts as assessment tasks to ensure a strong alignment between the learning process and measurement of students' achievement of the unit outcomes. As Biggs (2003) argues, "different formats [for assessments] get students doing different things… some being much more aligned to the unit objectives than others"(p172). If students are working online, wiki pages or blogs may be a more appropriate knowledge artefact than the traditional academic essay. In fact, "using Web 2.0 formats …it is possible to assess and support the development of a much wider range of knowledge, skills and attitudes than in the past" (Nicol, 2008).

Establishing Community to facilitate Cognition

Most online communities of enquiry emphasize the need for a strong social presence in order to support students in their academic pursuits. According to Garrison and Arbaugh (2007), the purpose of social presence is "to create the conditions for inquiry and quality interaction… to achieve worthwhile educational goals collaboratively" (p.161). In fact, social presence is an essential precursor to cognitive development because it provides the "groundwork for higher level discourse" (Arbaugh, 2007, p.74). When development is driven by discourse, the community is able to take the required risks and engage fully in their quest for knowledge.

A standard introductory discussion forum can be enhanced by encouraging students to embed short videos of themselves. This video web mail can help establish a sense of community quickly and effectively. Asynchronous video has been found to "deliver the verbal and non-verbal signals necessary in developing positive levels of immediacy and social presence" (Griffiths and Graham, 2009, p.22).

Setting up expectations about the community of enquiry and the students' role in driving the learning process are keys to the success of the pedagogy. It is important to start the unit (after a social presence has been established in a non-threatening way), with a robust discussion encouraging students to embrace the online community as their central enquiry arena and to accept the various technologies that will be used to support the enquiry processes of the community. The voice of the teacher is probably loudest at this time. An informal video recording of the lecturer explaining the rationale of the online community in a relaxed setting can be very useful as students tend to relate well to this more intimate approach. Griffiths and Graham (2009) report "students were able to perceive the instructor and his personality very well through the use of asynchronous video" (p.16). In fact, students reportedly commented that their connection with the instructor was "much more personal, this way, even more so that a face-to-face class usually is" (Griffiths and Graham, 2009, p.16). It would be important to follow up this video presentation with an online discussion in which students can raise and resolve their questions and concerns. Having established an open, trusting community with shared expectations, students are ready to begin the enquiry process.

Triggering the Enquiry Process

At the start, students require triggers to initiate their enquiry process. Most commonly in communities of enquiry these triggers are questions, issues or problems identified by the teacher and/or students for further investigation and research (Arbaugh, 2007). Triggers vary according to the disciplines and the topics being explored. They may include video stimulus, core texts from the literature and/or case studies or experiments. A video case study can be a successful trigger because it provides a common example that the students can discuss in relation to the further academic research that they pursue. The video can introduce some controversy or an issue that requires an argued response from the students and provoke their enquiry process. The video in Figure 1 requires a critical response from students based on an understanding and application of the literature relating to ethics and the media (YouTube, 2011).

Figure 2: Sample of a video that can trigger the enquiry process.

As the students respond to the triggers and engage in the research, a database tool can be useful to record and share the research being undertaken in the enquiry process. As students research the disciplinary literature, they need to record ideas from their preliminary readings, so that they can reflect and build on these ideas and conduct further more defined research as they start to increase their awareness and understanding of the topic. For this purpose, each student could commence a research blog. The blogs should show development of the students' ideas as they work through some of the disciplinary literature. The blogs are the students' means of creating their knowledge claims that will be put to the community for testing and discussion.

Testing Knowledge Claims through Discourse

As students start to develop their knowledge claims, they need a space to "test" (present, defend and extend) these claims. A discussion board is the ideal online space for this testing of claims. Students need to be able to respond easily to each other as they engage in an evidence-based debate and critical dialogue of their peers' contributions. During this time, students will be participating in several different online discussions, they will be defending their own knowledge claims and critiquing the claims of their peers. Students need to provide academically credible evidence in their argumentative discourse and this may include links to various audio-visual materials or websites. Depending on the nature of the discipline, students can include videos taken during practical placements in relevant professional contexts.

The student who is presenting the knowledge claim will lead each discussion. It is their responsibility to ensure the debate progresses constructively. They will synthesize the relevant input from other students and follow up on new literature that is provided by peer critique. Students can also continue to maintain their personal research blogs throughout the enquiry process.

Producing Knowledge Artefacts

Having thoroughly tested their knowledge claims through the discourse of the community discussion, students are able to produce knowledge artefacts. Ideally these will use a digital format that aligns with the online enquiry process that the students have engaged in. They may use a wiki to present their digital essay incorporating links to audio-visual evidence. The wiki can be opened up to the community for more peer editing and commentary as deemed appropriate. The student blogs are also digital artefacts that can be used to evaluate the students' research and their development of knowledge claims to test in the community discourse. These knowledge artefacts can then be evaluated as part of the overall assessment of each student's achievement of the unit outcomes.

Conclusion

The ROCE model is based on the premise that students' learning is enhanced through collaboration and critical discourse with peers. Its design is tailored to the goals and demands of the higher education environment. This is evidenced by its commitment to engaging students directly with the literature of their chosen discipline. The process of enquiry mirrors the process of scholarly endeavour and debate. Students create supportive online communities of enquiry that enable them to challenge themselves and their peers to delve into disciplinary knowledge and emerge with a clear voice that is able to expound the legitimacy and frailty of the various academic positions within the literature. The online environment provides flexible, purpose-built web technologies such as videos, forums, blogs, databases and wikis, which can both support and provoke students to engage in the enquiry process. The ROCE is pedagogically a better fit for the higher education context than the more constructivist models that prioritise the students' construction of knowledge over their engagement with the history of ideas in the academic literature. Overall, the ROCE is an approach that is flexible enough to apply in different disciplines and can be set up in most learning management systems. It offers a sustainable model that will address demands for flexible study environments that develop digital literacy skills (Johnson, Adams, & Cummins, 2012) and as such, constitutes a means for facilitating learning for the future.

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Mobilising authentic learning: Understanding the educational affordances of the iPad

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A strong body of evidence exists around the power of authentic learning as a pedagogical model to support learning for the future. In recent years, with the increased understanding and focus on authentic learning theory, the educator's toolkit has continued to grow. Mobile technologies have also undergone rapid change during this time, including the emergence of a new category of mobile tablets inspired by the iPad. For teaching and learning to succeed in the future, we cannot afford to ignore technological and pedagogical change. This paper outlines the motivation and plans behind a study to augment the theory of authentic learning and develop a set of mobile authentic learning principles. The study is informed by the theories of authentic learning, cognitive tools and mobile learning supported by the educational affordances of the iPad. Design-based research methodology will be employed to ensure the rigor of the study through two iterations of experimentation with a first year tertiary information systems for business course.

Keywords: mobile learning, authentic learning, cognitive tools, iPads

Introduction

A significant body of evidence exists on the benefits of a constructivist approach to teaching and learning (Bodner, 1986; Duffy & Cunningham, 1996; Gijbels, Watering, Dochy, & Bossche, 2006; Loyens & Gijbels, 2008). Authentic learning is one such learning theory, influenced by a constructivist philosophy. Authentic learning environments are only rarely used in higher education courses, despite the evidence of their capability to promote higher order learning (Lombardi, 2007b).

Technology has significant potential to be an enabler for authentic learning (Lombardi, 2007b), in particular through its use as cognitive tools (Jonassen & Reeves, 2004). Yet, despite a willingness to create more authentic and engaging learning environments for students, there are a number of factors that inhibit the approach in higher education. Pressures to increase class sizes, and teach in tiered lecture theatres, together with restrictive assessment policies (such as mandatory examinations or limitations on group work) pose challenges to teaching in an authentic learning environment. In this paper, we describe the design of a research study into teaching and learning with technology in a business course. The study will use a design-based research method (Reeves, 2006) to investigate a more authentic approach to teaching business using iPads as cognitive tools.

The traditional business course structure provides challenges to maintaining a case for the duration of the course. Semester long (16 week) courses are often taught in conjunction with other courses, splitting a student's time and attention across several disconnected discipline areas. Students may only see the lecturer or tutor for a few short hours a week, making it difficult for them to be immersed in the learning experience. Perreault (1999) suggests that authentic activities take much more time than more traditional learning exercises. If this time is unavailable within the set class structure, then an additional mechanism is needed to support these authentic activities beyond the classroom. As suggested by Lombardi (2007b), technology has the potential to greatly expand our range of authentic activities in the classroom, and one could argue, beyond it. Mobile technology in particular could be used as a way of bridging the gap between formal class sessions and sustained and engaged learning (Barbosa & Geyer, 2005).

In 2010, the arrival of the iPad was heralded with much interest and excitement, particularly be educators who could see its potential for use in student learning. Twenty five million units of this immensely popular consumer device sold within the first fourteen months (Jobs, 2011). It has reimagined and revitalized the market for tablet computers, effecting a reduction in demand for netbook and laptop computers. Due to its success, competitors have increasingly shifted their focus toward their own tablet offerings, and now, a number of high quality and relatively low cost tablet alternatives available. Such tablet computers have potential affordances for education that have not been explored in any great depth to date, especially in regard to their pedagogical advantages. The study described in this paper will explore current theory and practice, emerging developments and technological capabilities to investigate the pedagogical use of tablet computers, and develop a model for their use in supporting authentic learning environments.

Authentic learning

The age-old method of apprenticeship training has inspired the creation of educational pedagogies that value the importance on the context of learning. Collins (1991) suggested that in order for learning to be meaningful, it should be embedded in the same context that it will be used in later life. This is a fundamental principle of the theory of *situated cognition* or *situated learning* (Brown, Collins, & Duguid, 1989), a theory that has greatly informed the theory of *authentic learning*. Lombardi (2007a) emphasises the importance of higher order thinking and analysis that is afforded in authentic learning:

> To be competitive in a global job market, today's students must become comfortable with the complexities of ill-defined real-world problems. The greater their exposure to authentic disciplinary communities, the better prepared they will be "to deal with ambiguity" and put into practice the kind of "higher order analysis and complex communication" required of them as professionals. (p. 10)

Herrington and Oliver (cf. Herrington, Reeves, & Oliver, 2010) propose a list of nine key elements that characterise an optimal authentic learning experience. Authentic learning environments:
1. Provide authentic contexts that reflect the way the knowledge will be used in real life
2. Provide authentic activities
3. Provide access to expert performances and the modeling of processes
4. Provide multiple roles and perspectives
5. Support collaborative construction of knowledge
6. Promote reflection to enable abstractions to be formed
7. Promote articulation to enable tacit knowledge to be made explicit
8. Provide coaching and scaffolding by the teacher at critical times
9. Provide for authentic assessment of learning within the tasks (p. 18).

Such research has provided much insight into how technology can be used to promote authentic learning in higher education. However, further in-depth exploration is needed to explore how technology can be used as a cognitive tool to solve problems and create genuine artefacts within these environments.

Cognitive tools

Also referred to as *cognitive technologies* (Pea, 1985), t*echnologies of the mind* (Saloman, Perkins, & Globerson, 1991), and *mindtools* (Jonassen, 2000), *cognitive tools* have been described by Jonassen and Reeves (2004) as "technologies, tangible or intangible, that enhance the cognitive powers of human beings during thinking, problem-solving, and learning" (p. 1). Computers, smartphones, mobile tablets and the software applications they support, can all be used as cognitive tools. Viewing these devices as cognitive tools shifts the focus of the devices from being a medium for the delivery of content to a platform for the creation of knowledge. The student as the designer replaces the role of the instructional designer. The student uses the technology to access, interpret, organize, analyse and present knowledge to others.

Jonassen et al. (1998) propose that mindtools have the capability to engage learners in critical, higher-order thinking about content because:
1. The learners are the designers
2. The focus is on knowledge construction, not reproduction
3. Learning is in partnership with technology
4. They are unintelligent tools, relying on the learner to provide the intelligence
5. They distribute the cognitive processing
6. They are cost and effort beneficial. (p. 13)

Most research into cognitive tools to date has focused on computers rather than more recent mobile devices. With the arrival of the iPad in 2010, the world of mobile devices has undergone significant change. Many mobile devices now have similar processing capabilities and functionality to modern laptops and desktops, and they could be employed as powerful cognitive tools. This increased functionality could be used to support authentic learning, as described in the next section.

Mobile learning

An ever-widening body of research exists in the area of mobile learning (also known as 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) define mobile learning as: “the processes of coming to know through conversations across multiple contexts amongst people and personal interactive technologies” (p. 225).

Tablet based mobile learning

Recent advances in the world of tablet computing, as illustrated by the popularity of the iPad and other tablet devices, provide some answers and new questions to the field of mLearning. Now in its third generation, the iPad is still by far the leader (in terms of sales numbers) in the global tablet market. Over its three generations, the iPad has matured in terms of features to include two cameras, dual core processing technology, a high-resolution screen and 4G connectivity. Many educational institutions around the world are making use of the iPad through student and staff projects, distribution schemes (the Science Faculty at Adelaide University, for example, where students are provided with an iPad once enrolled) and the informal use of student owned devices.

In a comprehensive study on the use of mobile devices in higher education, Cochrane (2010) proposed five pedagogical considerations or “critical success factors” to mLearning:

1. The level of pedagogical integration of the technology into the course and assessment.
2. The level of lecturer modeling of the pedagogical use of the tools. (I think modelling is right, or did Thom use modeling?
3. The use of regular formative feedback from both lecturers and student peers.
4. Appropriate choice of mobile devices and software.
5. Technological and pedagogical support.

It is clear that tablet computers possess many affordances that could potentially enhance learning. However, as stated by Melhuish and Falloon (2010, p. 13), “A new mobile device might eventually be a catalyst for a sea-change in the way we perceive education, but the urgency and relevance of the learning need should always drive its use”. The theory and literature discussed above in relation to *authentic learning, cognitive tools* and *mobile learning* will provide a theoretical framework for the enquiry.

Theoretical perspectives to frame the study

The proposed research will be informed by principles of learning and theoretical constructs developed in *authentic learning, cognitive tools* and *mobile learning theory*. With technology, they will form a new theory of Authentic Mobile Learning. A conceptual illustration of the study and its related theory is provided in Figure 1.

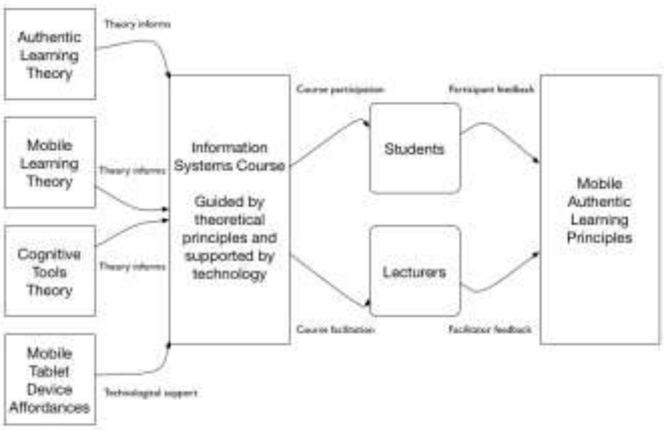

Figure 1 Mobile Authentic Learning Conceptual Framework

A design-based research approach (Reeves, 2006) will be used to develop, iteratively test and improve the design principles in an academically rigorous manner. This project will take place in two iterations over two full semesters with the design principles guiding the design of an introductory *information systems for business* course using the iPad as the cognitive tool of choice.

Investigating new technologies in education contexts is frequently conducted atheoretically, resulting in a focus on the technology itself, rather than as a pedagogical support. This study situates the study of a new and powerful technology (the iPad) within the context of the pedagogical theory of authentic learning, and with the focus on the device as a mobile cognitive tool that provides learning for the future.

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Peer review of e learning Initiatives at Charles Darwin University: The DSA project

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The Diversity and Structural Adjustment Fund (DSA) project at Charles Darwin University, Northern Territory Australia, aims to peer review current teaching and learning practices and resources to evolve recommendations for 'best practice' in e learning. A staged approach over two years was planned to evaluate current practices used in e learning across the University and 'to begin a process of building expertise in flexible and e learning at the discipline level' (Terms of Reference, DSA, Part 3b, v3.0 p2). During 2010-11 I was invited as a consultant on the project to peer review nursing and social work e learning initiatives within the School of Health Sciences. The project, now completed, has had several favourable outcomes. Regular and ongoing quality assurance of e learning sites carried out centrally within the University by the Office of Teaching and Learning has brought greater uniformity through quality assurance processes to the e learning sites across the Faculties. The current version of the internet platform, Blackboard, has been extended and enhanced. Through the purchase of new software, the previous use of WIMBA or the Wireless classroom which posed technical difficulties for the majority of teaching staff, has been replaced by 'Collaborate'. This later software has enabled face to face teaching in tutorials for students in all areas of the University. Other lessons learned include the integration of information about student support services and a more uniform structure to e learning sites as well as the availability technical assistance for academic staff.

Introduction and aims of project

The DSA project was designed to facilitate for Charles Darwin University steps towards best practice delivery with a marked enhancement of teaching and learning quality. In 2008 CDU's teaching and learning performance as measured by recent Learning and Teaching Performance Fund and Institutional Assessment Framework outcomes was below national norms. This performance was strongly related to CDU's rapid transition to a significant external provider in response to demands from both employers and students in the Northern Territory and beyond for the delivery of accredited professional programmes in which there are national skills shortages. These areas include nursing, social work and teaching education. Facilitated by a partnership with Bb Inc., the project aimed to do the following:

- Markedly enhance the teaching and learning performance of CDU;
- Significantly re-position CDU to meet the documented demands of its geographically dispersed, often regionally located unique stakeholder communities (with high representation of mature age, part-time and equity target group students) for high quality flexible provision; and
- Provide stronger service to labour markets in the NT and Australia through improved provision in areas of national priority.

The project had four related and interlinked components which form the chapters of this final report:

- Planning and Strategy Development;
- Optimisation of a Flexible Learning Management System;
- Staff Training and Learning Materials Upgrade; and
- Evaluation of the effectiveness of flexible learning approaches for target equity group students

Towards the end of 2011 the Learnline Steering Group was established which will, amongst other things, oversee the implementation of the recommendations in the above report. The Terms of Reference of the Learnline Steering Group are currently being finalised but the following has been proposed to the Learning and Teaching Committee of the University:

1. To recommend policies and procedures for Learnline.
2. To provide guidance to the PVC LT&CE regarding the learning technologies that should/should not comprise Learnline.
3. To provide guidance regarding upgrades, maintenance and other enhancements to Learnline technologies (including the enablement and disablement of functionalities within the suite of learning technologies).

4. To advise on the establishment and disestablishment of Learnline Roles and associated permissions.
5. To ensure Learnline is aligned to, and supports, CDU's accreditation (HE), registration (VET), review (HE and VET) and CRICOS requirements.
6. To assess the impact of Learnline on learning and teaching and advise accordingly.
7. To assess the implications of learning and teaching policies on Learnline and advise accordingly.
8. To monitor staff and student satisfaction with Learnline and advise accordingly.
9. To make recommendations regarding Learnline training and promotion.
10. To monitor compliance by Schools and VET Divisions with Learnline policies and procedures.

Peer review and upgrade of pedagogic approaches and learning materials in selected programs

The broad aim of this project component was to engage recognised external consultants to review flexible learning practice and resources, and make recommendations for improvement, with a series of eleven discipline groups at CDU and to build expertise in flexible and e-learning at the discipline level.
Peer review of teaching can be described as 'academic colleagues giving and receiving feedback on their teaching practices and its effectiveness in promoting student learning' (Harris, Farell, Bell, Devlin, & James, 2009, p.5). This type of peer review is an invaluable form of evaluation used to make judgements about current practice, and can at the same time be developmental, acting as a means to advance teaching, and as a tool for professional development. That is, it can be used for both formative and summative purposes. Along with student evaluation it helps provide a rich picture of teaching and learning in an organisation, and builds on the expertise already within that organisation. Further, peer review has the potential to develop understanding of the scholarship underlying the design and development of teaching resources (Harris et al, 2009; Taylor & Richardson, 2001; Wood & Friedel, 2008). Peer review for this project will include review of resources as well as teaching approaches, and involve academics from within CDU as well as outside the organisation.
The 11 discipline groups selected account for the majority of CDU's total and flexibly delivered load, and all had significant scope for improvement in the areas of student satisfaction, retention and progress. They were broken into groups of three as follows:

Group 1: Pharmacy, Exercise and Sports Science, Engineering and Information Technology
Group 2: Law, Education, Nursing
Group 3: Business, Social Work, Psychology
Group 4: Creative Arts and Humanities, Environmental Sciences

Each discipline engagement extended over a six-month time frame with the following **anticipated outcomes**:

1. A focus by targeted disciplines at CDU for a period of at least 6 months each, on improving course design and delivery, learning and teaching resources and methods, with special attention to flexible delivery.
2. Engagement of the selected disciplines with consultants who are nationally recognised experts in discipline and elearning/flexible delivery methods.
3. Participation by CDU staff in discipline-based peer review activities, and targeted course design and resource evaluation workshops.
4. Liaison and consultation between the Academic Development Team (ADT), consultants and the disciplines in developing the strategy for the peer review processes and subsequent implementation.
5. Opportunities for CDU staff to learn about their colleagues teaching approaches, share resources, and develop skills in the scholarship of teaching.
6. Summative peer review reports for each discipline by external consultants.
7. Strategies and priorities developed via the peer review process for improving teaching and learning approaches and resources within each of the nominated disciplines at CDU.

For each discipline group the engagement had four **phases**:

- Planning
    - Negotiating and constructing the process for peer review
    - Identifying and contacting possible external peer reviewers in the discipline, and
    - Appointing consultant and negotiating terms of engagement
- Design
    - Consultant's visit to CDU: conducting a needs analysis, document gathering, individual interviews with selected staff, focus group with staff and another with students
    - Remote consultation with expert via phone, email, videoconference as necessary

    - Peer review report compiled by consultant with recommendations for discipline specific educational design enhancements, learning and teaching strategies, additional resources, student support, etc;
- Implementation
    - Implementation and dissemination of recommendations, with ADT and consultant support via group-based and one-on-one support, workshops, mentoring, templates, development of case studies and learning designs, and online and face-to-face delivery of support
    - Workshops delivery by consultant and on-site visit
- Evaluation consisting of a report from the academic consultant and theme leader on outcomes achieved using the following questions as a guide:
    - How effective is the model of engagement and peer review used for the project, as an enterprise wide implementation of new learning and teaching methodologies in Higher Education?
    - What are the enablers for implementation in this context and how can they be utilised so as to embed the new knowledge, skills, attitudes and practices acquired during the project?
    - How can the barriers to embedding sustainable change in flexible learning and teaching (eg technological, pedagogical, organisational and cultural) be overcome at an organisation such as CDU?
    - What are the barriers and enablers to establishing communities of inquiry to support sustainable change and effective peer review activities within the organisation?

The following **deliverables** were expected of the peer review process:

1. A report from each external discipline consultant which includes a review of and recommendations for development of flexible learning and teaching methods, strategies and resources. This will provide a benchmark against which improvements can be measured. This is due, in most cases, about 2 months into the consultation process. Where consultants are contracted to review and support at the unit level only, the report should be short and delivery dates negotiated with the discipline and ADT.
2. A program of peer review activities devised by ADT and each discipline group, and informed by the consultant.
3. A report from ADT on the engagement of each discipline. Due after the four phases are complete: planning, review, design and development and evaluation).
4. A report from either the Head of School or Dean of each discipline. This is due after the four phases are complete.
5. Observable change to learning materials and teaching and learning approaches, following implementation of recommendations from consultants' report.

Organisation wide issues

- The need for reward and recognition of high performing teachers as a means of building teaching and learning capacity across the university.
- Promotion of reflective practice and the scholarship of learning and teaching, leading to amongst other outcomes, publication in high-quality journals. Create the conditions whereby a more scholarly approach to teaching and learning can be fostered, and research is conducted into the CDU student experience.
- The need to create more opportunities for exchange and documentation of best practice exemplars across the University, including an annual learning and teaching conference, and multi-disciplinary best practice approaches for teaching external and blended classes.
- Re-evaluate the issue of pre-requisites and the impact of being 'overly flexible' regarding study plans, at the risk of students missing out of developing key competencies and developing a sound knowledge base in core areas.
- Re-evaluate the practice of posting student evaluations of teaching on the public CDU website. This practice is probably counter-productive and not necessarily supportive of best teaching practice.
- Pedagogical frameworks for working with students of different disciplines be researched (currently a research project is underway). The results of this research then need to be embedded in the pedagogical approaches adopted, and translated into appropriate course materials using on-line and distance/flexible learning.
- Create a culture of teaching and learning innovation through resource allocation to academics.
- Support more flexible use of ICTs by academics, recognising their ability and authority to determine technology requirements.

Theme/discipline issues

- Communicate to students the career relevance of disciplinary knowledge, skills and attitudes.
- Provide resources that support the development and delivery of superior online learning experiences that differentiate CDU positively from other university providers.
- Create exemplars of best practice at the discipline level.
- Continue the practice established in the DSA project of providing time release for designing and developing new units.
- Establish processes by which staff can share and collaborate on the design and development of teaching and learning strategies.
- Assign mentors within each discipline to support new staff, and account for this in teaching workloads.
- Develop processes to assess and develop fair and equitable academic workloads relating to teaching students on and off campus students.
- Map content and assessment within undergraduate degrees. Define and map generic skills, knowledge, learning outcomes, assessment and pedagogic philosophy underpinning 100, 200 and 300 level units.
- Develop introductory online resources for students to orientate them to study and to Learnline, and create standard introductory information for each discipline.
- Model best practice communication styles and skills with distance students, using suitable technologies to establish closer connections with students and encourage persistence and effective study habits.
- Streamline practicum processes, e.g. by forming a working group with multi-disciplinary representatives from a range of disciplines that include practicum: for example pharmacy, education, exercise and sport science and nursing, to determine best practice processes for practicum/placement students at the University.
- Develop consistent policies and guidelines across disciplines regarding a range of academic issues, e.g. addressing student enquiries, plagiarism, late assignments, appeals, moderation of online discussions, and guidelines for effective student study online.

Teaching and learning approaches

- Build a course level approach to issues such as assessment, moderation, assignment turnaround time and feedback, responses to messages in email or on the discussion board, consultation hours etc. (standards, policies and guidelines);
- Develop strategies and resources that allow for the effective teaching of internal and external students in the same cohort using online technologies;
- Move from internal lectures, bolster internal seminars and focus on utilising pedagogical approaches best suited to the online student cohort;
- Use of and reflection on the *Levels of Engaging Students Online*. Staff need to continue to reflect on how to best achieve this type of authentic learning with students whilst managing the balance between student feedback and student engagement in the learning environment;
- Assessment:
    - Adopt assessment practices that effectively utilise the online communication tools.
    - Adopt rubrics as standard practice for assessing students.
    - Use student peer review as a valuable assessment practice in some units.
    - Provide formal mechanisms for students to provide feedback during the semester and feedback on assessment criteria;
- Incorporate strategies that support diversity amongst the student cohort and difference in learning style, and allow for varying levels of technical access, (where not mandated).
- Use strategies that support and encourage ‘community’ online, e.g. a thread on the discussion board for introductions to which the unit coordinator also contributes.
- Focus on first-year units as the foundation for excellence in teaching and learning.
- Provide more professional development and IT support for staff who work on campuses other than Casuarina.
- Sustainability (attainability) needs to be built into Learnline units. There must be a cycle of review and refreshing/updating unit content and online teaching methods built into the unit lifecycle.
- Suitable benchmarking partners should be investigated in order to undertake regular external comparisons between CDU offerings and those of its benchmarking partners.

Technology issues

- Acknowledge and respond to concerns about issues with IT infrastructure which impede easy and innovative response to flexible learning initiatives.
- Re-evaluate the range of tools and the technologies available, over and above those offered via Learnline, encouraging innovation, and including storage capacity for rich-media files generated by staff and students. This includes the greater use of wireless, laptop computers for flexibility.
- Allow for innovation: 'The central policy of locking down information technology is the single largest impediment to CDU competitiveness in teaching and learning for online students.' (Law Peer Review Report)
- Provide continuous, developmental on-going professional development in flexible learning and new technologies.
- Professional development of teaching staff regarding the effective use of web conferencing tools.
- Continue to implement consistency of Learnline templates, based on a discipline model, with design input from specialists in graphic design and educational design.
- Ensure that effective learning experiences are delivered that reflect current online technologies, staff competencies, access to technology support and universal accessibility requirements.
- 'Just-in-time' technical support at the discipline level.
- Provide dedicated Learnline trainers.
- Provide the conditions where innovative use of technology can be supported along with more established CDU practices in the technology.
- Graphic design support and input for all units to improve their aesthetic look and make the online learning environment more competitive with other university online courses (improve page layout, image clarity and sizing, use of fonts etc).
- Consider the impact and use of mobile technologies on the design and delivery of learning activities.
- Embedded technical and educational design support within the themes/Schools to improve quality.
- Explore the options for a centrally managed content management system to store, tag and deliver digital learning objects.
- Trial of new technologies such as e-portfolios (eg Mahara), marking software (eg Remarks).

Student demographics

Given the demographic characteristics of CDU students (the significant majority studying in distance mode , over 25 years of age) an online orientation site has been developed to assist students to make the transition to learning in fleximode. This site, known as Get Learning Online @ CDU, provides students with tips and a series of 10 WebQuest activities to enable them to navigate *Bb* and use it for successful study, communication, collaboration and assessment. The concept, design and activities were evaluated by 10 staff and 34 students and then again further evaluated by 10 students as part of the user acceptance testing for the 9.1 *Bb* upgrade. A total of 92% of the students evaluated the site positively agreeing or strongly agreeing that the site was a useful resource, was appropriate for beginning Learnline users, with the Quest activities helping them to understand how to use Learnline tools and would recommend the site to other students. Qualitative comments also confirmed this positive evaluation: "overall the tutorial was great and would be awesome for new students to engage in".

The introduction of new technologies: collaborate

In November 2011, CDU changed its online classroom system from Wimba to Bb Collaborate. This was in response to increased teaching using online classrooms, facilitated reflection of that practice through the reviews by external consultants documented in the next chapter, and enabled by new product developments in the market. CDU is the first adopter of Collaborate in Australia, but did so confidently having worked with Bb and offshore institutions to ensure robust testing.

There are a number of improvements to the system as a result of the move to Collaborate. Perhaps one of the biggest, most noticeable, differences is the interface. It features a sleeker, modern look and has a number of configurable options to enhance the individual participant experience and control of the session for the moderator. Several windows are movable and re-sizable such as the chat box, audio & video box and the participant view.

Audio and Video functionality has also improved. Moderators can setup a session to allow between 1 and 6 talkers at a time while Wimba did not have a talker limit. This function enables the moderator to control the flow of conversation better. In addition, a session can also allow between 1 and 6 participants to show video at once, while Wimba was limited to only one participant video at a time.

The whiteboard features in Bb Collaborate are also much refined compared to that of Wimba Classroom. The tool allows participants to create text, shapes, built in and customizable clip art, and an animated cursor display. More than that, the whiteboard is object-oriented, which means you can move, resize and manipulate the various objects after they are created.
In Wimba, the configuration wizard must be run outside of the session or prior to joining. In Bb Collaborate, the wizard can be run inside the session at any time. In Bb Collaborate, the audio is buffered and allows participants to "catch up" from a slow or poor connection issue.
In Wimba, the session tends to cater to the lowest common denominator regarding connection speed. In Bb Collaborate, each participant selects their own connection speed and the server pushes content accordingly.
There are also a number of completely new features in Collaborate:

- A web tour which allows the moderator to share specific websites so that participants can follow along;
- File Transfer to upload files and easily push the files to participants during the session;
- Ability to upload video, audio or flash files and push live during the session;
- Ability to create quizzes to push out to participants during the session. Results are graded immediately and can be saved;
- Moderated Chat where participants can chat privately with each other but moderators can view if desired;
- Activity Indicators that show whether someone is typing, talking, annotating, etc;
- Advanced Polling, enabling participants can respond to polls such as Yes/No or A, B, C;
- Plan, a separate application that allows moderators to create session plans ahead of time; and archive

Bb Consulting Services provided extensive training opportunities to CDU staff on Collaborate as well as augmenting training opportunities for Learn 9.1 SP6.
In summary, the DSA project has resulted in a major turnaround in the University's Learning Management System (LMS). Upon commencement of DSA, the LMS was unstable, the cause of significant dissatisfaction among staff (and some students), and not always compatible with teaching and learning requirements. Now the system is stable, favoured by staff and students, and capable of not only meeting but also expanding our learner engagement needs.

Challenges

The main barriers to engagement of staff in supporting activities related to fear and perceived lack of control over the teaching and learning environment when face to face delivery moves online. This was coupled by the perceived dividing line between the need to teach both internal and external students and difficulty in perceiving how to do both together without disadvantaging one or the other.

The findings from these consultations were fed into a formal needs-analysis process facilitated by two Bb consultants resulting from focus group meetings with around 20 central support and 30 academic staff and produced an overall e-learning training plan for CDU.

Their recommendations addressed the following:

- Faculty/Academic Training Strategies:
    - increase professional development for Bb trainers and support staff
    - establish quality standards for course design and facilitation
    - expand training materials and training opportunities for academics
    - provide faculty training incentives
    - form a Bb liaison network.

- Faculty/Academic and Student Support Strategies:
    - structure a cohesive academic technologies training and support team
    - add Bb-specific help desk personnel to the existing help desk team
    - create a knowledge base to provide students and academics a "one-stop" solution to questions.

Outcome of the peer review process: observable change

In all theme areas there was observable change, although this varied according to staff readiness to change themselves, or their approaches to learning and teaching or adopt new technologies. Staff workloads and continual staff turnover are factors that continue impact on the sustainability of any changes made and the opportunity to embed and systemise changes. Nonetheless, there has been observable change in:

- the navigation and structure of Learnline sites;
- staff awareness of the potential of Learnline to be more than a repository for content;
- the approach of some staff to their communication with distance students, so as to better engage students, to support and facilitate learning, and retain students;
- more effective and informed use and evaluation of technology;
- choice of assessment and activities, showing in some areas improved constructive alignment of learning outcomes, activities and assessments;
- expression of learning outcomes, which more precisely indicate what it is that academics expect students to do at the various undergraduate levels; and
- greater awareness of the needs of distance and online students, in terms of support and engagement.

Reponses from theme leaders or Heads of School indicate that the majority of staff were positive about the peer review and consultancy experience, although it is clear that staff need much more support in building units in Learnline, in formatting and shaping content and activities so that they better meet best practice guidelines in flexible learning and use of educational media.

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The digital tutor: accepting to lose control and make mistakes

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Pilot studies using online social networks within a French University postgraduate course were conducted over a five-year period in order to explore and evaluate the relative advantages and challenges of such tools for tertiary education. Students were following a curriculum as part of a second-year predominantly off-campus Master's degree. In this paper, after having defined pedagogical *eLearning exchange networks* (*eLEN*s), and how they can be implemented by using *social learning objects*, the latest case study analysis is focused on providing solutions for effective tutoring in the digital era.

Keywords: educational paradigms, social networks, collaborative learning, mediated discourse.

Introduction

Seven pilot studies using online social networking tools within a French University postgraduate course were conducted over a five-year period (2007-2012), in order to explore and evaluate their relative advantages and challenges for tertiary education. Students were enrolled in a second-year Master's degree ("Knowledge Management, training and digital mediation", Linguistics Department, Paul-Valéry Montpellier 3 University: http://www.univ-montp3.fr). The year-long curriculum was predominantly off-campus, with a compulsory one-week intensive on-campus session between semesters (in December or January), and was the first of its kind to be introduced in the French higher education system in 2004.

A collaborative learning environment and an online community were established and students were invited to use them to discuss pedagogical issues related to eLearning practice, and, in the more recent second-generation case studies (Panckhurst & Marsh, 2009), to organise completion of structured role-play projects. Over the five-year period, three different social networking tools were used: Ning (www.ning.com), grou.ps (http://grou.ps) and, most recently, Google+ (https://plus.google.com).

In this paper, after having defined pedagogical *eLearning exchange networks* (*eLEN*, Marsh & Panckhurst, 2007) (§ 1), and how they can be implemented with "social learning objects" (Weller, 2008) (§ 2), the latest case study, which took place from October 2011 to January 2012, is discussed (§ 3) in order to provide insight and sustainable solutions for effective learning and tutoring online (§ 4).

Social networks, pedagogical networks

An *eLearning exchange network* (*eLEN*) corresponds to the idea of formatting online social networks for pedagogical practice (Panckhurst & Marsh, 2011). In order to differentiate clearly between social and pedagogical networks, *Facebook* was excluded from the initial case studies, and *Ning*, which had just developed its public networking system at that time, was chosen not for novelty, but because it already had a French interface in 2007. Private group (and subgroup) networks requiring enrolment could also easily be set up using this tool on the open Web, hence setting aside any institutional VLE/LMS issues (Panckhurst & Marsh, 2008). In the first eLENs, online forums in which students were required to engage and discuss pedagogical issues related to eLearning practice were initiated, and a student-centred 2 or 3-phase period was adopted (Panckhurst & Marsh, 2011):

1. preliminary getting-to-know-each-other phase (initiated and conducted by the tutors);
2. compulsory discussion threads phase (designed and led by individual students with peer-group student participation);
3. an optional final third tutor-led phase.

Even though the initial functioning was highly appreciated by the students, two years down the track, by 2009, a significant shift in student attitude and perceptions of the place and value of eLENs in their learning was noted. With the increase in student private use of such tools as *Facebook* and *Twitter*, it was clear that students began to expect more from a social network being used as a tool for learning.

Imposed projects as social learning objects

The tutors decided to introduce “social learning objects” (Weller, 2008) in order to “facilitate conversation, and thus social interaction” and therefore moved from peer-driven discussion thread moderation to structured imposed role-play projects (the contents of which they hoped would act as ‘social object’ stimulation), accompanied with support information and weblinks, to be completed within a strict timeframe. An initial concern was that this apparently ‘dramatic’ shift in approach could result in a loss of learner independence/autonomy (*cf.* Downes 2008, and his key concepts for network usage: *diversity, autonomy, openness, interaction*). Not so. Students appreciated not wasting organisational time, and yet still feeling they had space to create original and interactive work:

> Paradoxically, I appreciated the fact that the groups were formed authoritatively, because this avoided people aggregating with others sharing similar interests, and we just had to “make do”. (In actual fact, all of the work I was involved with took place in a perfectly calm and respectful atmosphere.) (Student A is also a teacher; author’s translation).

A second issue was related to the concern that students might slip back into a teacher/tutor-centric pattern, regularly requesting advice. This was obviously not a problem either, judging by a clearly identifiable tutor-learner “form of trust”:

> The almost total autonomy we had for completing the activities […] helped us learn how to organise directives in groups, to confront our ideas and our doubts, without having a teacher to guide us. I think that the tutors established a form of trust with the students and this was perceivable in our work outcome. (Student B; Author’s translation).

The role-play imposed projects were divided into four phases:

1. work within imposed sub-group on imposed project (2-week period, in order to read, analyse, share, exchange and compile a preliminary summary on the topic to be submitted to peers and tutors);
2. peer-led online discussion with whole group on same imposed topic (2 weeks);
3. final write-up within sub-group and hand-in (8 days, submitted both to tutors and peers);
4. subsequent peer and auto-evaluation of work submitted.

This organisation was appreciated owing to its diversity:

> Dividing the work into stages means that it’s not a “monotonous” activity amounting to researching and writing-up. The diversity allows us to see the work evolve and means we can adapt to each stage. (Student C; author’s translation).

The final productions used a wide variety of tools (traditional word-processing documents, pdf and html documents, online documents and presentation tools, e.g., Google Documents, Prezi, Opale-Scenari, mindmaps, word clusters, questionnaires, spreadsheets, slideshows, audios, videos, etc.) The peer and auto-evaluation was also considered a highlight by the students, since in French tertiary education this still remains an uncommon approach: “[…] the fact that we had access to the work produced by each group is rare, and very beneficial.” (Student D; Author’s translation).

Key criteria for learning with eLearning exchange networks (eLENs)

Siemens (2010) stipulates that learners need to experience a certain amount of “confusion and chaos in the learning process” and that “clarifying this chaos is the heart of learning”. It is paramount that they be in “control of their own learning” since “meaningful learning requires learner-driven activity”. After a five-year period conducting this sort of tutor-learner-peer collaborative work, it has become apparent that eLENS can be used successfully in tertiary education, as long as a certain number of prerequisites are clearly established. The main criteria are summarised in Figure 1 below.

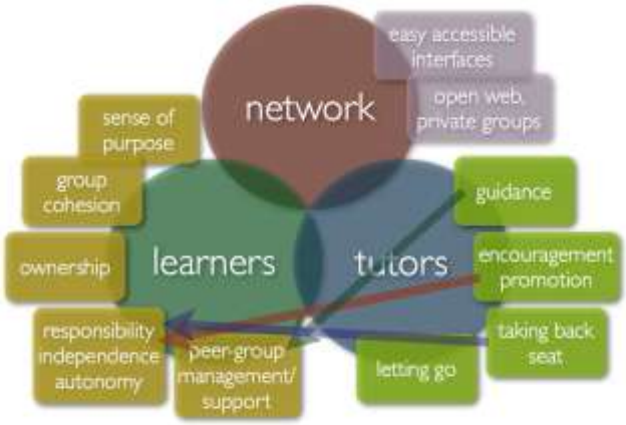

Figure 1: Our key criteria for effective learning and tutoring in eLENs

How can tutors adjust successfully?

In our experience, starting out from Marsh and Panckhurst (2006), through assessment of students' needs and recognition that more flexibility should be introduced into the curriculum, learners have been gradually taking *responsibility* for their own *autonomous/independent learning*, *sharing*, *peer-support*, *creation*, and they are in fact surfing the digital waves quite readily now. Weller (2011) focuses on "the digital scholar":

> Digital scholarship is more than just using information and communication technologies to research, teach and collaborate; it also includes embracing the open values, ideology and potential of technologies born of peer-to-peer networking and wiki ways of working in order to benefit both the academy and society. (Weller, 2011).

But how can "digital tutors" adjust? What positions, attitudes and roles do they need to adopt? As we know, "besides being experts in their respective academic disciplines, [Web] 2.0 lecturers have to be equipped with the necessary professional competencies (cognitive, teaching, technology, communicative, emotional, etc.) to successfully rise to the challenge of their duties in the 2.0 era." (Del Moral & Villalustre, 2012). But to succeed fully in the digital age, tutors also need to make sure the 6 steps indicated in Table 1 are carefully followed when organising online eLENs.

Table 1: Our 6 important steps for successful digital tutoring in eLENs

1.	Spend initial time carefully setting up and structuring the eLEN.
2.	Initiate ice-breaking activities (including surprise activities that create suspense) so that students can gain confidence, take ownership and feel trusted.
3.	Introduce structured imposed activities and stringent timelines.
4.	Make sure two tutors work together on each online course; this is important, so that they can provide support for each other and decide whether they should or should not intervene at precise moments.
5.	Let go of control — sit back and trust that learners, after initial tutor support and guidance, will progressively learn autonomously providing peer-support for each other.
6.	Accept and expect to make mistakes.

The most difficult lesson to learn for academics is to appreciate "the theoretical shift from instructor or institution-controlled teaching to one of greater control by the learner." (Siemens, 2008). Tutors need to take the back seat, but if they succeed in doing so, the effort is rewarded:

> This was a new, enriching experience but also disconcerting. Previously, I "reigned" [as a teacher], leaving little autonomy for students to lead their own discussions. My mere authoritative presence tended to hinder student communication. Here, a new perspective opened up. I realised that facilitating a group didn't mean imposing one's ideas, but remaining open-minded and leading skilfully. During the […] experience, I learnt to step back and delegate, so that others could readily participate. (Student E is also a teacher; Author's translation).

In our most recent case study (October 2011-January 2012), a new issue arose, related to virtual identity: several students refused to add a photo to their profile, perhaps because they felt that the shift to Google+ made them feel too virtually vulnerable. This was a novel aspect for the tutors, but they accepted this stance. However, several weeks later, one student group, who were working on multiuser virtual environments (MUVE), set up an appointment for the whole group with a person/avatar in a Second Life environment. This time the tutors, who nevertheless felt responsible for the group, were worried about the true identity of the real-life person, given that their website credentials and online information did not appear to be trustworthy. In this particular instance, the tutors sent a 'warning message' to the rest of the group. In hindsight, this was probably a mistake, and when the on-campus intensive session took place several students explained that they had felt that their autonomy, trust and responsibility had been slightly undermined on this particular occasion. The question that had arisen was nevertheless fascinating: for the tutors, identifying oneself over the Web with a photo was insignificant compared to trusting a total stranger, albeit a virtual one; for some of the students, the situation was the complete opposite.

Conclusion

Digital tutors/educators/facilitators are currently living in an era of *unease*. The paradigm shift has happened. A junior colleague who recently joined me on the second-year distance-education Master's course I run online, expressed the following: "I feel that my presence is totally unnecessary in this course; I don't know what position to adopt and it makes me uncomfortable." He subsequently suggested another colleague take his place next year, while I urged him to stay on. After hesitating for one or two months, he finally decided to stop co-tutoring the course. Notwithstanding, it is highly important to persevere. As digital tutors, we may well feel *uncomfortable*, as if we are doing very little when behind the scenes instead of being centre stage. But in *learning for the future,* less leadership and control from teachers and more ownership, responsibility and autonomy for students are crucial for learners. As digital tutors, we will gradually adjust and accept being able *to lose control and make mistakes*, learning both *with* and *from* our students — the true *future makers*.

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From shed to head: A conceptual toolkit for social sciences

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The conceptual toolkit is a heuristic device for teaching and learning key concepts and is grounded in Cognitive Load Theory (CLT). It focuses attention by stripping away extraneous material, encouraging a focus on the germane. This project brings the toolkit into virtual existence as a digitally animated interactive resource in the form of an extended metaphor. Key disciplinary concepts are represented as a 'tools' that can gain traction on data like a spanner on a bolt. Tools are acquired by learners and organized in a 'tool shed' ready for use. The tool shed allows students to organize concepts into memorable clusters; tools are organized on shelves akin to cognitive schemata in long-term memory. Subsequently learners may select tools appropriate to a specific 'job' and, extending the metaphor, these are placed into a traditional steel cantilever toolbox ready for use. Exercises then scaffold application and analysis, facilitating higher level thinking; tools are 'picked up' by working memory for application to tasks such as case study or comparison. Reflection on the suitability of tools selected allows for deeper synthesis and understanding.

Keywords: Conceptual toolkit, cognitive load, cognitive schemata, long-term memory, working memory

The metaphor of the toolkit

The 'toolkit' is an established pedagogical metaphor, with examples extending from philosophy (Baggini 2002) and ethics (Cooper 2008), to biology (Janssen 2008) proteins (Price 2009), conceptual modeling (Wieringa 2003) and urban infrastructure (NIWA 2012). The metaphor has also been extended to political thought (Roberts 2004); similarly, Heywood (2000, 2007), places an emphasis on concepts. This project extends the metaphor in a manner consistent with the lessons of CLT.

CLT and the toolkit

Mayer and Moreno propose multiple solutions to cognitive overload including "pretraining in names and characteristics of components" in a "mental model".

The tool shed: Reducing cognitive load

Stage one of engagement with the toolkit corresponds to "pretraining". This is done through acquisition and organization of tools for the shed; stocking the shed allows students to build "component models (i.e., representations of how each component works)." The shed stage requires "active processing" and encourages "meaningful learning", with students "mentally organizing the presented material into a coherent structure, and integrating the presented material with existing knowledge." Shelves in the shed are akin to cognitive schemata in long-term memory.

The toolbox: Encouraging higher level thinking

Stage two requires students to choose a small number of tools for a box appropriate to a particular job; selection and application to empirical material then facilitate construction of a "causal model (i.e., a representation of how a change in one part of the system causes change in another part, etc.). Beneficial outcomes include "better transfer" because "students know names and behaviors of system components" (Mayer and Moreno 2003). Tools picked up by working memory bring conceptual clarity to a case study or comparison.

The conceptual toolkit in Politics and Middle East studies

The toolkit reflects a teaching ethos and political commitment: that higher level thinking develops as concepts expedite analysis, analysis reveals patterns, and patterns render the complex comprehensible; and that education can empower individuals to analyse and so to read, listen or watch politics on a deeper level for themselves. The toolkit is intended to support learning within and beyond a tertiary environment.

One sample concept in Politics is legitimacy, a quality that “confers on a command an authoritative or binding character, thus transforming power into authority” (Heywood 2007: 219). For Weber, authority takes three forms: traditional, charismatic, and legal-rational (through mechanisms such as free and fair elections). Upheaval in the Arab world appears confusing. But the concept of legitimacy brings clarity, revealing deficits in the authority of Arab governments across the region and patterns in dynamic regional politics.

The toolkit is intended to have generic applicability; opening up the cognitive process to social science students in general could be done in tandem with the development of discipline specific learning skills. The capacity for ready customization is an integral feature of the resource: the ‘shed’ provides organization and storage space within which students can build a “component model” of concepts from Sociology, Social Anthropology or Human Geography as readily as Politics; the selection and application of concepts via a job-specific ‘box’ facilitates construction of a “causal model” with equally generic pedagogical value.

Development of a prototype of the toolkit is underway; a trial is planned with first year Politics students at Massey University during semester one 2013. The trial will be followed up with student evaluation using a tailored questionnaire via the Massey Online Survey Tool (MOST), plus peer review by social science colleagues from the GASP group within Massey University (Geography, Anthropology, Sociology and Politics). Feedback will inform further development of a stand-alone version that will be made publically available under a creative commons licence.

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Responding to diversification: Preparing naïve learners for university study using Time Budgets

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Government reforms have resulted in an increasing number of pathways and options for a broader cohort of students to undertake university-level study. These diverse learners need support to develop successful study orchestrations, balancing available time for learning with competing interests, such as family, leisure and employment. The Time Budget is a useful tool for naïve students to perceive course workload, understand expectations and balance their commitments. The Time Budget, in a single page, captures what students need to do, and when, to be successful in their studies. Time Budgets have proved to be a sustainable good practice initiative for undergraduate students – a tool that has made the transition from supporting face-to-face learners, to blended and fully-online learners; and from being a feature of individual courses, to whole programs and multi-university collaborations.

Keywords: study approaches, expectations, workload, online, learner diversity, university.

Introduction

Prompted by Reviews of Higher Education, such as the Bradley Review, governmental policy changes have promised to transform higher education, to 'drive improvements in productivity and create a smarter, cleaner and more competitive economic future for Australia' (DEEWR, 2009). Strategies aim to increase the diversity of learners undertaking tertiary studies, with increased representation of students from low socioeconomic status groups, students who are first in their family to university, rural and remotely-located students and students from Indigenous backgrounds (Budge, 2010). These 'new new learners' (Budge, 2010), or naïve learners, are now entering university programs of study through multiple modes, studying face to face, online, and blended courses, and are requiring formal and informal support to make this study and life transition.

Enabling naïve learners for quality learning in higher education

The quality of learning experienced by university students is influenced formally by the academic community but also, informally, by individual student contexts, or presage, such as students' prior experiences, knowledge, reasons for studying, their perceptions of the teaching and learning environment and their approaches to learning and studying (Entwhistle *et al*., 2002; Biggs & Tang, 2007). The term 'study orchestrations' was coined to describe those individual study approaches, chosen by a student, based on their perceptions of the learning context (Meyer *et al*., 1990a). Supporting students to develop successful formal and informal study orchestrations is important to student persistence and retention in university level study (Anderson *et al*., 2011) and such strategies become more pertinent when system changes promote the diversification of the learner cohort.

Shaping perceptions of workload and approaches to study

Naïve learners, although feeling digitally connected through social media, may struggle to focus on their studies without sufficient guidance (Powers, 2010). A known motivator for undergraduate students' approaches to the quality and quantity of study is their perception of course workload. Excessive workload prompts plagiarism, surface approaches to learning and results in poor quality learning outcomes (Jones, 2011; Biggs & Tang, 2007; Kember 2004; Trigwell & Prosser,1991). Techniques for tallying student workload, by evaluating the difficulty of reading materials that two thirds to three quarters of students could satisfactorily complete, have been devised (Lockwood, 2005). University Assessment policies can also regulate the amount of workload across courses - for example, at the University of South Australia, a standard 4.5 unit course, has been equated to approximately 159.5 hours of student effort and 4500 assessed words (UniSA, 2012; requirements 1.2.2 and 1.2.5c). However, it is essential that naïve learners also perceive what this standardised workload entails and that it is achievable.

Successful strategies, that assist in conveying these perceptions to naïve learners, are required (Kember, 2004).

Introducing the Time Budget

A sustainable tool to help naive learners develop positive attitudes and approaches towards studying at university is the Time Budget. Time Budgets are a visual map of all that the student needs to do, week by week, across the period of study. The Time Budget was initially employed in introductory physics courses a decade ago, and since then has been incorporated in a variety of engineering courses, shared between universities in a cross-institutional blended learning project (Blackmore and Kane, 2010; Quinn *et al.*, 2012) and more recently, has been incorporated across all units in a mostly-online Open Universities Australia (OUA) Associate Degree in Engineering (James *et al*., 2011). The main aim of using Time Budgets has been to help students to adopt successful university-level study orchestrations for a given course.

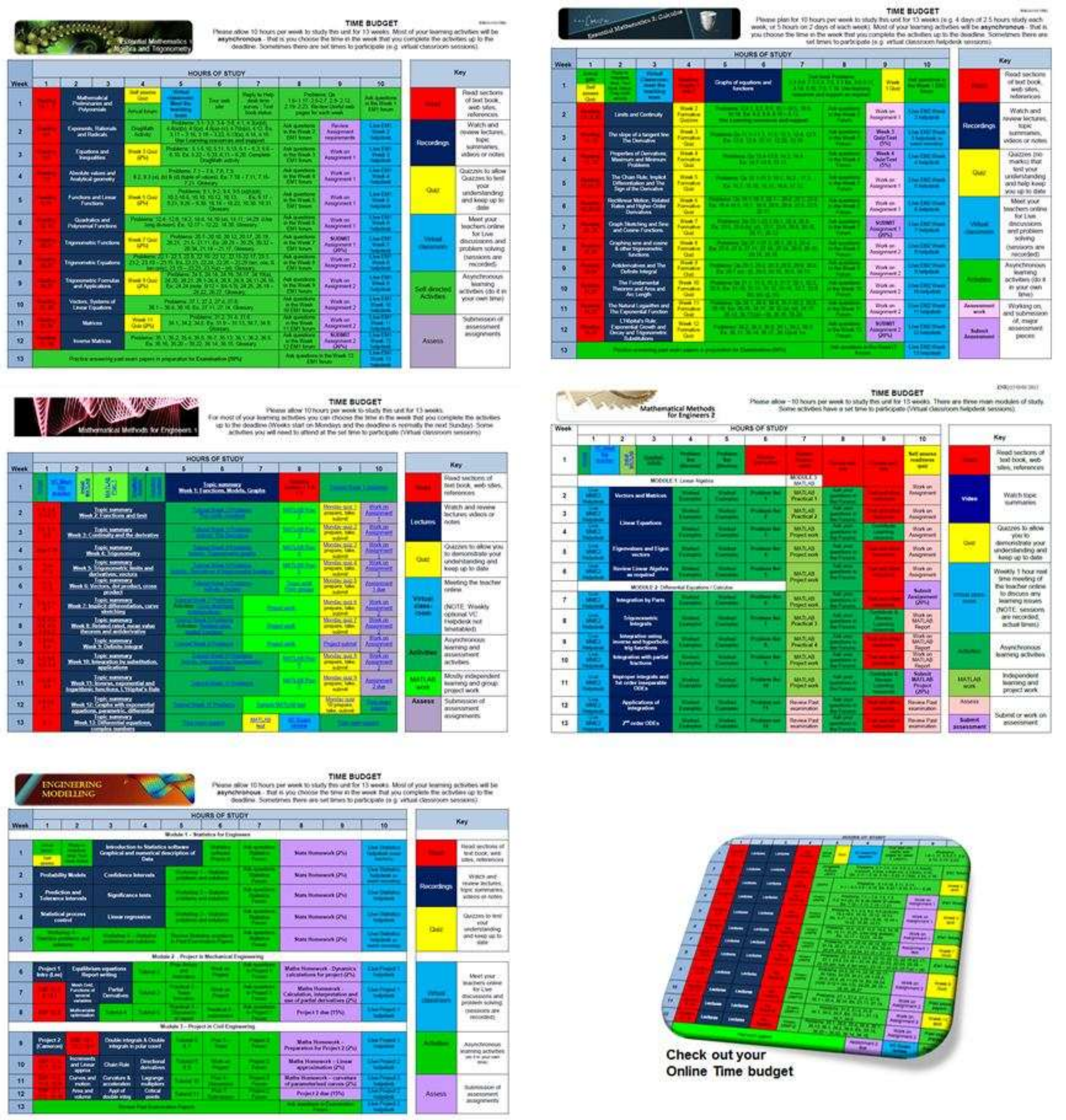

Figure 1 – Time Budgets from the 5 Mathematics courses in the Associate Degree in Engineering and the Time Budget logo used in all Units

Time Budgets emphasise time on task and task type and initiate the communication of expectations for high performance, two recognised principles of good practice in undergraduate teaching (Chickering & Gamson, 1987; LTU, 2010).

> Time plus energy equals learning. There is no substitute for time on task. Learning to use one's time well is critical for students and professionals alike. Students need help in learning effective time management. Allocating realistic amounts of time means effective learning for students and effective teaching for faculty. … Expect more and you will get it. High Expectations are important for everyone - for the poorly prepared, for those unwilling to exert themselves, and for the bright and well motivated. (Chickering & Gamson, 1987).

Case study: Time Budgets in an Associate Degree in Engineering

Time Budgets have been used in all the units prepared for a mostly online version of an Associate Degree in Engineering, delivered in partnership with OUA (James *et al*., 2011). The Time Budget documents were initially drafted by Project development staff in consultation with unit coordinators after interview and consideration of existing resources and environments. Iterative development of Time Budgets then occurred, in response to feedback from lecturers, tutoring staff, practical supervisors and, of course, students.

Paper-based versions of the final version of each unit's Time Budget were mailed to students on enrollment to be used as posters in their study space to provide a sense of the whole unit's requirements. The Time Budgets were consistently colour-coded to reflect when student learning activities are synchronous, or asynchronous, formative, or summative, instructive or interactive. In addition, online versions of the Time Budgets, with direct links to each of the activities, were included in the unit's web sites, to streamline students' navigation of the online environment to complete the required learning activities.

To support students using Time Budgets effectively, introductory quizzes, that allow students to self-assess how well they understand what is expected of them in the unit, included items that highlighted the importance of the Time Budget as an ongoing organisational tool. Students were prompted to use the document to negotiate adequate time for learning with their family and employers, who may be unfamiliar with the demands of university level study. Students were encouraged to identify early those timeslots, in their working week, that would allow them to learn for approximately 10 hours per week for each unit. Students were reminded that if they exceeded the time frames for independent problem solving allowed on the Time Budget, that it was time for them to change their approach to learning, by using Forums, virtual classroom sessions or Dialogue, to discuss their learning, rather than persist alone.

Time Budgets are not just for new learners, but are also used across programmes of study, inducting students to more advanced approaches to learning. Figure 1 shows a series of Time Budgets for the 5 mathematics units within the Associate Degree in Engineering. The first two units, *Essential Mathematics 1 & 2*, are more-structured foundational level units, with content, quizzes and problem solving activities. The second two are first year engineering level units, *Mathematical Methods for Engineers 1 & 2*, with time allowed for students to collaborate on an engineering project. The proposed Time Budget for the fifth unit, *Engineering Modelling*, contains separate modules for more independent study and two mathematical modelling projects, one addressing a civil engineering problem and one a mechanical engineering problem. Laying out the units as Time Budgets quickly conveys the macro-level learning designs of this series of units.

Aside from benefits for our students, Time Budgets have also proved to be a centre piece for the negotiation of redevelopment of units with developers and the unit's teaching team. By focusing on what students need to do, as reflected in a Time Budget, rather than what teachers need to teach, the Time Budget appears to be a more meaningful mechanism for staff to identify if the proposed learning experience of an online unit parallels that of its face to face equivalent. Also, the limitations of existing courses, such as heavy workload or an overly-didactic focus, become clearly evident, to all concerned, when mapped as hours of student work on a Time Budget. Research is currently underway to more fully investigate the role of Time Budgets in shaping successful learning approaches in our increasingly diverse student cohort as well as a parallel study on their impact in supporting staff conceptualise effective learning designs as a part of the course redevelopment process.

Conclusion

Australian Government Policy changes and flow-on higher education responses (James *et al*., 2011) have opened the door to allow a more diverse student cohort to start university. To ensure that this open door is not a revolving door, universities need to employ strategies, such as the Time Budget, to help induct naïve learners into successful study orchestrations, or the desired improvements in Australia's productivity, through the growth of a skilled work force, will be unlikely to be achieved.

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MUVE-ing pre-service teachers into the future

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This paper discusses our experiences of integrating a Multi-User Virtual Environment (MUVE) called *Quest Atlantis* into a pre-service secondary science education unit. The use of educational MUVEs as teaching tools is accelerating, so it is crucial that pre-service teachers develop some expertise with these and related technologies. We outline the processes we followed in embedding *Quest Atlantis* into the content and assessment of the unit, the results of this initiative and its implications for integrating MUVEs and other ICTs into teacher education programs. Challenges such as limited time and expertise, demands of a busy teaching program, and the need for continuous specialist support need to be overcome for sustainable integration of MUVEs and related technologies into pre-service teacher education. This is particularly important given the potential of pre-service teachers as change agents in schools, and the imperatives of the ICT-related National Professional Standards for Teachers and the Australian Curriculum.

Keywords: MUVE, Virtual World, Quest Atlantis, Pre-service teacher education, MMOG

Introduction

Recreational and educational use of Multi-User Virtual Environments (MUVEs) is accelerating in many parts of the world and teachers as future makers need to acknowledge and harness these technologies. The features defining most MUVEs include 3D graphical interfaces and chat tools that facilitate synchronous communication between multiple networked users represented by avatars (Dieterle & Clarke, 2009; Hew & Cheung, 2010). Many current MUVEs used in gaming contain highly engaging and motivating narratives that make them very appealing to users. There are more than 100 virtual worlds in existence or under development, and school leavers entering tertiary education are likely to have avatars and be using applications blending virtual worlds, games and social networking (de Freitas, 2008).

The same characteristics of MUVEs that make them so popular with adolescents also contribute to their enormous educational potential. Educational MUVEs blending online gaming and narrative with rich curriculum based content are becoming more widespread as teaching tools, and this increase is predicted to continue (Dieterle & Clarke, 2009; Hew & Cheung, 2010; Johnson, Adams, & Cummins, 2012a, 2012b). Examples include *Second Life*, *River City* and *Quest Atlantis*. In Australia, the increase in adoption of educational MUVEs at the school level is occurring in the broader context of the Digital Education Revolution (DER), a $2.4 billion federal government initiative aimed at better integrating ICTs into Australian schools (Department of Education Employment and Workplace Relations, 2012). The use of educational MUVEs is also accelerating in higher education institutions in Australia and NZ, as well as comparable countries such as the UK and USA (Dalgarno, Lee, Carlson, Gregory, & Tynan, 2011).

If our school teachers are to contribute to the DER by harnessing the teaching and learning opportunities afforded by MUVEs and related ICTs, it is vital they develop the experience and understanding to deploy them in the classroom. However, a global study concluded that a lack of knowledge on the part of school teachers was one of two major obstacles to integrating ICT in education (Pelgrum, 2001), and there is little evidence that this situation has changed markedly in the intervening decade. More specifically, reviews of the literature relating to MUVEs and related technologies in education (de Freitas, 2008; Kennedy-Clark & Reimann, 2010; Lawless & Pellegrino, 2007; Loveless, 2006; Schrader, Zheng, & Young, 2006) suggest that many school teachers may be less familiar with MUVEs than their students and are averse to using them and related technologies in the classroom. Some of the reasons for this are concerns about the effectiveness of these tools, as well as issues related to security, bandwidth and technology (Jones & Warren, 2011).

School teachers therefore require support and professional development in effectively integrating ICTs into their professional practice (e.g, review by Lawless & Pellegrino, 2007). It is therefore important that pre-service teachers (PSTs) are introduced to these technologies as an integral part of their teacher education programs, as argued by Fisher (2000). PSTs are more likely than their older in-service counterparts to be familiar with gaming and are often more open to using new technologies. Hence teacher education programs have a 'crucial role to play' in facilitating the use of multiplayer games and allied technologies in school classrooms (Fisher, 2000; Schrader, et al., 2006). It was concluded by Kennedy-Clark and Reimann (2010) that the more familiar PSTs are with virtual worlds, the more likely they are to consider using them in their subsequent teaching. However, studies indicate that PST programs often do not adequately teach PSTs how to integrate technology into their teaching, and that the ICT proficiency and confidence of PSTs is limited (Markauskaite, 2007). This is of some concern, and needs to be addressed if PST educators are to fulfill their potential role as "future makers" for the education of our next generation:

> When teacher educators provide the opportunities for pre-service teachers to practice meaningful integration of technology, while gaining the insights necessary for effective thinking and problem solving, a giant leap toward better schools for the future shall have been made (Fisher, 2000, p. 112).

In order to enhance PSTs' understandings and attitudes towards ICTs such as MUVEs, many strands of evidence argue for an integrated, authentically embedded approach. The TPACK theoretical framework of Mishra and Koehler (2006), for example, articulates the close relationship between learning how to teach with technology and the pedagogical and content knowledges of the teaching and learning context. While advocating the adoption of multiple strategies, Kay (2006; 2007) cites many studies emphasising the importance of authentic teaching tasks and an integrated approach embedding ICT into the array of units comprising PST education courses, as opposed to generic stand-alone units or add-on workshops, an approach also advocated by Lawless and Pellegrino (2007). This aligns with what we know about situated cognition (Brown, Collins, & Duguid, 1989), and assessment as the driver of the curriculum for students (Rowntree, 1987).

This paper introduces a case study in which an educational MUVE – *Quest Atlantis (QA)* – was integrated into the content and assessment of a core science education unit taken by pre-service secondary science teachers., It outlines our rationale for integrating QA, describes how we embedded the technology within the unit and discusses the enablers and barriers we encountered in this process. We hope that the lessons we learned from this exercise might encourage and inform similar initiatives in the future.

Integrating *QA* into pre-service secondary science education

Context of the study

This study emerged as one of several innovations incorporated into our teacher education programs as part of the Teaching Teachers for the Future project. This is a federally funded initiative aimed at enabling PSTs to effectively use ICT in education ("Teaching Teachers for the Future," 2012). The project was undertaken by an experienced ICT Pedagogy Officer, who had been appointed on a contract to the wider Teaching Teachers for the Future project, and two members of the secondary science education team who although reasonably technologically savvy had little direct experience with MUVEs. The intended outcomes were first, for the PSTs to learn about the science education potential of MUVEs like *QA* and second, for the learning experience to contribute to their own broader TPACK.

Choice and description of MUVE: Quest Atlantis

Of the available options, we chose to introduce the PSTs to *QA* for several reasons. First, *QA* is a free, very secure scenario-based MUVE aimed at children from 9-16 years old. It is already being used in public and independent schools in NSW, Queensland, Tasmania and Victoria. Second, *QA* embeds over 1000 curriculum-based interactive quests with integrated and customizable assessment tasks in a very engaging and motivational narrative, combined with a very strong focus on social responsibility. Third, the development of *QA* was informed by theories of transformational play, which locates learners and the content to be learned in an online game-play context (Barab et al., 2007; Barab, Thomas, Dodge, Carteaux, & Tuzun, 2005). For example, learners can be scientists doing virtual water quality testing, or they can be managers, making difficult decisions about strategies for national park management. Their actions and decisions have consequences which impact on the narrative and relate to complex socio-scientific issues that mirror some of the complexity of the real world. Unlike the real world, learners can travel into the future and see the consequences of their decisions.

Notwithstanding these real strengths, there are some inherent challenges in using *QA* as a teaching tool in Australia. One is its North American context apparent in the vegetation and choice of organisms in graphics and some quest tasks. For the most part this raises few problems, however in the case of the ecological topic used in this project, an Australian environment featuring local flora and fauna would provide a more locally relevant context and better suit the syllabus outcomes. Hence, even though *QA* tasks can be customized to some extent by teachers, some experience and a reasonable investment of time would be necessary to make particular topics applicable to Australia. In addition, as part of the quality assurance mechanisms built into *QA*, teachers must gain accreditation by undertaking an online training course. While this is a very reasonable step, participating in this course does require a reasonable investment of time by teachers.

Integration methodology

For many of the reasons outlined above, we took the decision to fully integrate *QA* into one of the core science units studied by 49 pre-service science teachers (PSTs) enrolled via distance education mode. The ‘Using ICTs in science’ topic within the unit was revised to incorporate *QA*, and a major assessment task was customised around students’ *QA* experiences. The Project Officer extended her previous accreditation to enable her to train teachers, and the two science teacher educators undertook the necessary training to become accredited *QA* teachers.

The PSTs were required to download *QA* onto their home computers, and to familiarize themselves with Adobe Connect. Adobe Connect was used in the training sessions alongside *QA* as it permits text and audio communication along with desktop sharing. This provided a means of talking to students outside the *QA* application (which is text only), as well as allowing the trainer to troubleshoot any technical problems as they arose. It also allowed training sessions to be recorded. A number of *QA* training sessions were scheduled in order to cater for the PSTs’ work and family commitments. Training was coordinated and conducted by the Project Officer. Once training was complete, the PSTs were required to undertake some preliminary quests, and then progress to an ecological sustainability topic called “Taiga”, which focuses on the importance of water quality and related ecological, social and economic issues.

Taiga was chosen because many of the concepts in the unit address outcomes in the NSW Year 7-10 science syllabus. The scenario also highlights the interplay between scientific, economic and social aspects of sustainability extremely well. This was particularly appealing given that sustainability is one of three cross-curricular perspectives of the new Australian Science Curriculum. The students were required to complete part of the Taiga quest for the assessment task, though they could complete the remainder if they so desired. As well as writing about the quest itself and its applicability to the classroom, students were also asked to discuss their experiences of using *QA*.

Lessons learned

This process had some lessons for us about dealing with the challenges in deeply integrating innovative ICTs into PST education units. Time was one challenge, as it took considerable time to redevelop the existing unit and build the associated assessment task and marking criteria. This was ameliorated by some teaching relief as part of the project. The limited experience and expertise of the science teaching staff in *QA* was another challenge that was overcome through the expertise and support of the Project Officer together with *QA* support staff.

Another category of challenges related to PST access to hardware, software and expertise. Some of these related to the fact that the unit was a distance education class distributed across Australia and abroad, rather than an on-campus group in a computer laboratory. Even though all the students were familiar with the hardware and network requirements associated with studying at a distance, one student could only access a computer sporadically, and technical problems occurred trying to load the application onto the computer lab that he could access. Some experienced *QA* “hanging” and had to log out and in again. This was difficult during the training process but greatly ameliorated by having Adobe Connect running in parallel, although this seemed to cause bandwidth limitations for some users. Some difficulties were encountered with real-time access to IT support as the platform is hosted in the US. Some students with less experience than others in ICTs and/or MUVEs found the learning curve particularly steep. The training workshop series had to be repeated several times to accommodate the timetables of the PSTs, including evening sessions. None of these problems were major, but trouble shooting them required considerable time and the combined expertise of the Project Officer, science teaching staff and support staff.

In terms of the consequences of this project, it is pertinent to note that students’ experiences of *QA* and reflections on what they had learned were very positive. All students explored and gained some familiarity with *QA*, and 25 students completed all steps required to gain formal accreditation to be *QA* teachers in their own classrooms. Overall findings from analysis of in-depth interviews are described elsewhere by Doyle and Reading (2012). In summary, many of these students moved from initial resistance to appreciating the possibilities of MUVEs such as *QA*. They also recognised that they developed a range of associated ICT skills along the way. Many saw the value of the training they had received and saw a place for educational MUVEs in PST education. Standard centrally administered student evaluations of the unit were as good as they usually are, indicating that students remained well satisfied with their learning experiences in the unit.

Just as important were the impacts on two of us: the science teaching staff who were involved in this process, some of which are summarised by Reading and Doyle (2012). We learned about the difficulties that our students experienced during their training by being in-world with them, and shared many of their difficulties ourselves. We developed our ICT skills and saw the enormous potential of MUVEs such as *QA* in science teaching and learning, particularly in dealing with the thorny issue of cross-curricular perspectives in secondary education where teachers still work predominantly in their own subject silos.

In the longer term, notwithstanding the successful implementation of the project, the decision was made not to include *QA* and the associated assessment in the unit in the following year. This was in large part because the Project Officer’s project-funded contract was due to expire before the next iteration of the teaching unit. Despite the gains in understanding and experience of the science teaching staff, we could not justify taking the time from other teaching, research and administrative responsibilities to repeat the process without the vital support and expertise of the Project Officer. In addition, this left more opportunity to address some of the many other science-specific and generic ICTs that could have been covered in the unit. However, the process has undoubtedly and significantly deepened the knowledge and understanding of MUVEs for the science teaching staff, and puts us in a much better position to connect PSTs to these and other related ICTs in different learning and teaching contexts.

Discussion and Implications

The case study outlined above illustrates some of the real challenges to some of the emerging directions of teaching and learning in PST education, as foreshadowed in this conference theme. Although the project deeply embedded a high quality MUVE into a disciplinary unit, in a way that satisfied many of the characteristics of good practice suggested by the literature reviewed above, this was not sustainable in the longer term. This outcome relates to four interconnected challenges that we were not able to overcome: time demands on academic staff, limited relevant ICT expertise of academic teaching staff, tensions between breadth and depth of ICT integration in a busy PST education program, and the need for continued high quality support and professional development from ICT specialists.

Previous studies (e.g., Kay, 2006) have also indicated that time demands have posed a barrier to effectively implementing ICTs in PST education programs. A recent report addressing the challenges faced by tertiary educators in Australia emphasises the problem of time constraints, suggesting that academic staff are ‘struggling to manage existing workloads’ (Bexley, James, & Arkoudis, 2011, p. xi). Strongly related to juggling overstretched time budgets is the issue of limited relevant ICT expertise of the curriculum area specialists, which was also raised as an issue by Kay (2006). Embarking on any new learning curve is time consuming, and integrating “innovations” almost by definition stretches the time commitments and expertise of faculty staff who may not be ICT specialists. These problems in tandem relate to a consequent fear of technological problems, which are very demanding of both time and expertise, and this is another known barrier to integrating ICTs in PST education (Kay 2006).

In relation to program constraints to ICT integration, it must be noted that this initiative focused primarily on MUVEs, with ancillary use of Adobe Connect. However these are only two of a huge palette of ICTs with which PSTs should be familiar. There is a limited number of ICTs that can be covered in any depth within a disciplinary unit with several other graduate attributes to integrate, and although this project facilitated deep integration of one promising and innovative ICT, it also narrowed the ICT palette to which the PSTs were exposed. To meet the future challenges of teachers requires ongoing selective evaluation and integration of some of the rapidly expanding ICT options into teacher education. To manage this in a sustainable and representative way requires serious consideration of course structures by mapping gaps, overlaps and opportunities across programs; and maximizing complementary links between curriculum subject areas, ICT-focussed units and any central or generic ICT workshop programs. The TPACK conceptualization (Mishra & Koehler, 2006) provides a useful framework for strategic mapping and planning, and its application has been shown to have contributed to PST TPACK (Galstaun, Kennedy-Clark, & Hu, 2011; Hu & Fyfe, 2010). There is good evidence that collaborative partnerships between universities, schools and education authorities (Kay, 2007; Pegg, Reading, & Williams, 2007) are particularly promising approaches, though implementing this kind of professional development has also been shown to be constrained by time and workload constraints for PST educators, as well as the PSTs and teachers (Pegg, et al., 2007).

One of the solutions to the limited time and limited expertise of PST educators that initially facilitated this project was appropriate support and professional development. As noted by Kay (2006), there are many ways that ICTs in general can be introduced into PST education programs, but ultimately good support of the PSTs is a key access consideration, without which many other strategies would have little effect. The commitment and expertise of the Project Officer was essential in driving the project, conducting the training and troubleshooting technical problems. Without this support, the PSTs enrolled in that unit (and the PST educators running it) would not have had such a good opportunity to experience the learning possibilities afforded by an educational virtual world in science education. However, as is becoming more common in the increasingly casualised Australian higher education sector (Bexley, et al., 2011), the Project Officer was employed on short term contract, which was not able to be renewed once the project funding ceased. One-off injections of funds and short-term strategic projects can impact on the institutional ICT-related culture and knowledge base, but as we found, sustaining the impact requires sustaining the support.

Many of the challenges that are outlined above to integrating MUVEs in particular, and ICTs more generally into PST education are equally relevant across the higher education sector. However, several features of PST education programs mark them as particularly important in this regard. Preservice Teachers are indeed ‘future-makers’. They occupy a pivotal position as potential change agents in the ICT literacy of our society (Pegg, et al., 2007), with the capacity to influence the preceding generation of older in-service teachers, and future generations of school children. The importance of this role is underscored by the recently endorsed National Professional Standards for Teachers, three of which relate directly to knowledge and practice of ICTs (AITSL, 2011). Similarly, ICT is one of three cross-curricular perspectives mandated by the new Australian Curriculum. It is the responsibility of PST educators to help PSTs meet these standards and meet the curriculum requirements. It has been predicted that MUVE-like technologies will form a component of “the updating of teacher education” (Schrader, et al., 2006). This is already happening via applications of virtual worlds such as VirtualPrex project (Gregory et al., 2011). Systemic considerations of the time, expertise, curriculum and support requirements of academic staff in non ICT teaching areas would greatly facilitate the more widespread adoption of MUVEs and other technologies in PST programs.

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Designing to close the gap

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This paper reports on the initial phase of the development of a large scale online design and implementation project, known as the ACIKE Online Unit Development Project, for the Australian Centre of Indigenous Knowledges and Education (ACIKE). The project is underpinned by a design-based research framework and encompasses the design, development and staged delivery of 81 units across seven higher education undergraduate and post-graduate courses. The rationale underpinning the project is to promote Indigenous learners' participation and success in higher education, with a particular focus on the online environment, whilst providing opportunities for all students to develop the skills and knowledge to work cross-culturally in a learning environment focused on building Indigenous cultural competence.

Keywords: design-based research, educational design, Indigenous, higher education, templates

Introduction

The higher education environment in Australia is being reshaped by funding, policy and regulatory changes in line with a vision to create 'an outstanding, internationally competitive tertiary education system to meet Australia's future needs' (Bradley et al., 2008, p. x). This vision of a sustainable future entails a broadening of the participation base in higher education, particularly from groups of people currently under represented, including 'Indigenous people, people with low socio-economic status, and those from regional and remote areas' (Bradley et al., 2008: xi).

The Australian Centre for Indigenous Knowledges and Education (ACIKE) is one institution taking up the challenge to increase the participation of Indigenous learners in higher education. ACIKE is a joint initiative of Charles Darwin University (CDU) and Batchelor Institute of Indigenous Tertiary Education (BIITE) which commenced delivery of courses in 2012. ACIKE offers a learning environment that aims to 'provide pathways to build the social, human, economic and identity capital of Indigenous peoples across Australia' (Charles Darwin University, 2011a).

The ACIKE model represents a significant shift in the way in which higher education is being offered to Indigenous people in the Northern Territory and across Australia. ACIKE offerings incorporate digital technologies into the learning mix. Units of study offered in internal, external and intensive workshop modes all utilise learning materials and activities developed in Learnline, CDU's version of the Blackboard Learning Management System (LMS). The inclusion of online learning as a component of all delivery modes in ACIKE has the potential to engage Indigenous and non-Indigenous learners with each other and with content in new ways; however, this approach is not without challenges and setbacks.

Access to computers remains a stumbling block for Australian Indigenous learners accessing higher education. This reality suggests that assumptions about the benefits of the integration of technology across ACIKE courses require careful review and evaluation. Indigenous Australians experience reduced access to computers and the internet as compared to the wider community (ABS, 2008) as well as facing issues which compound access such as low levels of English literacy, the user-friendliness of the location of public access computers, and restrictions to computer usage as a result of avoidance relationships and connections to the land where public access computers are located (Daly, 2005; Nicholls, 2009; Reedy, 2010; Vodic et al., 2012). CDU's rollout of a mobile learning environment in the second half of 2012 provides opportunities for leaners to access and engage with Learnline content using smart phones, iPads and other mobile devices even when they do not have discretionary access to an internet enabled computer. The potential of the mobile augmented learning environment to enhance Indigenous student participation is highly exciting but it is too early yet to measure its impact.

The ACIKE Online Unit Development Project

This paper reports on the first twelve months of the ACIKE Online Unit Development Project which involves the design and staged development and delivery of 81 Learnline units. The first, though necessarily brief, part of the ACIKE project was spent conceptualising the design of the ACIKE online learning environment. The initial design period was informed by research and review of literature in educational design, with a particular focus on Indigenous pedagogies, as well as by the context of the project. This period was somewhat constrained by the pragmatic realities of the eighteen month timeframe for the project deliverables to be achieved and the competing agendas and power dynamics that played out in the relationship between the project partners.

The early design work led to the first iteration of the ACIKE Learnline template, which provides a framework for the development of online units, providing consistency in design, navigation and approach. The template assists academic staff in the development of units and enhances the usability of Learnline sites for students. The template provides a practical guide for academics moving into developing and teaching in the online space for the first time. The template also embodies best-practice design principles (Akarasriworn et al., 2011), a student-centred approach to learning, and is underpinned by social justice principles which are in alignment with ACIKE's goals and the broader CDU strategic aim to position the university as a first choice destination for Indigenous Australians seeking higher education and as 'a leader in the teaching and understanding of Indigenous knowledge systems' (CDU, 2010, p. 6).

The design process is underpinned by an understanding that online learning spaces reflect and reinforce 'values, ideologies, and images that are motivated inclusions and exclusions which act in the interests of particular cultural, class and gendered groups' (Luke, 1988 in Henderson, 1994, p.10). The ACIKE Learnline template is intended to provide a framework for online learning which reflects the ACIKE context and which promotes the success, retention and completion of Indigenous people in higher education courses and which provides all students with 'the knowledge, skills and understandings which form the foundations of Indigenous cultural competency' (Universities Australia, 2011, p. 181).

Rationale

Recent data show that Australian Indigenous students are completing year 12 education at higher rates than ever before (ABS, 2011; Karvelas, 2012). There are, however, significant challenges and changes required in order to ensure that school completion rates for Indigenous students match that of the wider Australian population and that year 12 completion translates to increased and equitable representation of Indigenous students in higher education. In Australia, Indigenous access, participation, success and retention in tertiary education are significantly lower than that of the general population. Australia wide, the Indigenous participation rate in higher education sits at 1.25% and would need to more than double to 3% to achieve parity compared with the total number of domestic students participating in higher education. (DEEWR, 2011a; DEEWR, 2011b)

The Northern Territory (NT) has an Indigenous population comprising 32% (ABS, 2010), and is the state or territory in Australia with the highest Indigenous population as a proportion of total population. The Indigenous participation rate in higher education in the NT of 15.63% represents students enrolled in both BIITE and CDU in 2006, prior to the ACIKE partnership, and while this is higher than other states, it is lower than the rate which would represent parity with the Indigenous population of the NT (DEEWR, 2011a). The ACIKE partnership faces the challenge of capitalising on the strengths of both organisations to design the conditions that optimise Indigenous students' access, participation, success and retention in higher education, arguably at a rate that matches or exceeds the pre-ACIKE Indigenous combined participation rate in higher education.

Design-based research

Design–based research is increasingly used in the field of technology-focused educational research. The characteristics of design-based research include situating research within an educational context and the design of an educational intervention and testing of it over many iterations and refinements. Design-based research results in reflection, theorizing and the development of practical design principles which may have wide application.

In many respects design-based research is similar to action research in that it 'seeks to increase the impact, transfer and translation of education research into improved practice' (Anderson & Shattuck, 2012 p.16) although design-based research has the potential to be wider reaching than action research as it moves beyond a practitioner researcher approach to one that involves a design team which includes partnerships between practitioners and researchers. Despite this potential, most design-based research literature reflects small-scale educational innovations and interventions (Anderson & Shattuck, 2012; Barab & Squire, 2004) rather than larger-scale interventions with widely applicable outcomes. The scope of the ACIKE Online Unit Development Project, with a focus on the design and delivery of 81 units, has implications for online unit design and delivery within ACIKE and potentially more broadly across CDU and BIITE. The scale of the research in testing a ‘disrupting innovation’ (Anderson & Shattuck, 2012, p. 24) pushes the boundaries of design-based research and will potentially lead to new understandings of what works for Indigenous learners in the online environment in the ACIKE context as well as developing theoretically grounded design principles which address broad systemic issues to do with inclusion and exclusion of Indigenous knowledge and issues in a wide range of university courses.

Methods

The development of design-based research is characteristically informed by a mixed method approach to data collection, including the use of qualitative and quantitative methods. Design-based research is a process with the focus of data collection methods changing as the research progresses through iterative phases of development, with qualitative methods used primarily in the early phases of design, implementation and preliminary evaluation, and quantitative methods introduced ‘as the design is re-evaluated, refined [and] scaled up’ (Bowler & Large, 2008, p. 41).

In the early phases of the ACIKE project a review of literature and semi-structured interviews with Indigenous students already using Learnline at CDU provided focus for the initial design of the ACIKE Learnline model and the subsequent template which was designed to guide unit development in the LMS. Feedback from a focus group comprising of BIITE and CDU staff was used to refine the initial template design prior to implementation by the ACIKE Online Unit Development Team in partnership with academic staff from BIITE and CDU. The development of the first 38 ACIKE Learnline units, based on the initial template, occurred in preparation for delivery in Semester 1 2012.

Evaluation of the first phase of the project is planned but has not yet commenced. Evaluation will encompass review of the design process, the ACIKE Learnline model and template, and evaluation of individual ACIKE Learnline units. An instrument to evaluate exemplary Learnline units at CDU, currently under development, will be used to review individual ACIKE Learnline units and as a tool for providing feedback to academic staff to guide iterative development of online units. Subsequent cycles of evaluation will include interviews with academic staff, tutors, students, members of the ACIKE Online Unit Development Team and others involved in the project. The range of data collection methods and sources of data will assist in providing triangulation of research findings and thus support the validity of the design principles that emerge from the project.

Reflections

As the first phase of the ACIKE Online Unit Development Project nears completion, and formal evaluation has not yet commenced, it is too early to reflect on the research findings or to divine the final design principles that may emerge. The following section, however, presents some reflections on key elements of the project to this point.

Alignment of priorities and focus of project partners

A major innovation such as the ACIKE Online Unit Development Project requires alignment of direction and focus from the leadership and staff of the project partners from the beginning of the project. As with other recent design-based projects the issues of ‘project structure and power relations and negotiations aimed at realising conditions for real partnership’ (Leeman & Wardekker, 2011, p. 313) were possibly not given sufficient consideration prior to the commencement of the project. In the ACIKE project a shared understanding of the project goals, and processes to achieve these, were negotiated and articulated through a project plan. In addition, a communications strategy was put in place to ensure formal communication and reporting processes were in place at all levels of the project. Despite this, the articulated vision for the project has been impacted by the partners’ differing political agendas and assumptions of entitlement and ownership. In addition, differing priorities on issues such as staffing and workload management have impacted on the timely achievement of the project milestones.

Co-operative diversity

The ACIKE project has benefitted from a rich array of formal and informal collaborative partnerships, including those within the ACIKE Online Unit Development Team itself. These have provided opportunities for creativity and innovation in the project design and implementation. A defining characteristic of design-based research is that it involves collaborative partnerships between researchers and practitioners (Anderson & Shattuck, 2012).

This recognizes that any individual will not have all the knowledge to negotiate the complexities of research, design and implementation nor the diverse range of knowledge and skills needed for successful innovation and change implementation. The progress made in the ACIKE project is characterized by a high-performing team which has leveraged diversity of experience and background between practitioners and the project team and channeled this into the project.

Teacher preparation

Findings from a recent design-based research study advise that 'for any major innovation to succeed, the teachers involved need to be adequately prepared and to be in a position to make a difference' (Leeman & Wardekker, 2011, p.324). In the ACIKE project, training of teachers to use Learnline, the ACIKE template and in teaching and learning in an online environment was conducted concurrently with the initial design phase of the project. There was little time for ACIKE staff to prepare for the new learning environment, and unit development for the online environment has been, in most cases in addition to teaching and administrative responsibilities. This had an impact on the opportunity for systematic and consistent development of quality online units and on the timeliness of unit development.

Conclusion

The ACIKE Online Unit Development Project is an example of a large scale educational innovation underpinned by design-based research. The scale of the project and its application across courses and disciplines provides the opportunity for the emergence of theoretically grounded design principles, refined in the context of ACIKE, which will potentially impact on online course design across CDU and more widely to broaden participation in higher education by Indigenous students. The project aligns with the Australian Government and CDU's vision of broadening educational participation to groups currently under-represented in higher education. The vision of increased participation by Indigenous students in ACIKE is yet to be realised. Indeed, the project has been characterised by the messy reality of research conducted in the 'buzzing, blooming confusion of real-life settings' (Barab & Squire, 2004, p. 4) where it has suffered set-backs linked to the competing agendas of the project partners and seemingly impossible time constraints. Against this backdrop the design, development and delivery of the first phase of ACIKE Learnline units has been achieved, with ongoing development, trialling, evaluation and iterative development of the ACIKE Learnline template continuing. The contribution of this project to ACIKE's vision of providing pathways and building sustainable futures for Indigenous Australians is anticipated to be significant, however, the claims about the potential of new models of delivery and approaches to learning and teaching in the online environment in the ACIKE context are yet to be fully implemented and evaluated.

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Digital communities – contexts for leading learning into the future?

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In 2011, a robust, on-campus, three-element Community of Practice model consisting of growing community, sharing of practice and building domain knowledge was piloted in a digital learning environment. An interim evaluation of the pilot study revealed that the three-element framework, when used in a digital environment, required a fourth element. This element, which appears to happen incidentally in the face-to-face context, is that of reflecting, reporting and revising. This paper outlines the extension of the pilot study to the national tertiary education context in order to explore the implications for the design, leadership roles, and selection of appropriate technologies to support and sustain digital communities using the four-element model.

Keywords: digital, interaction, collaboration, leadership, community of practice

Introduction

McLuhan's (1968) claim that we live in a "global village" has certainly proved correct. Digital communities can provide opportunities to engage with a national and international community of learners or colleagues around a particular domain of practice. However, research and experience reveal that many of these digital communities are not sustained, and the authors propose that effective leadership and a sound design framework may be the key elements for success.

This work-in-progress builds on research conducted with an established three-element model that has proved robust to guide campus-based, face-to-face Communities of Practice (CoP). This initiative has been successfully operating at the University of Southern Queensland (USQ) since the pilot project in 2006 and the number of successful CoPs has grown to twenty (McDonald, 2010; Star & McDonald, in press). The three-element model structures 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).

In 2011, the three-element CoP model was trialled in a digital environment with the ascilite Community Mentoring Program (Reushle, 2011). Outcomes of that trial suggest that appropriate leadership in a digital community can create the conditions of motivation (inspiring members to be involved), attachment and identity (keeping members involved). The authors are extending the trial to include national digital communities, researching both the design and leadership aspects of digital communities. To effectively support the digital communities, appropriate technologies will also be identified.

Moving from local to digital communities

Participation in communities of practice builds on the premise of social learning theory that we are social beings, who learn best in social contexts (Vygotsky, 1978; Wenger, 2010). CoPs can foster peer interaction, changes in practice and build learning communities. At USQ, the three-element model of growing community, sharing of practice and building domain knowledge has been used as a unique organising framework for CoP gatherings and has provided an effective working model for professional development to support academics in the reshaping of higher education theory and practice (McDonald & Star, 2008). Communities of Practice do not have formal institutional structures or hierarchical leadership and reject meeting-style activity, preferring to refer to any synchronous activity as gatherings. The focus for any activity generally emerges 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 ideas and resource, debate and build expertise within a safe and supportive community. Six years' of experience and research in the Australian context by a co-author of this paper has identified that leadership (as opposed to "management") is a crucial element for CoP success and sustainability (McDonald & Star, in press).

Learning and teaching in higher education is changing rapidly to address the imperatives of digital futures. Developing knowledge and experience of how to effectively lead and support digital communities is critical to enhance skills and practice that can be applied across diverse learning and teaching contexts. However, in an ever-increasing digital environment (influenced by events such as the roll out of the National Broadband Network, increasingly diverse cohorts of students, collaboration with colleagues across the world), it is imperative that educators have the confidence, skills and motivation to effectively employ digital communities in their daily work. It is also critical that they model the effective use of digital communities for their students and address the disconnect highlighted by Ohler (2010) who notes that many educational systems still force learners to have "two lives", their "traditional educational (lives) within school" and outside of school, their "digital lives".

In 2011, the USQ three-element model was trialled in a digital environment with the pilot ascilite Collaborative Community Mentoring Program. A preliminary evaluation of the pilot revealed that the digital CoP enabled peer support and collaboration by providing access, convenience, flexibility, utility, speed, and cost-effectiveness. On the other hand, some participants indicated a lack of sustained engagement with the community. One participant noted the difficulty in "making the program a high priority. It kept slipping down the list of 'things to do'. I often felt distracted from my project goals and, due to conflicting demands on my time, this made me feel frustrated that I could not progress my project outcomes. Although I felt fully supported, I was not fully committed" (Reushle, 2012, p. 5). Further informal investigation of these issues suggests that the effective operation of digital communities also appears to be highly dependent on visible, consistent and astute leadership. CoPs have emerged as a non-hierarchical structure that attempts to re-engage academics in learning and collegiality and yet, there is little research about leadership and role definition within such structures.

The evaluation also revealed that the three-element framework, when used in a digital environment, required a fourth element, that of reflecting, reporting and revising, something which appeared to happen incidentally in the face-to-face context. This four-element model (Figure 1) provides the basis for the design of a digital community and will now be tested for application to support productive connections in other Australian tertiary contexts.

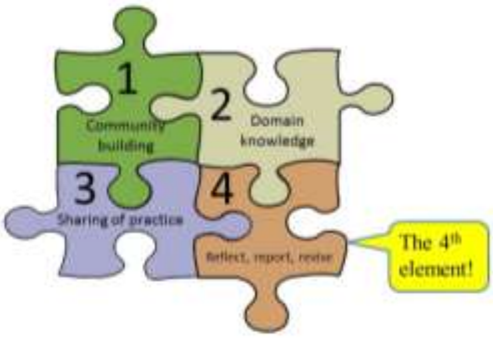

Figure 1: 4-element Community of Practice model

The digital community design and research plan

The authors will proceed through an iterative, reflective, action learning approach. The four-element model - community building, sharing practice, building domain knowledge, and reflecting, reporting and revising - will provide the design framework for the next stage of the digital communities' trial. Collegiate structures, including CoPs, seem ideally suited to the style of leadership espoused by Kotter (1990, cited in Anderson & Johnson, 2006, p. 3) who suggests that "leadership is about influencing and engaging others to effect change". Thus, the role of leadership in community building, orchestrating the sharing of practice and the building of domain knowledge and expertise are important for CoPs to lead change and transform practice.

Leadership of digital communities must also recognise the special conditions of this social, community-based form of engagement. Facilitating community is not a static, one-time event related to switching on an electronic platform or suite of technologies. There also seem to be a number of significant questions to be answered relating to the digital literacy skills of the community members and what is regarded as productive engagement within a digital community, particularly the affective level of that digital literacy. Do people feel attached to online collaboration sufficiently? If so, which people and why? At some level, leadership may fail if those who are to be part of that digital community are not in tune with the modality of interaction, even while agreeing to its importance. Do digital communities bring members closer or, for those less experienced in the digital environment, can the very tools being used lead to a greater sense of separation? What is the fit between engaging in a digital community and the learning to be a member of that community (where learning may be the sense of becoming adept at its modes of operation)?

While technologies can assist in providing a platform for communication and collaboration, even more important is the social construction of the community. The technical architecture supports the community, while the social architecture enlivens it. The roles, processes, and approaches that engage people - whether face-to-face or online - are essential in relationship building, collaborative learning, knowledge sharing, and action. Together, technical and social architectures create the container for the community (EDUCAUSE, 2012). Through mediated interaction, distributed in time and space, with many less formal markers of community, the environment tends to involve more numerous, but weaker ties between participants and ensuing bouts of passive engagement or occasional bursts of activity. This apparent weakness, compared with more traditional communities can also be a strength, where leadership focuses specifically on promoting the ties between people, based on common interests and affiliations at the individual level.

The authors propose that the tenets of distributed leadership (Scott, Coates, & Anderson, 2008) may be more appropriate for digital communities and investigation of participant expectations and appropriate leadership activities will be a focus of this research. A crucial feature of distributed leadership is a focus on empowering colleagues that leads to capacity building. Through the practice of distributed leadership, people at all levels engage in action and demonstrate leadership in their own areas of expertise.

The authors will review the current literature and conduct surveys to identify key leadership issues and needs of members of digital communities, and identify key informants for follow up focus groups and interviews, if required. Qualitative data will be collected through these interviews to identify key themes regarding the leadership requirements of digital communities. A number of trial digital communities are being established which will use the four-element model and be facilitated through the application of the leadership skills identified in the literature, and through the data from the surveys, focus groups and interviews.

Identification, evaluation and implementation of technologies to support the four element design will operate concurrently. Further surveys and interviews will be conducted post-pilot, with the findings used to develop a model for digital communities' leadership capacity building and the refining of the design elements for digital communities of practice.

Conclusion

The authors contend that leadership in the digital context must promote links between individuals within the community (enabling community to emerge), rather than focusing only on linking all individuals to a single collective entity, "the community". This implies that digital communities need to have mechanisms for members to share resources, ideas and expertise, thus building the capacity of its participants as well as building strategic collaborations within the community. Laycock (2012, para. 6) has noted that "many well-meaning leaders in fact strangle their communities through their zeal to direct all communication between participants through its platform" and believes that this is "unnecessary and denies the multiple ways in which we as human beings naturally interact". The aim is to foster a culture of shared ownership and commitment noting that there is strong evidence of the close relationship between shared leadership, responsibility and capacity building (Crowther, 2011). This enhances the capacity not just of one or two people but of many and enables a broad distribution of leadership functions, talents and responsibilities.

The authors will investigate the application of a four-element model, a number of identified leadership skills and range of technologies to determine which is most effective in providing a framework and platform for communication and collaboration to support the social architecture of the digital community. The project will address leadership questions and build leadership capacity for digital communities and has the potential to generate sectoral wide benefits by providing validated, generalisable examples and opportunities to influence practice.

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NPC: an online model to improve prescribing skills of health care professional students in Australia

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The National Prescribing Curriculum (NPC) is a series of case-based modules that mirror the decision-making process outlined in the World Health Organisation's Guide to Good Prescribing. The emphasis is on learners building their own formulary of preferred drugs for specific conditions thereby enabling them to prescribe confidently and rationally. The modules were developed to overcome shortfalls in basic pharmacological knowledge and prescribing skills as identified by junior hospital doctors. Problem Base Learning (PBL) has been used as pedagogical approach for the modules and includes real life case scenarios, authentic tasks and expert peer feedbacks. Learners can access the modules at their own pace and also can revisit them upon completion. We report for the first time students' perceptions of the NPC as learning resource and usability issues, and how academics are embedding the NPC modules into their units. We also discuss limitations and possible areas of improvement.

Keywords: prescribing skills, national prescribing curriculum, online healthcare education.

Introduction

The development of the National Prescribing Curriculum (NPC) was a response to the need expressed by junior doctors in Australia in 2001 (Smith et al., 2006), and prescribing errors and adverse drug reactions that remain the most common cause of injury to hospitalised patients (Nichols et al., 2008, Bobb et al., 2004, Roughhead & Semple, 2008). This percentage of error appears to be increasing and has significant consequences for patient safety (Heaton et al., 2008, Maxwell et al., 2006). This could show dissociation between lectures and clinical reality that health care professionals face when they finish their studies. This gap has been also described in other disciplines like education (Buckingham 2005; Schon 1987; Stigler and Hiebert 1999; Smith 2000). One of the possible reasons of this dissociation can be the fact that some real life situations may not be explained adequately in traditional face-to-face teaching contexts and requires a technological intervention (Reyna, 2011). On the other hand, prescribers are facing progressive demands due to more licensed medicines available, increasing indications for drug treatment, greater complexity of treatment (polypharmacy) and more elderly and vulnerable patients (Maxwell & Mucklow, 2012).

In this regard, online learning as an alternative approach could showcase effective prescribing practices, promote dialog on critical issues in the field, help students to apply theory to practice, and create enthusiasm and confidence in the learner to implement safe practices. There are other factors that could influence prescribing such the environment, team, individual, patient and task (Basket, 2010). Prescribing is an important part of medical practice but may not necessarily be a strong focus in the training of medical students or other health professionals. Safe-prescribing skills and awareness of medication errors is required by all members of the health care team, and should be a core component of undergraduate and postgraduate training programs (Coombes et al., 2008).

In order to overcome these issues, the National Prescribing Services (NPS) decided to develop the NPC as a web-based course founded on the World Health Organization's Guide to Good Prescribing (de Vries, 1994). The resource currently comprises 28 modules covering common therapeutic topics from COPD to Diabetes, polypharmacy, hypertension, lipid management, etc. The modules have been designed for individual, self-paced learning or can be used as part of small group work. Module content is written by subject matter experts and undergoes a rigorous peer-review process, similar to that followed by peer-reviewed journals, during their development. Educational designers review the content to ensure that it is appropriate for online delivery and that the tasks are meaningful and meet the learning outcomes. Evaluators at NPS design formative and summative research to gather the impact of the modules on students' knowledge construction and to find areas of improvement.

Problem Base Learning (PBL) was identified as pedagogical approach for the NPC modules. This approach was considered to be the most suitable to overcome the gap between traditional didactic lecturing and the clinical reality that their students would eventually face, so we decided to base their instruction on real-case scenarios. Students will need relevant medical knowledge to solve a clinical problem presented on the module. Since the instructors at McMaster University's Faculty of Medicine developed Problem-Based Learning in 1969 (Albanese and Mitchell, 1993; Vernon and Blake, 1993), this pedagogical approach proved to be a successful in the area of medical education. Currently, 70% of medical faculties in the US use PBL in pre-clinical years (Kinkade, 2005). PBL has been successfully implemented in various disciplines, such as architecture (Maitland, 1997), business (Stinson and Milter, 1996), education (Duffy, 1994), law (Driessen and Van der Vleuten, 2000), social work (Boud and Feletti, 1991), engineering (Fink, 1999; Woods, 1994) and physics (Wiliams, 2001).

The NPC modules have been designed as a logical progression where learners can engage in their own way with their patients, discuss therapeutic goals with their peers, choose the optimal non-drug and drug therapy, prescribe medicines and get expert feedback. Additionally, learners can advise the patient how best to use the chosen therapy and finally, test their knowledge gained using review questions built in with expert's feedback at the end of the module. After completion, the learners can revisit the modules and can print My Formulary that contains the drug classes and prescribed medicine used across the different modules.

Recently, the focus of the NPC has diversified to include other health professionals, and minor adjustments have been made to accommodate this change (e.g. replacing the specific term 'doctor' with a more generic term of 'prescriber'), but the overall structure of the course has been kept the same. It has been shown that short prescribing courses run locally by universities and hospitals enable new prescribers to develop their own personal formulary of preferred drugs for specific conditions and to improve prescribing (Bennett-Levy et al., 2009). The NPC differs from these courses with the fact that is more flexible due to the online nature and it is the only nationally available course for students and health professionals from multiple healthcare disciplines.

Research questions

(1) Is the NPC a valuable learning resource for the students?
(2) Are there any usability issues with the module design?
(3) What are academics perceptions of the NPC?

Materials and Methods

Learning Design

A typical NPC module has the following logical progression: (1) Introduction to the condition and learning outcomes; (2) context/case study that defines who and where the learner is for the purpose of the module; (3) a list of short term therapeutic goals where learner can nominate, vote and see their peers' votes; (4) expert's feedback on therapeutic goals as guidance; (5) consider a non-drug treatment and submit their answers following by expert's feedback; (6) choose the appropriate drug treatment for the condition; (7) verify the suitability of the treatment; (8) select drugs and prescribe online followed by feedback written by the expert; (9) feedback on the prescribed incorrect drugs that may cause adverse reactions; (10) monitor patient progress via multiple choice question and instant feedback from expert; (11) provide information to the patient and followed by the expert's ideas, and; (12) multiple choice quiz to give a quick review of the module. Every time learners submit their answers they will get an instant expert feedback.

The NPC follows the 3 essential characteristics of a good learning design according to Britain (2004): (1) learning is active; (2) activities are presented in a logical progression; and (3) the template is reusable. The delivery method is for self-paced learning but flexible enough to be use in face-to-face tutorials. In fact many academics introduce the modules on tutorials at the beginning of the semester and provide the login details for the students.

As the NPC content is written by content experts with vast clinical experience, the case study presented in each module is authentic. The tasks and the level of interaction that learners get involved promote a conceptualisation of the patient, development of critical thinking and problem-solving skills, considering different ideas of treatment, and meaning of feedback.

Technical specifications

We have developed our modules using Flash professional and they are hosted on a commercial Flash-based e-learning platform. Each module takes learners approximately one hour to complete. Learners access the modules through a self sign-in process, organised through their universities. The main features of the NPC website where the modules are contained can be summarised as: (1) self-registration for students; (2) drugs tool; (3) my formulary tool; (4) writing prescription tool; (5) authoring tool; and (6) monitoring tool.

(1) Self-registration for students
The educational designer at NPS creates a group for each university or organisation on the database. Inside these groups, cohorts are created upon academic request at the beginning of each semester. When a cohort is created and modules are included, the educational designers assign a course key and email sign-up instructions for students to relevant academics. Students for each of these organisations have to self-register into their university and course. The self registration page can be found at www.nps.org.au/npc.

(2) Drug tool
The drug tool is a database that is organised by condition and it is classified in drug classes. A drug class might have lots of brands of products under it. Each product comes with information such efficacy issues, safety issues, commentary and resources. Inside the drug class there are different types of products available and contain details such drug name, form, strength, directions, quantity, repeat, cost, other issues and commentary. Links with additional information are placed inside the drug tool. Most of the links comes from the Australian Medicine Handbook (AMH), Therapeutic Guideliness (eTG) and NPS website. This is an example to visualise the structure of the drug tool; *Drug Class> Anti-infectives > antibacterials > aminoglycosides > drug name: Gentamicin.* Each module has a drug tool that allows learners to choose a medicine at the time of prescription.

(3) My formulary tool
This is a centralised application that takes input from the drug tool. It stores the drug choices from students as well as their notes and in which modules they have chosen them. It also implements a My Formulary page that will display the drugs that the students have added to it (when and by which module they have added them). Additionally, the Formulary tool provides data for the Write Prescription tool so the student can choose which drugs they need to write a prescription.

(4) Writing prescription tool
This is a tool that allows students to complete and submit an online prescription with the drugs they selected for their patient in a previous step. When they submit this prescription they will get expert feedback. Learners are able to search for drugs in their formulary, select drugs for the prescription, enter doctor, patient and drug details into the prescription, preview and print the prescription (if desired) and get feedback from an expert on the correct prescription. The prescription tools have the same fields as those used in Australian public hospitals and general practice and look similar.

(5) Authoring tool
This area is exclusively for the educational designer and contains the sequence of activities covered in the learning design part. This section allows the designer to build the series of interactions the module will follow.

(6) *Monitoring tools*
This section is for academics who want to see their student progress. The grade book is a functionality that allows gathering information of the whole cohort and reports on a spreadsheet the activities of all the students inside the cohort, particularly currently visited and completed modules. This is a useful feature for academics.

Methodology

Online surveys and forms were used to gather quantitative and qualitative data. All NPC registered students at the time of the study (n=4,339) were invited to participate on a voluntary base. A link to a cross-sectional questionnaire containing 18 questions was e-mailed to students. The questionnaire captured demographics of participants, completion of modules, student's attitude and perception of usefulness. Quantitative data was analysed using SPSS v.19. Descriptive statistics were calculated for all variables. Analysis was undertaken for all questions of all applicable respondents. Qualitative responses were analysed using a structured process in which key phrases and concepts were identified, the data categorised, and recurring themes and issues recorded. NPC usage data was gathered from the server for year 2011. Due to system setup and limitations, data on usage implied a tedious manual process, which is the reason why it was done only for last year. Additional qualitative data from academics was gathered at the time they were requesting a new NPC cohort via online form early in January 2012.

Results and discussion

Demographics of participants
A total of 442 (10%) valid surveys were received and almost all respondents had completed at least one module (94%, n=417). Among the entire sample almost two thirds were female (66%, n=292). The highest proportion of respondents were from New South Wales (NSW) (28%, n=125). The next highest proportion of respondents were from Victoria (VIC) (21%, n=94) and Queensland (QLD) (16%, n=71); there was also considerable response from Tasmania (TAS) (14%, n=63).

Approximately 80% of all respondents were studying medicine. The remaining respondents were made up primarily of pharmacy students (14%, n=62) and nurse practitioners and dentistry. This makes sense as the modules were primarily targeted for medical students but pharmacist and nurse practitioners are finding the NPC modules relevant and useful for their disciplines.

Completion of modules
Although the greatest proportion of respondents indicated that some or all of the modules were compulsory (58%, n=257), it is also of note that almost one quarter of those who completed a module indicated that they were not compulsory (25%, n=109) (Table 1). A quarter of all respondents also indicated that the modules were linked to assessment (26%, n=113). Students most commonly completed 4 modules (15%, n=62). However, there were 52 students (13%) who completed all 25 modules.

Table 1: Use of the modules in the curriculum

	% (n)
Modules not compulsory	25 (109)
Some/all modules compulsory	58 (257)
Some/all module completion counted to course mark	13 (56)
Some/all modules linked to assessment	26 (113)
Other	4 (18)

Chronic obstructive pulmonary disease (COPD) was the module completed by the greatest proportion of students (64%, n=266). This is also the first module to be displayed in the series of modules which may influence the uptake and completion by students. Other frequently completed modules include chronic heart failure (59%, n=247), post-operative pain (56%, n=234) and acute pulmonary oedema in chronic heart failure (49%, n=205) (Table 2).

Table 2: Top 10 NPC modules completed

	% (n)
M1: COPD	64 (266)
M9: Chronic heart failure	59 (247)
M4: Post-operative pain	56 (234)
M8: Acute pulmonary oedema in chronic heart failure	49 (205)
M16: Polypharmacy in multiple system failure	49 (204)
M18: Anticoagulation in atrial fibrillation	48 (200)
M11: Acute coronary syndrome	48 (200)
M19: Prophylaxis of deep vein thrombosis	47 (196)
M6: Confusion in an elderly woman	46 (193)
M10: Urinary tract infection	44 (182)

Ranking of usage per module

In calendar year 2011, there were a total of 19,895 completions for all modules by learners across Australian universities from medicine, pharmacy, nurse practitioner and dentistry. Ranking of usage per module has been calculated taking into account the total number of modules completed vs. the specific module figures, for example in M1: COPD there were 1,044 learners that completed this module (1,044/19,895 *100= 5%). Data presented on Table 3 shows that the students used the modules evenly. For modules 26 and 27 the percentage of usage were low as they were new modules rolled out 6 months ago when the study was conducted. This data was crucial to decide whether we decommission modules with low usage. Our concern was that students can be overwhelmed by having to complete 28 modules as each module takes 1 hour. Although the data on Table 1 shows that only in 13% of the cases modules are counted towards course mark, so students can decide whether or not to complete the whole set of modules. It will be required in the future to ask the students what they think about having 28 modules, what the optimum number of modules would be to improve prescribing skills? For example, it could be that NPC modules need to cover more modules or fewer modules will be required for students to understand the prescribing process and to feel confident with their skills. To elucidate these questions further research need to be conducted.

Modules names are: (M1) COPD; (M2) Peptic ulceration with H. pylori; (M3) Peptic ulceration with NSAID use; (M4) Postoperative pain and vomiting; (M5) Opioid dependency; (M6) Confusion in geriatric patient; (M7) Confusion associated with alcohol withdrawal; (M8) Acute pulmonary oedema; (M9) Chronic heart failure; (M10) Urinary tract infection; (M11) Acute coronary syndrome; (M12) Chronic angina; (M13) Hypertension; (M14) Respiratory tract infection in a child; (M15) Seizure; (M16) Polypharmacy; (M17) Anaemia; (M18) Anticoagulation for atrial fibrillation; (M19) Prophylaxis in deep venous thrombosis; (M20) Adolescent depression; (M21) Analgesics in persistent pain; (M22) Glycaemic control in long-established diabetes; (M23) Long term management of type 2 diabetes P1; (M24) Long term management of type 2 diabetes P2; (M25) Insomnia; (M26) Opioid analgesics in chronic non-cancer pain; (M27) Lipid management and CVD risk; (M28) Acute mania in bipolar disorder; (D1) Facial pain; (D2) Sore mouth; (D3) Bone problems.

Table 3: Ranking of usage per NPC module in 2011

Module	No. Students completed	%	Module	No. Students completed	%
M1	1044	5	M16	1145	6
M2	852	4	M17	606	3
M3	817	4	M18	795	4
M4	881	4	M19	749	4
M5	584	3	M20	520	3
M6	799	4	M21	681	3
M7	557	3	M22	665	3
M8	964	5	M23	683	3
M9	999	5	M24	651	3
M10	746	4	M25	613	3
M11	781	4	M26	473	2
M12	663	3	M27	363	2
M13	870	4	D3	21	0
M14	531	3	D1	27	0
M15	712	4	D2	103	1

Students' attitude

The general attitude among the student responses towards the module tasks, content, relevance and navigation was overwhelmingly positive (Table 4). There was a high level of agreement (approximately 95%) that the module tasks were engaging, that the instructions easy to follow, the content clearly presented and that the modules were relevant to (anticipated) clinical experience. There was also encouraging results in regards to the module learning objectives which were found to be clear. The tasks in the modules were also found to adequately address the objectives (approximately 95% agreement). Interestingly, more than 40% of students indicated that they would not be more motivated to complete the modules if they were formally assessed. Approximately 30% indicated that the modules did not increase awareness of other NPS products, suggesting improvement could be made in the promotion in the modules of other NPS resources. There was some disagreement (approximately 20%) in the ease of navigation of the modules.

Table 4: Attitudes toward content, navigation, learning objectives and other aspects of the modules

	SA	A	D	SD
	% (n)			
Module tasks were engaging (N=415)	22 (92)	74 (307)	4 (15)	0 (1)
Instructions easy to follow (N=414)	29 (120)	66 (271)	5 (22)	0 (1)
Content clearly presented (N=414)	30 (122)	67 (276)	4 (15)	0 (1)
Relevant to (anticipated) clinical experience (N=414)	38 (156)	59 (244)	3 (14)	0
More motivated if formally assessed (N=414)	21 (87)	39 (161)	37 (154)	3 (12)
Links to other resources useful (N=415)	23 (97)	61 (255)	15 (61)	1 (2)
Increased awareness of other NPS resources (N=415)	18 (75)	51 (213)	28 (117)	2 (10)
Learning objectives clear (N=415)	21 (88)	73 (303)	5 (22)	1 (2)
Tasks addressed the learning objectives (N=417)	23 (95)	74 (302)	3 (12)	0 (1)
Easy to navigate (N=413)	22 (92)	57 (234)	18 (74)	3 (13)

(SA) Strongly agree; (A) Agree; (D) Disagree; (SD) Strongly disagree.

Perception of usefulness of NPC

Approximately 90% of learners positively responded when asked about the impact of the modules on developing critical appraisal skills and, and whether the modules were effective in testing understanding of the content rather than just memory. More than 90% of learners agreed or strongly agreed that the feedback was adequate to guide decision making. Almost all students considered the feedback from experts to be useful (52% strongly agreed and 46% agreed). The usefulness of access to peers' answers and ideas was less but at 80% agreement, the result is still very positive (Table 5). There were also 20% of students who indicated that they were not encouraged to complete the modules and may indicate room for further promotion among academic staff.

Table 5: Attitude towards module feedback, developing skills and encouragement to complete

	SA	A	D	SD
	% (n)			
Effective for developing critical thinking skills (N=412)	23 (96)	65 (266)	11 (46)	1 (4)
Tests tested my understanding – not just memory (N=414)	28 (117)	65 (267)	6 (26)	1 (4)
Expert feedback was useful (N=413)	52 (214)	46 (188)	3 (11)	0
Adequate feedback to guide decision making (N=412)	24 (99)	66 (270)	10 (40)	1 (3)
I was encouraged to complete NPC modules (N=414)	22 (92)	58 (239)	17 (71)	3 (12)
Access to peers' answers/ideas useful (N=414)	23 (95)	57 (235)	18 (74)	2 (10)

It will be necessary to gather students' perspective of what they learn as it 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 psychology (Ellis et al., 2007; Matthew *et al*., 2007; Marton and Booth, 1997; Prosser & Millar, 1989).

Academic perception of NPC modules
When we asked academics (n=38) at the time of sign up for 2012, 64% reported that they use the NPC in both 1st and 2nd semester while only 11% in 1st semester and 6% in 2nd semester. Fifty-two percentages of academics informed that they use the modules for year 4 and 5 students. Only 14% of academics were willing to help NPS with the following tasks: (1) Identifying students to give a testimonial about their experience with the NPC modules for promotional purposes (written or filmed); (2) Research and/or evaluation activities and studies involving the NPC modules; (3) Reviewing/updating the content of the NPC modules. This was not a surprise as we know academics have competing schedules. Additionally, 75% of academics who signed up for NPC in January 2012 had positive comments about NPC as learning resource, as example:

> I think NPC modules are relevant, I like the stepwise progression ... they're very thorough ... I really like the emphasis on non-pharmacological treatment to start with, they sort of encourage the student to think about the whole case and the whole patient ... they're also used by the majority of schools and universities in Australia and it's sort of good to know it's a consistent approach being used across the country.
>
> I think that the standard of prescribing both in doctors and medical students needs overall to be improved and I think that the NPC modules are doing an excellent job.
>
> The NPC is a very good resource; it presents a logical progression for students to follow when making clinical decisions. I believe it has a lot of interaction that allow students to engage with it in their own way.

Limitations of NPC modules
There are several limitations of the NPC modules related to functionality, cross device compatibility, and social presence. We are currently working on a strategy to overcome these issues.

The NPC modules have a functionality called grade book that allow academics to export an Excel spreadsheet with the list of their students and stage of completion of the modules. The main limitation of the NPC modules is for assessment purposes, not all of the interactions are captured on the database. List of short term therapeutic goals (Step 3 in sequence) and also providing information to the patient (Step 11) are recorded on a database but this is not accessible to academics on the report. Data on multiple choice questions in: considering a non-drug treatment (Step 5), monitoring patient progress (Step 10) and multiple choice quizzes designed to give a quick review of the module (Step 12) cannot be captured. Medications used by learners in different modules can be exported as PDF but academics will not have direct access to this information. All of these are technical limitations that need to be addressed in order to promote NPC modules into the curriculum as assessment tool for academics.

The NPC interface is design in Adobe Flash which is not compatible with portable devices running iOS platform (Apple devices). Adobe also announced that will not support Flash for mobile devices. These portable devices are changing the way we organise our everyday life, learning resources and tasks;

allowing us to increase productivity. Because of their portability, large display, and touch screen, tablets are ideal devices for one-to-one learning, as well as fieldwork. According to the NMC Horizon Report in Higher Education (2012), tablets have come to be viewed as not just a new category of mobile devices, but indeed a new technology in its own right. They blend features of laptops, smart phones, and earlier tablet computers with always-connected Internet, and thousands of apps with which to personalise the experience. The NMC report mentioned that the time to adoption is 1 year or less. We are currently studying the possibility of migrating our modules from Flash to HTML5, CSS3 and JavaScript in the near future. The aim is to extend cross device compatibility which will help us reach more learners and also improving their learning experiences.

It has been described before that one of the major components of student satisfaction in online learning is the levels of interaction. High levels of interaction result from highly cooperative learning environments (Simonson et al., 2012). Educators are challenged to seek and implement tools and strategies that recreate face-to-face human elements of cooperation, immediacy, intimacy that model physical classroom experiences (Gunawardena & Zittle, 1997). Social presence is the awareness of interaction partners over a communication medium (Short, Williams & Christie, 1976). The NPC modules have a weak social presence and students can only see how their peers replied on the therapeutic goals section (Stage 3) and also in considering a non-drug treatment (Stage 5). A better way to connect learners may be developing an online learning community promoted by instant messages where students can create a profile for online discussion and sharing of resources, etc. In this space learners can discuss and consider ideas and learn from each other in a constructive manner. An online learning community of users will help to create social presence, build cohesion and elevate student's attitudes, performance, satisfaction and student engagement (Ring, 2012).

Additionally, it has been reported the use of video cases in PBL scenarios to be a valuable stimulus for group discussions in medical students. Students thought the video cases enabled them to create realistic mental pictures of conditions, provided integrated pictures of patients as people, which challenged them to elaborate the cases seriously and were more memorable than text-based cases (De Leng et al., 2007). We are considering including digital video in future NPC modules to describe the case scenarios and possible patients concerning. Digital video provides a natural medium for enhancing the sense of context and realism in case studies. It can capture the complexity of real life scenarios and allow students to replay events as many times as they need and absorb important features that escaped them on first viewing (Reyna, 2010).

Limitations of the study

The study has been focused primarily with an evaluation rather than a research approach to estimate how valuable to the students the NPC is as a learning resource. Although the NPC modules follow a Problem-Based Learning approach commonly used in medical education, does not use a conceptual framework to be tested. We are planning in the future to strength our relationship within the universities involving academics in the design process of the NPC modules taking into account a conceptual framework for learning based on a constructive alignment. This will give us opportunities for future research and improving students learning experience.

Conclusions

From the data presented, it is clear that the NPC modules are valuable learning resource for students. This leads to accept the first research question we formulated. We need to promote the NPC modules within pharmacist and nurse practitioners to increase the uptake in these disciplines. It will also be necessary to further evaluate student's perception of learning. A good model could be phenomenography as has been shown to be effective when evaluating technological intervention in the curriculum.

In regards to the second research question about usability of the modules, only 20% of students indicated to have some issues navigating the modules. This could be due to technical issues like Flash player and Java platform. However, when students move to tablet computing, this may become an issue for the drawbacks that Flash has for touch screen interfaces and no compatibility for iOS devices such iPads, iPhones and iPod touch.

Overall academic perceptions about NPC modules were positive and they are up taking the NPC modules within their units, especially for year 4 and 5 students. Limitations in terms of functionality may prevent them from using the NPC modules as assessment tools. Issues with cross device compatibility, social presence and inclusion of digital video, if addressed, could have a positive impact on student's engagement and enhance the learning experience. We are looking forward to implementing these in the near future.

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Conducting and Reporting on Educational Technology Research for Institutional Impact

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The advance of educational technology coupled with competitive forces, ever-increasing digitisation, and new entrants into the Higher Education sector, has created an environment of constant change for those working within it. This paper discusses how seven people, in five institutions across three countries joined forces to develop their knowledge, skill and ability in conducting and reporting on educational technology research for institutional impact. Reviewed in this paper are a range of approaches adopted across the different institutions, considerations of which of these have been effective and examination of whether targeted communication strategies have helped overcome inherent barriers.

Keywords: educational technology research; institutional impact; reporting; higher education.

Introduction

The advance of educational technology coupled with competitive forces, ever increasing digitisation and new entrants into the Higher Education sector has created an environment of constant change for those working within it. As both educators specialising in technology and as academics utilising the technology, we have a responsibility to lead, and support those in leadership, in these times of change. We can accomplish this through our dual roles of encouraging users and assisting educational change whilst at the same time supporting academics to embrace a new educational environment. The challenges include developing our knowledge and skill as well as conducting and reporting on educational technology research for institutional impact. The authors review the approaches taken across the different institutions, consider the challenges of those approaches, reflect on the lessons learnt along the way and evaluate the effectiveness of the resultant strategies adopted.

The problem in context

With technology developing at an ever-increasing pace, the information and research on how it can be applied in education is overwhelming. Institutions are relying on technology to solve many of the current and emerging challenges in higher education. In spite of this constant change, academics are slow to adopt new technology

(Laurillard, 2010). The role of the educators who specialise in technology to evaluate the information and report to stakeholders is becoming more important. Leaders who make strategic decisions in this climate of change rely on the information we provide about resourcing and costs. Fellow educationalists are looking for information about features and functionality. Academic staff who need to buy-in as the users of new technology need information on how to apply the technology to the best advantage pedagogically as well as the potential barriers to be overcome. Clearly, there is no single approach that will secure buy-in on all those fronts. In the light of those challenges, we are exploring ways of communicating successfully, drawing on our collective experience in the field.

Multi-national collaboration – what we did

Seven people across five institutions from Australia, New Zealand and South Africa joined the ascilite Community Mentoring Program in 2012 as mentors/mentees to work collaboratively to achieve similar goals. Communication has been through *Skype*, Adobe Connect, emails, a group wiki and other online means. Since 2003, the ascilite Community Mentoring Program has been bringing people together to share experiences and develop their knowledge through dialogue, action and reflection (Reushle, 2012). The benefits of the ascilite Community Mentoring Program are to expand skills, knowledge and experience, develop communication and leadership skills, network and enhance confidence (Reushle, 2012).

The team consists of mentors from the University of New England, Armidale, and Charles Sturt University, Orange, (both Australia), who are mentoring educationalists from North-West University, Potchefstroom Campus, South Africa, University of Pretoria, South Africa, University of Canterbury, New Zealand and two from Charles Sturt University, Wagga Wagga, Australia. The two mentors are academics in ICT Education and Strategic Learning and Teaching Innovation respectively. The mentees are instructional and educational designers, an academic for research methodology programs, a flexible learning advisor and an innovation technology officer, hence defining us collectively as 'educators specialising in technology'. These seven represent a plethora of experience and knowledge.

The group meets via *Skype* and Adobe Connect because it accommodates the diverse locations, technical skills and is cost effective. A Dropbox folder enables us to share files and a secure wiki facilitated the collaborative writing of this paper. Cut-off dates helped coordinate all contributions into a seamless paper. The research question we posed as an overall theme was:

"How can we, in our different capacities, conduct our own research or keep up to date with the current research, to evaluate and report to different stakeholders on new education technologies for maximum institutional impact?"

Methodology and literature review

As a framework for organising an overview of our institutions' strategies for communicating educational technology research we drew on strategies developed by Surry and Land (2000) from Keller's (1987) ARCS model. Keller describes his original model of Attention, Relevance, Confidence and Satisfaction as "a method for improving the motivational appeal of instructional materials" (Keller, 1987, p. 2). Surrey and Land (2000) developed a framework of strategies, and it is within this framework that we consider the levels of motivation at which we reach out to our stakeholders to achieve our goals. A meta-analysis of the cases (see Table 1) was carried out to determine if there is any pattern in what works and in which type of environment. In this way we can pinpoint where each institution can learn from other institutions.

The ARCS framework, when used to motivate staff to use teaching technology, identifies reporting to grab the 'attention' of the intended audience in order to raise awareness of new technologies and arouse the curiosity. Providing 'relevance' to the particular context of staff members can be accomplished by highlighting the ways in which a technology can fulfil their present needs. To engender 'confidence' in the use of the technology an extended approach is needed in the form of training and support. Rewarding staff through awards and reporting success stories and innovations creates an environment where staff can set attainable goals, share experiences with like-minded colleagues and experience 'satisfaction' which is the highest order of motivation. Surrey (2000) writes of using Keller's (1987) ARCS model to develop strategies to increase faculty motivation to use technology. Attention gaining strategies include demonstrations and showcases, Relevant strategies; include access to equipment and mini grants for research opportunities, Confidence building strategies such as workshops and peer support, and satisfaction strategies such as awards, release time and improve teaching and research.

Reporting research to gain attention is relevant for bottom-up, top-down and sideways dissemination and can utilise technology-assisted gimmicks (bells and whistles). The message can be non-personalised to speak to a wide audience and personal involvement is negligible. The direction we report to will dictate the relevance we add to the communication, as we need different kinds of buy-in from each audience. Knowledge of the different audiences is needed and used to adapt the messages so that the intended audience can recognise themselves in the communication. Connecting people is very important (Laurillard, 2010), as is creating and supporting professional learning communities (Maor & McLoughlin, 2005; Nicolle & Lou, 2008).

To communicate for confidence becomes more specific, as messages need to be tailored to the individual. Personal involvement increases as we often have to spend time with individuals in a mentoring capacity to ensure fluency and confidence. "Instrumentalist theories of change, therefore, are based on the premise that adoption and utilisation of technology are highly individualised and contextualised processes" (Surry & Land, 2000, p. 146). The audience should also be encouraged to reflect on the new information and consider its use in constructing solutions. Satisfaction may be assured by encouraging staff to become innovative and apply their knowledge in new ways, in teaching or another sphere of their academic life.

Much of the literature considers the dissemination of educational technology research, not in isolation, but as an element of a wider program of educating higher education faculty for a particular purpose. This purpose has been to encourage academics in implementing the use of technology for teaching, much of it in a blended learning or online context. A wide variety of methods of dissemination have been used with varying success. The traditional lecture/seminar has been a part of each set of tools used in communication educational technology research, but by no means the most successful. Maor explains that, "a common problem with traditional staff development activities is that they tend to attract the best teachers, or the early adopters or innovators, who have already espoused technology innovation in their teaching" (2005, p. 914). An approach involving authentic contexts and situated learning experiences that lead to reflective practice is likely to be more transformative and sustainable.

Another successful method of disseminating educational technology research is that of peer-to-peer communication. Roberts points out that "early adopters may also assist in raising awareness and acceptance of the new technology by "spreading the word," providing demonstrations, sharing best practices, and possibly even serving as mentors or consultants to their peers, engaging in real time problem solving as difficulties or questions inevitably arise." (Roberts, 2008, p. 8).

Academics are overloaded by email, in their own silos – often unaware of external drivers - and are notoriously resistant to change (Bromage, 2006) as well as being entrenched in the traditional transmissive, individualistic, summative type of education. How can we effectively lead them through the array of possibilities to successfully change to teaching and learning for the future? How can we therefore make our communications processes timely, sustainable and at the same time get across the need for changing their learning and teaching approach not just doing what they've always done electronically and/or seeing technology as purely for administrative purposes? Sustainability, as Uys (2007) argues, "advocates true partnership between academic and support staff" (p. 15). Without this, as well as policy decision, it is hard to move traditionally conservative higher educational organisations to embrace technological change for learning and teaching rather than for operational effectiveness (Uys, 2007). There is also the need to make sure that "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 (Uys, Dalgarno, Carlson, Crampton, Tinkler, 2011, p. 1267).

Background of the institutions

The University of New England (UNE), Australia

UNE is situated in NSW, Australia and was formed in 1938, becoming independent in 1954 (Bennett, 2009; Chick, 1992). There are approximately 18,000 students enrolled at UNE with more than 80% enrolled as off-campus students (Corporate Intelligence Unit, 2011). UNE, although a traditional university, has been a distance education provider since 1955 (Bennett, 2008). In the past, on-campus students experienced their learning through face-to-face lectures, tutorials, workshops and excursions, whilst off-campus students received their study materials in the mail through paper-based resources. In the 1980s this expanded to audio cassettes and, in the 1990s, multimedia CDs. Since 2000, UNE has been providing study resources through their Learning Management System (LMS) and is now providing almost all student learning resources fully online. The university has changed LMS several times in the past few years attempting to find the one that best suits the needs of their students and academics. Resources are provided through downloadable Portable Document Format (PDF), but they also utilise the affordances of the Internet provided through resources such as chat rooms, discussion boards, wikis, blogs social networking tools and virtual worlds.

The University of Canterbury (UC), New Zealand

UC, New Zealand's second university, was established in Christchurch city in 1873, and moved to its present site in Ilam in 1975. Approximately 12,000 students (UC, 2011) are enrolled across the six colleges/schools of the university. In 2007 New Zealand's second oldest teachers' training college, the Christchurch College of Education, which was established in 1877, merged with the university. The College of Education brought with it the Distance and Flexible Learning Options (FLO) which it had been offering students since 1995 as well as students in satellite campuses in Nelson, Tauranga, Rotorua and New Plymouth. Close to 60% of the College's 3,500 (UC, 2011) students are involved in the FLO program and all College of Education courses have an online presence through the LMS with the majority of courses being actively taught online, as well as on campus. The major earthquakes which began in September 2010 have encouraged an increase in the number of on-campus courses, throughout the university's other colleges, which also make use of the LMS. In February 2011 this increased significantly following the earthquake which closed the campus on the second day of semester one.

The University of Pretoria (UP), South Africa

While social and economic inequalities persist in post-colonial Africa, this country is the door to economic and other opportunities in Africa. Over the past 104 years, UP has become one of the largest residential universities in the country, with about 45,000 on-campus and 14,000 distance students (UP Strategic plan, 2011) spread over seven campuses. UP takes a leading academic institutional role, attracting students from the continent and further, particularly at post-graduate level. The diversity of programs continues into a diverse student and staff population, with focus on accommodating and developing human capital as much as increasing the post-graduate and international research footprint. The faculty of education offers post-graduate courses via paper-based distance education to mostly under-provisioned and under-qualified rural teachers. The rest of the university embraces a blended learning and teaching strategy combining lectures with LMS-delivered resources, activities, assessment, communication and more (Picciano, 2009). Currently about 2,000 subjects[1] have a presence on the LMS. More than 80% of students ((UP, 2011) as found in a recent unpublished survey) have web-enabled cell phones, and the use of other mobile devices is increasing. In response, the university recently launched the roll-out of wireless hotspots over the campus, being the first university in Africa to do this. One of the motivations to 'leapfrog' to mobile learning (m-learning) as an enhancement to contact teaching is to accommodate the students who do not have personal computers or Internet, and depend solely on on-campus computer facilities, to access the LMS. Unlike the other universities, new learning technology is mostly used to supplement lectures in a blended learning approach.

North-West University (NWU), South Africa

The NWU is a multi-campus university with the three campuses situated in two provinces. The Potchefstroom and Mafikeng Campuses are situated in the North-West Province and the Vaal Triangle Campus is in Gauteng. The university was established in 2004 with the merger of the Potchefstroom University for Christian Higher Education and the North-West University. The NWU's slogan "Innovation through diversity" describes the university precisely as the university is accepted as one of the best-managed and most innovative universities in South Africa. The university celebrates and encourages multiculturalism, multilingualism and multinationalism (NWU, 2011). As a multi-campus university, the students are offered a variety of choices, both academically and geographically. The three campuses collectively offer 15 faculties, which in turn offer more than 50 schools with currently 62,557 students enrolled (NWU, 2012). At the School of Continuing Teacher Education, the Interactive Whiteboard (IWB) sessions are used by the lecturers as a synchronous approach of contact with the students and facilitators. Learning materials are mainly paper-based, consisting of study guides, textbooks and a DVD containing additional information such as presentations and video footage. In line with current trends in the field of open distance learning, SCTE has started to implement the use of a LMS, IWB and m-learning to supplement paper-based learning materials.

Charles Sturt University (CSU), Australia

CSU is a multi-campus university with a large proportion of its students studying at a distance rather than on

[1] Many subjects (also known as units, modules or courses in various locations worldwide) contribute credits which make up a student's individual programme of study towards a degree or other qualification, (also known as their course).

campus. Specifically, in 2011 (CSU, 2011) 24,265 students were enrolled in distance mode, 9139 in on-campus mode and 5,003 in a mixture of on-campus and distance modes. In 2011 the University employed 784 full-time equivalent academic staff, in four faculties, 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. An LMS was introduced in 2009, to increase student engagement and interaction via the provision of an announcements tool and a resource sharing tool in all subjects. Tools such as blogs, wikis and chat rooms were incorporated at the discretion of the academic. Since 2009 additional online educational technologies have been introduced increasing the move towards harnessing the social media, open and participative nature of Web 2.0 technologies.

Conducting and reporting on technology research

There are a variety of ways in which each institution has been conducting and reporting on technology research, which mostly centre on the availability of ICT and the LMS to students, and functionalities which add value to learning and teaching, and learning for the future. Collaborative research with academics consists of technology adoption case studies. Numerous departments provide small-scale ‘distance’ education programmes while flying under the banner of blended learning. These programmes provide excellent research material, acting as ‘laboratories’ to explore innovative teaching and learning approaches that respond well to an unique multicultural context.

Results of internal surveys are disseminated upwards to the stakeholders. For example, a task team that investigated a new computer-based testing system for high stakes assessment reported their findings in depth to a steering committee that had to make the final decision on which system to spend their resources on. Another example is an investigation into lecturing capture systems that was requested by the faculty which was reported back to that faculty’s deans and management structures.

Completed research comprised of Masters, PhD studies and research grants report their findings as dissertations, journal articles and contributions to conferences. Communication consists of reports and contributions at local and faculty research forums. After this level, a glass ceiling is reached where little information filters through to top management for policy making implementation.

Educational Designers (EDs) and Flexible Learning Advisors (FLAs), though not given research time, carry out ‘scholarly activity’ to keep up with their subject/domains of interest. Time allocation to concentrate on a particular educational technology or pedagogy allows them to lead knowledge and capability, that is then shared with others via professional development sessions. This way, an increase in knowledge about relevant learning, teaching topics, educational technologies and benefits from the collective and social constructivist advantages of being part of teams, is created and maintained. Such situations are opportunities to put forward relevant and appropriate aspects related to educational technologies and learning and teaching ’philosophy’ so that they can provide context, support and enthusiasm for academics around the ever changing world of educational technology. In some universities each school within a faculty has access to a dedicated ED/FLA who is physically located in that school. In other universities the number of EDs/FLAs is limited to a small number in a central location. A variety of ways of reporting on technology research occurs which can be loosely categorised into formal and informal style. Methods of communicating educational technology research have often been chosen to reach a particular audience.

Traditional formal reporting includes presenting at conferences bringing research to the attention of the institution. This approach tends to be generic and not discipline specific or applicable at an institutional level (Uys, et al., 2011). Likewise the usual reporting back through university committees is also conducted to a greater or lesser extent. The impact of this formal approach tends to be quite small, limited and lacks the ability for broader penetration.

A range of structured and organic communication processes has been implemented to augment the formal approach. Structured process can include: daily ‘What’s New’ university wide announcement; book club sharing of practice with prior reading of current research papers applied in practice; learning and teaching symposiums and an internal conference on Learning and Teaching; areas of professional focus where EDs/FLAs are specifically responsible for developing expertise around particular educational technologies; pilots of new technologies with champions and early adopters and road shows when university wide presentations are made around a specific topic or range of topics to raise them to the forefront of conversation. This structured communication is supported through a range of organic communication that centres on inclusive sharing and creating a collegiate environment. These organic groups include *Yammer*, an online social networking site and an ICT Community of Practice for sharing educational technology related practice. Further organic sharing of practice amongst EDs, FLAs and academic staff encourages continuous collaboration and collegiality.

Written forms of communication have been used. Reports are requested from management on new technologies, but information communicated in a report, is often too wordy for time poor academics to assimilate. Papers and posters published for conferences are seldom viewed by academics. Newsletters and emails containing information may be delivered to everyone, but they are not necessarily read. Courses have been created within the LMS to provide information on new technologies and educational design ideas. Staff have found this helpful, and tend to access the space when they are looking at making changes or thinking about trying something new (Tull & Brooker, 2009).

Planned events such as a university wide ‘Showcase’ or college level ‘Show and Tell’ have taken place, where academics share their use of educational technology alongside the ED/FLA who communicates pedagogical uses for new technology developments. Some universities hold a ‘Teaching Week’ to provide an opportunity to present to a wider audience. These events, more often than not, attract those academics that are already interested in, and looking for, innovation.

Attendance at department meetings and Learning and Teaching committee meetings has met with more success, partly because of a captive audience, but also because there is often more of an opportunity to ask questions in a less formal environment. Sometimes it has been possible for academics to see the technology in action to clarify their understanding of it. Group training sessions and workshops offer similar opportunities, but with the added advantage of being more ‘hands on’. Word of mouth, particularly from a colleague, appears to have the most impact across all institutions. Champions are supported and encouraged to work with others in their area. By far the most frequent method of communicating information on new technologies is through one-on-one sessions with academics. The informal session, which is most often focused around course design, provides the opportunity to discuss new methods and technologies.

The use of informal and formal communication methods stimulates conversations about educational technology challenges and opportunities within schools, faculties and the wider institutional context. EDs/FLAs are integral to this conversation and are able to participate in a wide variety of areas that includes school boards, learning and teaching committees, meetings, forums, professional development planning and delivery, morning tea, corridor exchanges and other groups/forums, on demand. These constitute a wide variety of opportunities to provide both leadership and support of leaders in implementing change.

Table 1 shows an aggregation of the known communication methods used by the authors’ institutions. These methods have been categorised according to Keller’s ARCS framework for motivation (1987). The wide variety of methods is spread across all levels of motivation and the majority of methods are common to all institutions.

Table 1: Comparison of reporting approaches from our institutions

Challenge	Intended Audience	Approach	Institution
Drawing Attention	Leaders	Reports	UC, CSU, UP, UNE, NWU
	EDFLAs[2] Academics	Papers	UC, CSU, UNE, NWU
	ED/FLAs, Academics	Posters	UC, CSU, UNE, NWU
	ED/FLAs, Academics	Community of Practice	CSU, UP, UNE, NWU
	ED/FLAs, Academics	Book Club/Writer's Groups	CSU, UNE
	ED/FLAs, Academics	Daily Announcements	CSU, UNE
	ED/FLAs, Academics	Showcase & Road shows	UC, CSU, UP, UNE, NWU
	ED/FLAs, Academics	Show & Tell	UC, CSU, UP, UNE, NWU
	ED/FLAs, Academics	Teaching Week	UC, UP
	ED/FLAs, Academics	Emails	UC, CSU, UP, UNE, NWU
Demonstrating Relevance	ED/FLAs, Academics	Learning & Teaching Committee Meetings	UC, CSU, UP, UNE, NWU
	Academics	Department Meetings	UC, CSU, UP, UNE, NWU
	Academics	Online examples e-learning space	UC, CSU, UP, UNE, NWU
	Academics	Champions in department	UC, CSU, UP, UNE, NWU
	Academics	Group training sessions	UC, CSU, UP, UNE, NWU
Developing Confidence	Academics	Workshops	UC, CSU, UP, UNE, NWU
	Academics	Drop-in sessions	UC, CSU, UNE
	Academics	Online documentation	UC, CSU, UP, UNE, NWU
	Academics	One-to-one consultations	UC, CSU, UP, UNE, NWU
	Academics	Formal Qualifications (Grad Cert)	UC, CSU, UNE
Developing Satisfaction	Academics	Mini grants	UC, CSU, UNE, NWU
	Academics	Improved teaching	UC, CSU, UP, UNE, NWU
	Academics	Education Innovation Awards	UC, CSU, UP, UNE, NWU
	Academics	Professional development portfolio for promotion	UP, UNE, NWU

Defining our audience, issues and constraints faced

As context is critical for communication, which is rarely carried out in a neutral environment, we need to target audiences in different ways for maximum effect when reporting on educational technology to support or lead change. For comparison purposes, therefore, we divided our audience into three categories; leaders, EDs/FLAs and academics (see Table 1). We further decomposed these headings to include the type of information our audience might need (see Figure 1), including; leaders who make strategic decisions and must focus on implementation relying on information we provide about resourcing and costs, EDs/FLAs, focusing on support are looking for information about features and functionality and academic staff that need to buy-in unequivocally as the users of new technology need information on how to apply the technology, as well as the potential barriers to overcome.

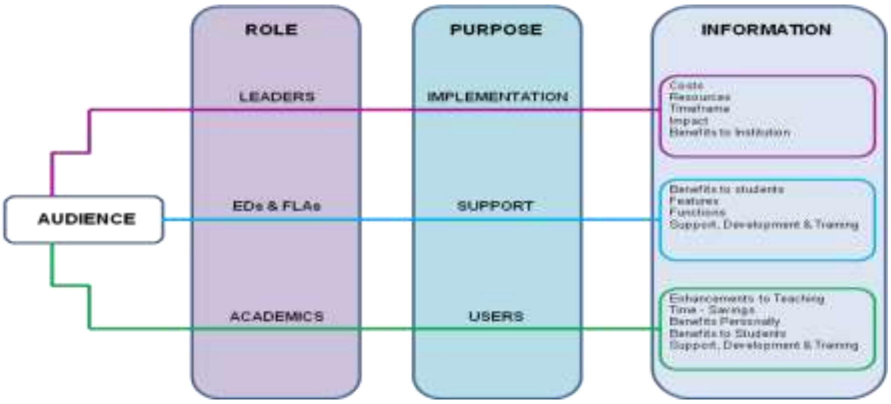

Figure 1: Who is our audience?

Leaders

One of the major barriers to communicating the latest educational technologies can be senior management within faculties and schools as well as within the senior management of the university as a whole. Their potential lack of buy-in or the low priority given to new tools or ways of doing things can have a seriously detrimental effect on the implementation of change around technology. Additionally without careful timing of messages and new

[2] As different names are used for similar roles across worldwide locations for the purposes of this table we have used Educational Designer (ED), and Flexible Learning Advisors (FLAs)

information, EDs/FLAs can be seen as creating a problem with academics rather than providing a solution. In this climate of constant change, if leaders are shown the features and benefits of technology before they are ready, regardless of the advantages of that specific tool or pedagogy, it is unlikely they will buy in to it.

Educational Designers or Flexible Learning Advisors

As a still relatively new and emerging profession EDs and FLAs come from a range of backgrounds that are either more or less focused on education or technology. ED/FLAs were traditionally paper focused and often seen as proofreaders and editors with high journalistic skills. Working directly with academics on specific subjects they were often involved in the presentation of content above all else. Now, more commonly, EDs/FLAs have a range of higher level curriculum review process and project management abilities along with educational and information systems backgrounds. These combined abilities, coupled with their ability to work collaboratively, (a must in the information age) situate them as change agents for introducing, supporting and implementing new educational technologies. A key requirement is to enable academics to build capability and sustainability whilst at the same time putting in place the strategies that senior management want across the institution. Over and above all the EDs/FLAs must be change agents and culture shifters.

Academic Staff

The rate of educational change is fast moving and constantly changing. Whilst EDs/FLAs are accepting that 'the only constant is change', this is not necessarily the case for academics. The academic propensity to work alone, to need time and space to formulate ideas (Bromage, 2006), coupled with research being high on the agenda, related to performance management are perceived by academics as critical to their career means that (often as a survival strategy), learning and teaching is pushed down the agenda. The perception (real or otherwise) of lack of provision of time to embrace new educational technologies for subject design and development adds weight to this. What is vital then is to concentrate on communicating the 'benefits' of technologies, in a timely way, in this educational revolution, to teaching staff whilst at the same time making explicit the support mechanisms and very real help and support that can be provided.

What are the issues and constraints?

In developing communications reporting technologies to others in our institutions, there are a number of issues or constraints to be considered so that appropriate changes can be suggested.

Internet Connections

Insufficient Internet access can be seen as one of the major reasons contributing to the failure of the realisation of the potential of e-learning in open distance education in many contexts (Ololube, Ubogu, & Egbezor, 2007). Insufficient Internet speed limits the technologies that can be utilised, particularly those which deliver multimedia content, while excessive taxation of ICT goods and services keep these inequalities entrenched.

Student Diversity

Teaching and learning with technology is often hampered by technological and social inequalities. Many students are multicultural, multilingual, with diverse levels of skills and knowledge, like insufficient reading and writing skills. Other challenges such as the diversity of students in terms of age, gender, language use, culture and living in deep rural areas are at the root of learning inequalities. In order to overcome these challenges a palette of learning technologies to address learning inequalities in an open distance learning environment is used.

Access

M-learning may provide a solution to the challenge of access to the Internet, as the scale and ubiquity of mobile networks often provide the only infrastructure in rural areas (GSMA, 2010). M-learning using these networks offers exciting opportunities to optimise communication between lecturers, facilitators and learners as it offers learning opportunities to rural or remote learners without the necessary infrastructure for conventional access to the Internet (Evans, 2008). As communication and interaction are of pivotal importance in the learning process, m-learning can contribute towards the quality of education. M-learning has all the advantages of e-learning, with the added benefit of portability in the form of devices such as iPods, iPads, tablet PCs and smart phones (Evans, 2008). The challenge for lecturers lies in embracing the strengths of mobile devices and design learning materials that utilise the convenience, connectivity and personalisation that such a platform offer (Griffen, Mitchell, & Thompson, 2009). The 2012 Horizon report states that tablet computing presents affordable learning opportunities (Johnson & Brown, 2012). The advances of tablet computing with a growing number of features are ideal for one-to-one learning. It also reports that the Zimbabwean government, in partnership with Apple, are planning to bring solar-powered iPad devices to rural institutions without electricity (Johnson & Brown, 2012). South-African institutions should learn from this example and invest in the use of m-learning to address the connection challenges of students. This implies that, with the increased use of mobile and wireless technologies, "the time and place for learning, working, and socialising will blur even more" (Bonk, Kim, & Zeng, 2006 (p. 561). An important implication is that mobile and wireless technologies may create greater opportunities for lifelong learning as learning will be more accessible to a wider range of individuals (Bonk, et al., 2006).

Strategic Alignment

Barriers to incorporation of technology are on all levels, from government policy that limits distance learning to certain institutions, the University's strategic plan, infrastructure, the profile of the student's entrenched social and other inequalities. When the primary focus of a University is to increase its international ranking as a research institution, it can affect innovative teaching with technology. Further barriers to improved teaching are promotions and government subsidies for research outputs.

None of the top down approaches has been found to be very successful. Important information regarding retraining and redesigning for the upgrade of a LMS are often poorly disseminated through the official faculty structures because the people in charge are not the people on the ground and, they have different priorities. From the bottom up, EDs/FLAs communicate and advise in workshops and on a one-on-one base with lecturers who seek out their services. Emails are also sent from the LMS to lecturers and other staff who have a presence there. A middle-out approach is used to get all the EDs/FLAs on the same page, for instance in preparing to implement a new technology institution-wide.

Financial

Across the sector there are restricted funds for implementing new technologies or giving existing staff time off from regular activities to pursue new avenues. The particular difficulty for EDs is that they are not given time to explore new developments nor are their performance management targets related to research in any way to motivate such exploration. In addition, the research life cycle can often be slow in relation to the emergence of a new educational technology lifecycle.

Change management and institutional impact

The pervasive use of educational technology in higher education has made it imperative to understand what the critical issues are when implementing enterprise wide learning strategies to support a digitally enhanced learning environment. Managing change for enterprise-wide impact in higher education in particular is problematic since people are central to the process, and it is therefore necessary. Fullan (1991, p. 350) suggests, "… we explicitly think and worry about the change process" in educational reform.

To ensure institutional impact, when creating sustainability, the situation turns to the challenge of maintaining interest and motivation towards embracing new ideas and technologies. The problem then is how to keep on an academic's radar, how to gain their attention and take interest in what you are reporting to them. Kotter (1996) states that to lead change and gain buy in from necessary stakeholders senior leaders must create 'a sense of urgency'. This does not happen naturally, it comes from people who have the motivation to get things done. He further states that for change to be successful, 75% of an organisation needs to change. His view is that, when there is a disconnect between the internal organisation and external environment, or where there has been 'success' complacency occurs, which leads to inaction.

How do we communicate, to connect?

Having explored the issues and constraints when conducting and reporting on educational technology research for institutional impact, we now examine communication strategies to help connect with our different audiences in leading or supporting change.

Communicating with Leaders

Experience with specific project proposals shows that it is useful to create multiple documents that drill down into the detail. With complex papers and proposals there is a need to simplify the detail and the message. Detailed documents may not be the best way to present the information. What works better is to create the detailed document and then distil it into one containing one sentence answers addressing: who, what, where, when, why and how much. This is critical for senior management, who prefer knowing that you have addressed the relevant aspects, to having all the details. Speak directly to the leaders. Committees can sometimes interpret and misinterpret your information so going directly can save time and hassle. Offer to present. It is quicker and can have more impact than reading a paper.

Communicating with Academic Staff

Timeliness and workload is the critical factor when communicating to academic staff. They will ask “What is the relevance of this ‘new’ educational technology right now to me as I work through the academic year? Do I have the time to adopt it and will it save me time if I do?” Affordances and pedagogical considerations are often deferred until the end of semester and/or additional resources in terms of time with EDs/FLAs. Often it requires one-to-one support and sharing of practice with another academic to truly buy in to the technology.

Communicating with Educational Designers

Communication at this level tends to be much less formal. Physical proximity may make face to face discussions and impromptu demonstrations of newly discovered technologies possible. Social media sites such as Yammer or Google+ can be used to share information found on the Internet with those who are more distant, or who prefer written communication. Email is often used to pass on information received in this same format. In communicating with this group too though, there are opportunities to share within a more formal presentation, information that has been gathered from conferences or workshops, as well as research undertaken. Affordances, features, benefits and pedagogical relevance are crucial issue to engage EDs/FLAs. Once these are established they are able to ‘transfer technology’ and disseminate both the ‘why’ and ‘how to’ to other audiences.

From reflections on experiences in presenting to different audiences some general communication recommendations emerge regardless of the technology being presented or the mode of presentation. For the purposes of clarity the principles are identified in brief with a fuller explanation (see Table 1) for which the communication channel is most apt.

Table 2: Recommended Communication Channels for our Different Audiences

Principle	Explanation
Be clear	Technology can be complicated so clarity is key. If you cannot sum your main points up in a few sentences your audience will not grasp it.
Illustrate your point	‘A picture speaks a thousand words’ and can often explain complex concepts quickly and easily. Use diagrams, visualisations, mock-ups, personas and analogies to help convey key ideas and contexts.
Simplify complexity into something tangible	Do not get bogged down in detail. Most people do not want to read it but they do want to know you have researched it. Technicalities get in the way of the message. Use appendices, attachments or links to more information.
Create a conversation	Connect with your audience and create a space for questions, answers and contextualisation through a conversation. Creating a dialogue allows the information to flow and allows you to clarify your points or relate it to a specific audience.
Get to the point	Shape your information to be like a pyramid with focused findings at the top and the details at the bottom. This shows the construction of your work with a stable foundation is key
Present your information	With our audience becoming increasingly time poor it is useful to note that it is quicker to listen than to read especially for a large audience. Think mathematically - (time to read paper) x (number of audience) – 1 hour to read x 100 people = 100 hours on your paper.

Conclusion and summary

From the literature reviewed, and examination of the approaches employed within our different organisations, when conducting and reporting on educational technology for institutional impact it is essential to adopt appropriate styles of communication and reporting mechanisms for our different target audiences. In an environment of constant change, specifically targeting our identified audiences with the right media of the message, as well as choosing the right type of messenger is crucial to drawing attention, demonstrating relevance, developing confidence and developing satisfaction. Additionally, we must take into consideration what particular stage of technology adoption our audience is at. If we can get these things right, we can at last lead a change from technology in education being traditionally driven by efficiency and administrative purposes towards truly embracing technology for effective enhancement of the student experience and genuine learning activities and opportunities.

What we can see from reviewing the literature and examining how we approach conducting and reporting on educational research to our target audiences is that across each of the institutions we have all adopted a range of methods to reach the different audiences we serve that follows current thinking in this area. Are we making it explicit to our audiences that the different approaches we adopt are for different reasons (attention, relevance, confidence, satisfaction)? However, whilst there is clear formal research and focused research, an area that could be developed is examination of just how successful those different audiences found those different approaches presented by EDs/FLAs in particular. To gain feedback from those different voices would add a new dimension to our understanding of how to disseminate educational technology research with impact, in this climate of change.

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Implementation of the eLearning Lifecycle Model to Develop Reflection in Pre-Service Teachers

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This paper outlines the planned research into the use of an ePortfolio Environment to support the development of reflection in pre-service teachers. Reflection is a key skill for teachers to possess as they continue to learn into the future. It is a doctoral research project that involves the implementation of sections of the eLearning Lifecycle model (Phillips, Kennedy, & McNaught, 2011) within a PebblePad platform. The proposed environment will include examples, activities and interactions as part of an Enculturation Teaching Model (Tishman, Jay, & Perkins, 1993). The impetus for the activities will be the sections of the Framework for Teacher Reflection (Colton & Sparks-Langer, 1993). The implementation aims to develop a teaching environment that can be used in a variety of platforms to develop reflective abilities in pre-service teachers that will be used for continued professional development.
Keywords: ePortfolio, Reflection, eLearning Teaching Models, Pre-Service Teachers.

Introduction

This doctoral research project developed from experience in working with pre-service teachers and the difficulty faced in developing reflection with these students. The study aims to identify a framework using an electronic learning platform that will assist in the development of reflection in pre-service teachers. The research proposes to utilize the PebblePad ePorfolio to scaffold the students' development of reflection. PebblePad was selected because it had been used in the action-learning project unit previously. The eLearning Lifecycle model developed by Phillips, McNaught and Kennedy (2011) was chosen as it follows a cyclic implementation with a structured framework for review and ongoing improvement tailored to an eLearning environment. The structure of the PebblePad ePortfolio and the experience of the researcher within the teaching unit meant an adapted implementation of the lifecycle could be planned.

Within the eLearning environment, an enculturation teaching model (Tishman, Jay & Perkins, 1993) is used to provide (1) examples of good practice (2) activity prompts to teach reflection and (3) a platform within which the students can interact with one another. This teaching model was originally developed to increase higher level thinking skills or the dispositions of thinkers and can be transferred to reflection, which also requires the use of metacognitive strategies.

As part of this teaching model, the planned activity prompts were taken from the areas of the Framework for Teacher Reflection (Colton & Sparks-Langer, 1993) that encompasses many components of reflective practice. It is anticipated that this model will provide the foundation for the activities and ensure there is a strong theoretical base for the prompts.

The overall goal of the research is to develop an outline of an effective electronic teaching environment that concentrates on the development of reflection in pre-service teachers. The outline may be transferrable to other ePortfolio teaching platforms and perhaps even other content or skill areas beyond reflection.

Literature Review

The literature for this project comes from two key areas that are very briefly outlined here. The first is reflection, its importance in education, and the methods trialled to develop it. The second is the area of ePortfolio in terms of providing a teaching environment within which to develop these reflective abilities.

Reflection

Reflection has been identified as being important in education because in the future, "schools will be restructured communities of learning requiring empowered, [and] reflective decision makers" (Colton & Sparks-Langer, 1993, p. 45). With the rapidly changing global climate, there is a need for lifelong learners who are able to reflect on their abilities and make changes with these times (Yost, Sentner, & Forlenza-Bailey, 2000) and continue to learn into the future based on these experiences.

In a conceptual review of reflection in higher education, Rogers (2001) identified a number of key common theoretical factors that emerged from the authors of reflection. These included a clear understanding of the terms being used in relation to the general definition, the timing and the context; the outline of the antecedents; the contextual factors; the definitional component; the process; the methods and the desired outcomes of the process (Rogers, 2001). These factors need to be clearly outlined to all stakeholders involved in the development of reflection in any given context to ensure a shared understanding of the concept and the process.

The Framework for Teacher Reflection (Colton & Sparks-Langer, 1993) provides a model from which all of these theoretical factors can be identified. The model is divided into three sections that focus on (1) action in terms of an action research style of approach to developing reflection; (2) constructing knowledge and meaning in relation to choosing an area of focus and discussing this with others and; (3) the professional knowledge base that consists of the background of the reflection and the context in which it occurs. The model also identifies attributes of reflective thinkers, which lead to the identification of the proposed enculturation teaching model.

For this planned research, the reflection by the students is completed as part of an action-learning project. The aim of the project is to encourage reflection that Dewey (1933, p. 9) defines as "active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and further conclusions which it tends". The goal is to move beyond the recording of events *after* the incident (reflection that Schon describes as *on-action*) to taking action at the time of the 'surprise' to make a positive change to practice (reflection *in-action*) (Schön, 1995, p. 30). The students' projects are implemented in a practical situation with the issue of focus being chosen by the students based on previous experience within the classroom and should follow cycles of action research (Grundy, 1995).

The overall aim of the action-learning project is to not only improve the students' abilities within their chosen area of practice but to also provide experience with the process of action research and reflection as a catalyst for ongoing professional development. The recent development in electronic portfolios provides the option to use them in teaching environments and includes another component of the standards required by the Accreditation of Initial Teacher Education, being the use of technology.

ePortfolio

The use of electronic portfolios or ePortfolios has increased recently, due largely to government policies (particularly in the United Kingdom) requiring their use (Clark & Eynon, 2009; Joyes, Gray, & Hartnell-Young, 2009; McAllister, Hallam, & Harper, 2008). An ePortfolio is "a collection of authentic and diverse evidence, drawn from a larger archive representing what a person or organization has learned over time on which the person or organization has reflected, and designed for presentation to one or more audiences for a particular rhetorical purpose" (Barrett, 2005, p. 5). This definition immediately identifies that a person may have several levels of an ePortfolio from a working document to a presentation portfolio (Pellicione, Dixon, & Giddings, 2005) that is adapted to meet different purposes (Clark & Eynon, 2009).

Joyes et al. (2009, p. 487) provide a useful extension to this description by adding that "behind any product, or presentation, lie rich and complex processes of planning, synthesising, sharing, discussing, reflecting, giving, receiving and responding to feedback." The authors go on to discuss that these processes make up ePortfolio-based learning which is receiving increased attention from the Joint Information Systems Committee (JISC) that works with colleges throughout the UK in digital technologies (Joyes et al., 2009). It is this learning process that is the feature of the ePortfolio that led to it's use in this planned research.

Dr Helen Barrett, who has been labelled the "grandmother of ePortfolios" (Barrett, 2010), advocates that ePortfolios be utilized as learning tools. In her 2005 white paper, Barrett highlights the processes of learning and assessment involved in an ePortfolio and proposes that the technology is now available to "engage students in active participation" and reflection through "assessing and managing their own learning" (Barrett, 2005, p. 23). There are a number of commercial platforms available for ePortfolios and many have self-directed help packages within them that guide the learner through the process (Pinney & Edwards, 2007). This structured support is important in the development of reflection (Lamont, 2007). The platform of PebblePad has been shown to be user friendly and to allow for communication with others (Pinney & Edwards, 2007). It has also been demonstrated to play a significant role in the development of reflection when implemented with ongoing support (Bloxham, Boyle, & Thanaraj, 2009). This then provides a strong base for further research.

The Research Outline

The planned research will involve the implementation of sections of the eLearning Lifecycle Model developed by (Phillips et al., 2011). The cycles of this model are designed to develop and evaluate electronic learning environments based on the principles of action (McNiff & Whitehead, 2006) and design-based research (Hoadley, 2004). The process involves the implementation and review of the environment to make improvements with each iteration. This project proposes to use the model from Cycle 3, the trialling of the environment through one review at Cycle 4, followed by recommendations being made for practice as part of Cycle 5 (Phillips et al., 2011).

Within the eLearning environment the execution is based on the enculturation teaching model (Tishman et al., 1993) and the framework for reflective teachers (Colton & Sparks-Langer, 1993). Figure 1 shows the relationship of these components within the research. The overall implementation of the case study is planned within the cycles of the eLearning lifecycle (Phillips et al., 2011). The PebblePad platform has a "Gateway Resources" facility that provides a platform within which the teaching model can be realised. Within the resources, the students can be provided with access to (1) examples of good practice (2) prompts or activities aimed at the components of reflective thinking and writing and (3) a space where comments and interactions about this process can be shared (Tishman et al., 1993). The planned prompts and examples are based on research into the development of reflection that can be placed within the components of the Colton and Sparks-Langer (1993) framework for teacher reflection.

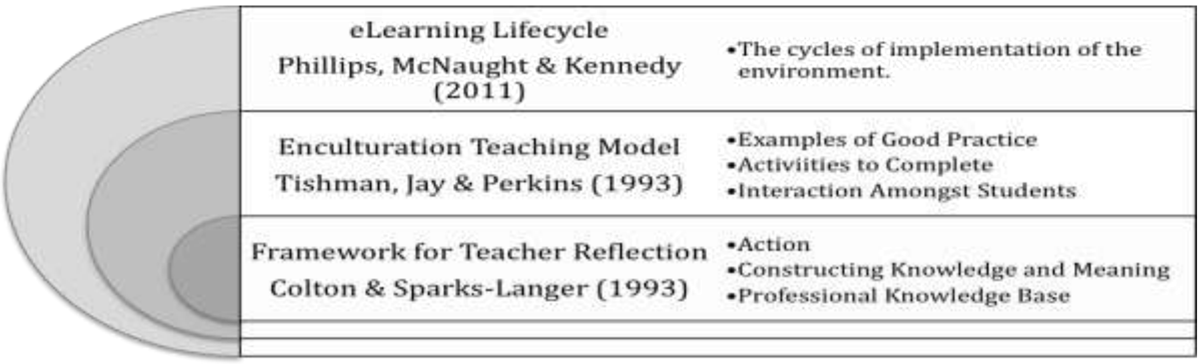

Figure 1: Relationship of Research Components

The choice of these models and frameworks came from experience with the teaching platform with previous groups of students and the understanding that a strong theoretical base was required in the planning of the prompts. In the past, the students remained very focused on the use of the platform as an assessment tool rather than a vehicle for the development of reflection (Roberts & Maor, 2012).

Data will be collected using a mixed methods approach including feedback questions on each of the prompts, interviews and learning analytics as detailed below:

- a set of questions will accompany each activity prompt to identify whether the task was useful and if so why. The students will be asked to answer these as a blog reply.
- interviews will ask the students about their experiences with the environment. The focus group interview environment is planned to allow students to encourage each other and provide a range of viewpoints on the PebblePad environment. The individual interviews will be more focused and use examples of each students writing as the basis for questions as well as allowing comparison of student's responses to log data generated within the PebblePad platform that identifies the students' usage patterns.
- learning analytics will be used to evaluate possible links between levels of reflective writing and engagement determined by usage log data from within PebblePad. This numerical data may add to the details from the interviews about the use of the prompts within the environment.

The implementation and data collection for this research will occur within 2012 with final reporting planned for early 2013.

Proposed Outcomes

The outcomes of this research for practitioners will be a better understanding of how to scaffold pre-service teachers to reflect through an ePortfolio environment. This will include methodologies of action research, strategies to engage the students in reflective discussions, and formats to demonstrate reflective abilities.

The principles of the ePortfolio environment identified in the research may also be transferable to other platforms to expand the use of ePortfolio as a teaching and learning tool. In terms of theory, the research will add the layer of the learning environment to existing framework for reflection developed by Colton and Sparks-Langer (1993); provide the context identified as required by Rogers (2001) and add to the knowledge of ePortfolio-based learning environments as discussed by Joyes, Gray and Hartnell-Young (2009).

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Reflections on staff development in eLearning via a community of practice model

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This narrative seeks to identify practices which have enabled staff in eLearning roles to support their peers to increase the use of eLearning within a New Zealand tertiary education context. Specifically, it examines those factors which have contributed to the development of institutional capability in eLearning over a two-year funded period. Unitec New Zealand has recently implemented a transformative eLearning Development Strategy with the aim of developing the capability and capacity of Unitec academic staff in integrating learning technologies. The funding of a number of temporary roles aided development of staff capability and capacity in eLearning through a Community of Practice model. We consider factors that contribute to the development of a sustainable learning culture, and identify how a community approach has enabled this. We further explore and reflect upon the enablers and barriers experienced in the eLearning roles, and the implications of using this model and its efficacy in meeting institutional goals. An extended version of this paper was presented at the Moodle Research Conference held in Heraklion, Crete on 14-15 September 2012.

Keywords: eLearning, capacity building, staff development, Community of Practice, tertiary, New Zealand

Background

Unitec provides vocational and applied professional education from Certificate to Doctoral level at it's four Auckland campuses, with mostly face to face courses, however there is an increasing demand for more flexible delivery of courses. Oram's (2009) Auckland 2060 report forecasts a climate of change requiring teaching practice to be reconsidered to reflect the societal demands of the future. In 2010 Unitec began implementation of a transformative initiative described as the Living Curriculum. This entails a number of key principles including complex conversations, curiosity, focus on practice, social constructivism, blended learning experiences, research-informed, interdisciplinary, literacies for lifelong learning and embedded assessment. Underlying this, an additional 'eLearning Development Strategy' was launched with the aim of developing the capability and capacity of Unitec academic staff in integrating learning technologies to enhance the learning experience offered to Unitec students. It was recognised that in order to fully integrate eLearning into the Living Curricula, institutional capability had to be developed and support structures provided to facilitate development activities. As a vehicle for realising these objectives, the Community of Practice (CoP) model was selected as a potentially empowering approach to building social capital.

Communities of Practice

Wenger (2006) defines communities of practice as "groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly". The Community of Practice model was selected with the aim to facilitate staff capacity building partly because it presented the opportunity for the practitioner to adopt the role of both expert and learner within the Community. This is of particular significance given the nature of the Living Curricula, and in questioning the traditional role and identity of academic staff as experts rather than life-long learners and collaborative constructors within the domain (Keesing-Styles & Ayres, 2011). This approach is also more fitting with ‘Ako’, the Māori concept of teaching and learning as a reciprocal, connected and interrelated process “where the educator is also learning from the student and where educators’ practices are informed by the latest research and are both deliberate and reflective. Ako recognises that the learner and whānau [family community] cannot be separated”. (Ka Hikitia, 2008, p.20)

Additionally, the Community of Practice model is one which is said to offer a “demanding and productive perspective” (Wenger, 2009) from which to view the relationship between community and technology. In understanding how technologies can influence, challenge, foster and be adapted by communities, participants are afforded the opportunity also to experience and reflect on the implications of eLearning as framed within the Living Curriculum.

Funded Roles to support eLearning Strategy rollout

Unitec leadership recognised that the implementation of the eLearning Strategy, Living Curricula and transition from Blackboard to Moodle, would present staff with some confronting change. It was acknowledged that staff would need time and support to enable an optimal response to the new demands being posed. The success of the eLearning Strategy therefore was dependent on strong support within departments and central support teams, to ensure staff had adequate scaffolding for the change process. “Teacher’s capacity for change is frequently compromised by issues of workload, and a significant ongoing challenge was enabling processes whereby workloads could be managed effectively to allow the time and space for conversation and reflection.” (Keesing-Styles & Ayres, 2011 p. 50).

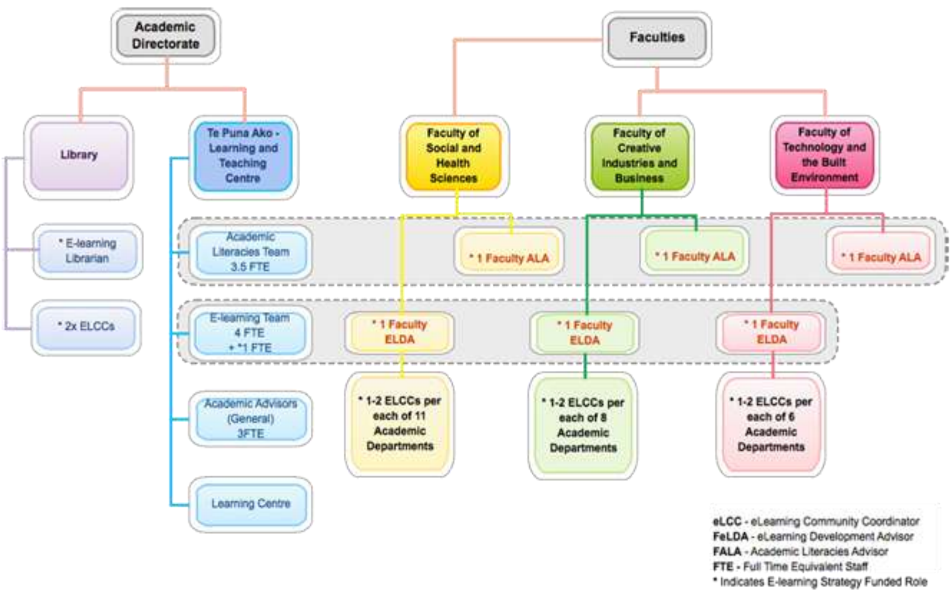

Figure 1: Roles supporting staff development in eLearning during the eLearning Strategy Implementation

Unitec leadership recognised the key value of providing well-resourced support services in enabling the pedagogical shift and technical skills acquisition required to successfully implement the eLearning Strategy, as “support allows those engaged in the difficult process of implementation to tolerate the anxiety of occasional failures” (Guskey, 2002, p. 388). Provision of support under the eLearning Strategy involved both centralised and faculty-based resourcing. The eLearning Strategy was driven through Te Puna Ako, the learning and teaching development centre. The Centre provided dedicated expert support for staff in eLearning (including technical support in partnership with IT services), general academic support, and support in the integration of literacies. The Te Puna Ako Learning Centre provided academic support to students. A number of additional, temporary roles were funded to support and foster increased staff capability and capacity in eLearning and associated academic and information literacies. A supplementary eLearning team member was employed in Te Puna Ako for the duration of the eLearning Strategy roll-out. Additionally, one full time eLearning Librarian role, three full time Faculty eLearning Development Advisors (FeLDAs) and three Faculty Academic Literacy Advisors (FALAs) were recruited to complement the department-based eLearning Community Coordinators (eLCCs) and to work closely with Te Puna Ako.

These additional roles were initially deployed for 18 months. The department-based eLearning Community Coordinator (eLCC) roles were a part-time appointment filled by existing Unitec teaching staff, who were each given (up to 0.2) time release to provide staff development opportunities within their department.

> "The CoP model has been a key vehicle for facilitating collaboration within and across departments, as has the funding of specific 'technology stewards' (eLCCs) within the departments. These eLCCs are vital shaping voices in helping keep the focus and purpose of eLearning developments on core pedagogic issues." Keesing-Styles and Ayres (2011)

The FeLDA's and FALA's assisted in liaising with and supporting the various departments in Unitec, and supporting the Communities of Practice. The initiatives driven by the Library impacted on institution-wide adoption of eLearning, assisting in embedding information literacy through technology, building capacity, and providing access to resources and equipment.

Community of Practice Implementation

In 2010 official implementation of the CoP approach was launched with a five day workshop facilitated by Etienne Wenger & Beverly Trayner. The workshop set the stage for the eLearning community in establishing an identity, defining roles and initiating the eLearning Strategy at Unitec.

> "The first organised event most of the eLCCs attended was the week-long Community of Practice workshop with Etienne Wenger and Bev Trayner. I cannot emphasise enough how important and meaningful this event was for me. Wenger and Trayner provided the eLCC group with an important introduction into community of practice theory and practice, and eLCCs spent the week conversing, bonding and learning. We entered as individuals and exited as a community. As far as I'm concerned, the organisation of that workshop was a stroke of genius." (eLCC quoted in Benseman, 2011, p. 8)

The eLCCs had regular informal and formal events together, workshops, regular mini symposiums where they shared what they were doing, shared knowledge, and talked together about the challenges they were facing. These opportunities were utilised more by the active eLCCs and those who had time available. Some eLCCs also ran a similar CoP within their department, but tailored to their departmental needs. The eLearning team modelled the role of "technology stewards" (Wenger, White & Smith, 2009), encouraging interdepartmental interactions and sharing of best practice. This coaching from the eLearning team assisted eLCCs to support their CoP's as they were established and shaped to meet each department's needs. The use of Moodle Docs, Moodle tracker, and forums supplemented the internal support. Participants of the eLearning CoP also contributed in wider Moodle community activities.

Identified Issues

A mid-point survey and end point interviews of eLCCs were conducted in the eLearning Strategy implementation period. Several themes emerged from this data, which are useful in informing an evaluation of the efficacy of the approach taken, and in reflecting on those factors which had impacted on the eLCCs ability to foster staff development. Evidence is also drawn from the Strategy evaluation and evaluation moderation documentation.

Time and Workload

Time and workload were highlighted as the most significant barriers to participation in the eLCC community, and in fostering community and staff development within the Departments. "Many staff are keen to learn more and get involved - but the opportunity to do so is limited by staff and eLCC's time, free meeting "slots" and similar resourcing issues" (eLCC).

Allocated time to participate in Community activities was seen as a crucial enabler. "Having an official role and time release within my department allowed me to greatly expand the eLearning support I had previously been unofficially providing to staff in my department. It enabled me to have individual discussions with each of my colleagues and provide them customised support to achieve their eLearning goals." (eLCC)

Digital Literacy

Digital literacy levels of staff impacted on the uptake of eLearning technologies and their ability to recognise the pedagogical affordances of these technologies. There were many staff requesting Moodle basic tools workshops who were simply not ready to discuss Living Curriculum characteristics or the eLearning Strategy as they did not feel confident using online technologies. The Natural Sciences department found the collaborative design and use of a Moodle course template alleviated some of the barriers related to literacy issues for their staff.

Support

Midpoint and endpoint feedback accorded with the Unitec leadership's acknowledgement that support systems would be crucial to the implementation of the eLearning Strategy. From the eLCC perspective particularly, the value of local (within Departments) and central support services, and conversely, the detrimental impact of a lack of support were perceived as crucial determiners in enabling both community and staff development to flourish.

Central Support

The integral role Te Puna Ako played in staff development was frequently recognised, both for the provision of practical training and advice, and for the interpersonal support and connections. The support activities offered by Te Puna Ako were highly valued, with one on one training and mentoring rated by eLCCs as the most useful support received. The value of face-to-face communication with Te Puna Ako was also highlighted. "TPA staff are our hub to go to. It is excellent to be able to drop in anytime and have face to face contact" (eLCC). eLCCs ranked the Te Puna Ako mini symposiums in particular as being 'highly useful' in supporting the eLCC role. "I learnt a lot, met so many people, very friendly and approachable lot at TPA, exchange of experiences, friendly atmosphere, love the homemade cakes" (eLCC). Activities facilitated through the central support teams provided important opportunities for sharing knowledge and keeping momentum.

> "The eLearning communities' mini symposiums were great as you got to see how web 2.0 tools could be utilised in teaching in a way that I could understand and hear staff talking about successes they were having, so I could then see scope for being innovative and creative in teaching, and TPA provided a great space for that to happen with an inclusive open flow through feeling about it". (eLCC)

Many of the eLCCs requested more opportunities to share best practice in the existing format of TPA sponsored mini symposiums, though equally there was a desire for tools based workshops, highlighting the need to consider digital literacy levels for these key staff. "I have found that when I need to do a specific thing in eLearning that specific consultation is very helpful." (eLCC)

Local Support

It was concerning that one quarter of the eLCCs felt they received 'little or no support' from within their department. The majority met with their Head of Department monthly or less and were more likely to met with Te Puna Ako staff. One eLCC wrote that "without active support and championing within a Department's management and leadership structure it is difficult to get traction."

Strong local support greatly enhances the chances of successful staff development. In the Department of Languages there was strong leadership support, evident in the provision of additional, department funded e-learning leadership roles to support the work of the eLCCs. This department had very active eLCCs who took were proactive in enhancing their own capability and sharing their learning and experiences, in the Department CoP and National Moodle Moot for example. There was recognition of successes within the department and ongoing dissemination of the learned expertise across the department. Many staff development activities were initiated in this department, including well patronised forum conversations, 'social' eLearning events and a variety of workshops. This department integrated a number of additional web 2.0 technologies and worked with the eLearning team to identify discipline specific Moodle modules and plugins that supported their students to meet learning outcomes.

Role Ambiguity

A lack of clarity of the eLearning roles may have impacted on their efficacy and on the way in which the roles were received and perceived by other staff. This ambiguity appears to have resulted in part from the tension between the organic and dynamic nature of roles within a CoP, and the management and peer expectations of a paid role in achieving specific outcomes in a given timeframe. Roles within a Community of Practice are by necessity fluid, allowing for participants to in turn offer their unique perspectives, experiences and expertise. Scope exists within the CoP model to appreciate the unique contributions made by different practitioners within the domain. The expected outputs required of the eLCCs, FeLDAs and eLearning staff under the Strategy however, may have been at odds with their roles as CoP participants and stewards.

Reflections on Community

The actualisation of a true Community of Practice may not have been realised in the eLearning implementation period. However, a community approach to adapting to the LMS migration and eLearning Strategy was certainly a defining characteristic of the process, and a catalyst for 'shift' in pedagogy, and staff development initiatives. "Sharing practice is more useful than sharing/ discussing academic position" (eLCC). While feedback on the efficacy of the Community of Practice model was mixed, there is evidence that the approach taken by Unitec had very positive outcomes in empowering staff initiatives, and providing the basis for a collaborative approach to staff development. One eLCC said:

> "My involvement in the Unitec eLearning Community of Practice was hugely beneficial to me, impacting my role both within my own department and across the institution as a whole.... Being part of a wider community exposed me to a range of other Unitec staff with an interest in eLearning. I was able to share my ideas with others from different disciplines and to adopt ideas used elsewhere to good effect. I have certainly learned a lot from the experience and continue to benefit from a number of ongoing professional relationships formed through this community." (eLCC)

Over the Strategy period, there was a visible shift in focus from Moodle tools to discussions around pedagogy. This was evidenced in eLCCs presentations at community workshops and mini symposiums for example. The scope of interest broadened to the integration of other tools with the Moodle platform as staff, delved into eportfolios, use of twitter for collaboration and introducing RSS feeds to encourage currency within the discipline in Moodle learning spaces for example. The exploration of iPads as a teaching and learning tool grew as did educational gaming and digital storytelling. There were more Web 2.0 technologies integrated with Moodle and more complex use of core Moodle tools and investigations into their application to learning. This experimentation improved the support the eLCCs could offer staff across all levels of digital literacy. The Community approach as a vehicle for staff development, and a means of facing institutional change enabled participants to own part of the vision of the eLearning Strategy, and development of eLearning use in the institution, as well as providing a forum for challenging some of the Strategy's goals. Recognition needs to be awarded to the departments who have - with the support of their eLCCs and FeLDAs - developed successful communities where sharing of best practice and continuing focus on staff development was becoming a norm.

Learning institutes considering a community of practice approach to staff development would benefit from adapting the model to meet specific institutional goals and the pedagogical changes sought. The selection process for new eLCCs requires careful consideration to achieve the best outcomes. There is the potential to exploit the early adopters' willingness to understand and apply eLearning in their teaching practice. These devoted individuals often step forward and act in this capacity for their peers regardless of time release, and as such, time release is an appropriate recognition of their contributions and addresses the workload inequalities this can raise. Existing peer-relationships allow eLCCs opportunities to model and disseminate best practice among their teaching team, in an informal and non-threatening manner, but the importance of dedicated support from management in optimising the impact afforded by these opportunities should be recognised. While the roles of the community participants require flexibility to be responsive to their community's needs, clear guidelines and shared understandings of the role between eLCC, peers and managers will reduce role ambiguity, and improve outcomes.

Where to from here?

The Faculty eLearning Development Advisor positions have been extended to maintain momentum in embedding eLearning into teaching practice. A number of Departments have self-funded time release for key staff to continue developing their peers. Additional departmental positions have been created out of a deeper understanding of the value in supporting staff to embrace eLearning. Since the conclusion of the initial eLearning Strategy implementation phase, tailored communities of practice have been emerging in response to staff interests and skills, knowledge and experiences acquired over the past two years. These communities are evidence of an institutional shift in approaches to staff development, and have empowered teaching staff to initiate their own fora for exploring interest topics. It appears that true Communities of Practice are now developing in the wake of the eLearning Strategy, and that the emergence of these communities has been facilitated by the opportunities afforded by funded time release for staff development and community participation.

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Moodle and the Living Curriculum

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This paper discusses how Moodle can act as a catalyst in transforming teaching practice. During Unitec's implementation of a new eLearning Development Strategy, framed within a broader teaching and learning initiative referred to as the Living Curriculum, the institute migrated from Blackboard to Moodle. Reflecting on this transition period, the authors identify how the social constructivist approach underpinning Moodle complements and can be employed to facilitate and incorporate the characteristics of Living Curricula. An overview of Unitec's characteristics of Living Curricula is given, with four themes providing a framework for their application. An investigation of the Moodle tools through the lens of these themes enables us to relook, rethink, and redesign our learning spaces. Examples illustrate some of the affordances of Moodle in enabling a Living Curriculum, and lead to a reflection on the support required to encourage teachers as learners to recognise these affordances for their pedagogical potential. Discussion around the design and intent of Moodle leads to a consideration of how teachers dispositions ultimately impact on the tool's employment.

Keywords: Moodle, Living Curriculum, tertiary, teaching practice, affordances, dispositions

Background

Unitec is New Zealand's largest Institute of Technology providing vocational and applied professional education from Certificate to Doctoral level, with four campuses in Auckland offering mostly face to face delivery courses but with an increasing demand for more flexible delivery options.

The institution purchased a Blackboard license in 1998 and for the majority of courses was a repository for core documents and a means for announcement broadcasting. In 2009 an evaluation resulted in the decision to adopt Moodle as the institutional learning management system (LMS). The migration to Moodle was launched within the context of two significant institutional strategies; the Living Curriculum and eLearning Strategy.

The Living Curriculum

In 2010 Unitec began implementation of a transformative initiative described as the Living Curriculum. Development of the Living Curriculum was closely informed by discourse around transition pedagogy and social constructivism. It is defined by a number of key characteristics including complex conversations, curiosity, focus on practice, social constructivism, blended learning experiences, research-informed, interdisciplinary, literacies for lifelong learning and embedded assessment.

Using the key characteristics, Unitec developed a set of principles of learning and teaching (conversation, curiosity/enquiry, collaboration, self-efficacy, problem solving, creativity, and reflection). In analysing these, four key themes emerge; enquiry, discipline, autonomy and conversations as shown in Table 1. Embedded in each theme is the concept of Ako - the Māori concept of teaching and learning as a reciprocal, connected and interrelated process "where the educator is also learning from the student and where educators' practices are informed by the latest research and are both deliberate and reflective. Ako recognises that the learner and whānau [familial community] cannot be separated". (Ka Hikitia 2008, p. 20)

Table 1: Ako: learning together, Unitec pocket guide to the Living Curriculum (Unitec, n.d.)

Conversations *how learners engage with self and others to develop understandings*	**Ako as puawaitanga**. Ako acknowledges that curriculum development derives from diverse forms of intercultural communication.	Conversations about enquiry, knowledge, practice, learning and teaching are significant for engagement between and among learners, teachers, practitioners, communities, scholars, and with self and texts. Conversation develops beyond chat or discussion and becomes true dialogue that involves analysis, synthesis, critical thinking and reflection. Effective conversations help to build inclusive relationships, involve questions as well as answer, and facilitate the expression of different points of view. Conversations are contextually situated, and both technology and relationships mediate and facilitate conversations.
Enquiry *how learners go about asking and answering questions*	**Ako as wānanga.** Wānanga informs the curriculum through critical enquiry. The relationship of the learner and the teacher is interdependent, and reciprocal for personal and communal good. In this context, the teacher is prepared to learn from the learner.	The process of enquiry is at the heart of the tertiary learning experience. It necessitates reflecting on the world within the perspective of a domain, formulating a question, locating information in response to the question, interpreting and testing ideas and information, generating and synthesising ideas, and presenting and reflecting on the process. Synthesis, reflection and evaluation will in turn generate questions for further exploration.
Autonomy *how learners increasingly develop their capability and confidence*	**Ako as mana**. Mana binds the authority of learner and teacher with matauranga (knowledge). Integrity is developed through a process of poutama (scaffold learning).	Individuals taking increasing charge of their own learning, which may be best achieved through a scaffolded and staged process of learning how to learn, planning, managing and reflecting on the process and products of learning.
Discipline *how learners engage with the knowledge that underpins the discipline*	**Ako as kaupapa**. Kaupapa is a process by which intellect internalises, distinguishes and creates new knowledge.	Defined as a community of practice which has a (contested and evolving) body of knowledge and theory, based on particular ways of knowing and practising, which is taught and applied and researched. A discipline has its own literacies and language. Members of the discipline (faculty, learners, practitioners, scholars, etc) identify with this community of practice and help to induct new members.

Underlying the Living Curriculum, an additional 'eLearning Development Strategy' was launched with the aim of developing the capability and capacity of Unitec academic staff in integrating learning technologies to enhance the learning experience offered to students.

How does Moodle fit with the Living Curriculum?

Are the eLearning Development Strategy and the Living Curriculum about Moodle? Not directly, but the affordances offered by Moodle have influenced the eLearning Strategy, and have enabled teachers to reconsider their practice and learning design, in light of the foundational philosophy of the Living Curriculum, which is closely allied with social-constructivism. (Pachler, Bachmair & Cook, 2010 p. 47, as cited in Keesing-Styles & Ayres, 2011). Barajas and Owen suggest that implementation of an LMS will only improve educational outcomes if "teaching (pedagogic effectiveness) and institutional sphere" are considered (2000).

Moodle development was informed by social constructionism which, as with social constructivism generally, regards learning as a social activity. It has a particular focus on the learning that can occur while learners are actively involved with the process of constructing artefacts for use by others ("Background", 2012). With this view in mind, Moodle aims to offer students control of shared content in many of its core activities, enabling and encouraging learners to construct and co-construct learning artefacts, and contribute towards the provision of learning experiences in the online sphere.

It warrants strong mention that the driver for adopting Moodle as the institutional LMS was pedagogical - "The eLearning Strategy was predicated on the need for pedagogic change and for teachers to reflect on their own teacher identity, views of knowledge, and the place technology has to play in facilitating these beliefs." (Keesing-Styles & Ayres 2011, p. 50). Siemens encourages institutes to define learning as their starting point for selecting a technology platform. "A clear definition of learning vision and desired future states, created through input from stakeholders (administrators, faculty, students, and information services) should provide the foundation for decision making, and the boundaries of platform selection" (Siemens, 2006). The social constructionist foundations of Moodle complemented the transformative practices proposed in the Living Curricula and eLearning strategies more completely than other LMS options.

It can be argued that the use of an LMS provides structure and a safe starting point for academic staff embarking on their eLearning journey. Had Unitec endeavoured to implement an eLearning Strategy utilising only Web 2.0 technologies without a supporting LMS, some pioneering teachers may have been successful in navigating the new territory of teaching with technology but others may have struggled without the structure accommodated by an LMS. Had Unitec implemented the Strategy whilst still using Blackboard, it would have been without the benefit of the Trojan horse effect that the Moodle transition enabled and which provided the impetus for people to realise that change was needed and inevitable. As recognised by the Manager of Te Puna Ako at Unitec "The shift to Moodle facilitates changes in learning and teaching through our eLearning Strategy framed within the living curricula" (Ayres, Pers. Comm. 2009).

Moodle's Affordances in Realising a Living Curriculum

Moodle used at its best aligns well with the Living Curriculum, and offers affordances which can facilitate learning experiences consistent with the underlying principles, characteristics and themes of Living Curricula. The design and future direction of the Moodle LMS development are driven by an intention to support social constructivist and social constructionist pedagogy.

> Moodle doesn't FORCE this style of behaviour, but this is what the designers believe that it is best at supporting. In future, as the technical infrastructure of Moodle stabilises, further improvements in pedagogical support will be a major direction for Moodle development. ("Philosophy", 2012)

James Gibson's perceptual theory of affordances (Withagen et al., 2012, Gibson, 1982) originates within the domain of cognitive psychology and has been foundational in discourse around technologies. Putnam (2006) for example, identifies four key "affordances of technology" - providing access to information; automating, simplifying and transforming tasks; representing knowledge and thinking; and communicating and collaborating with peers and experts.

The work of theorists such as John and Sutherland (2005) has led to viewing affordances in terms of potentiality, and has introduced the argument that user perceptions, rather than the tools' innate features, are more influential in determining the affordances of the tool. Fisher, Higgins and Loveless (2006, as cited in Roder & Hunt, 2009, p. 220) describe digital technologies as "tools which afford learners the potential to engage with activities", with the ability to change the way users approach tasks, thus altering and influencing the nature of the activity. Withagen et al. (2012) also suggest that affordances can encourage certain behaviours, making them more likely to occur.

A considerable body of literature explores the affordances of technologies in terms of education, with a view to the relevance of learning technologies to meeting societal needs and social approaches to learning. McLoughlin and Lee (2007) explore pedagogical choices available given Web 2.0 technology affordances and recognise the social constructivist principles of Pedagogy 2.0 afforded in social software tools. Roder and Hunt (2009) note "The kind of technology which has driven many of the changing needs of society are also providing some of the tools, now beginning to appear in Web 2.0 which can, perhaps, assist in providing educational programmes to satisfy them" (p. 220).

The following sections consider the affordances of Moodle framed within the four key themes of the Living Curriculum as described in Table 1.

Conversation

Moodle can act as an enabler for complex conversations through "tailored opportunities to share ideas, ask questions and express their knowledge" in "an environment which is flexible, both in time and space" ("Pedagogy", 2012). When discussing complex conversations we refer not to chat, but contextual dialogue that "involves analysis, synthesis, critical thinking and reflection" (Ako: Learning together, n.d.). Complex conversations explore different points of view, posing questions as well as answers. When complex conversations become part of the learning process, learners are scaffolded through the practice of collaboration and participation, towards taking responsibility for facilitating complex conversations independently. Complex conversations need to occur between learner and teachers, peers, practitioners, other stakeholders, texts and self.

Using Moodle, teachers share resources with their students in a range of format types, or by linking to websites, ebooks and library links to research databanks. Where courses have multiple teachers, the range of texts can be extensive as contributors bring with them their own experiences and interests. This can offer students a wider variety of texts to engage with, but also the opportunity to critically evaluate a range of texts. There are many Moodle tools that allow students to also share readings they come across in their own learning journey. Teachers can deliberately design activities that promote this sharing where students upload or link to relevant material and explain its relevance to the course. Resources can be discussed in forums or chat activities to provide opportunities for learners to have critical conversations with peers, teachers and invited participants.

The chat activity is used in Unitec's Captive Wild Animals course for students and teachers to discuss the texts and interpretation of upcoming assignment requirements. Students are also raising and discussing current industry news in their informal chats, offering opportunities to tailor the curriculum pathway to their needs.

The flexibility afforded by the asynchronous nature of forums allows participants to post anytime, relieving the instant response pressure in the classroom, giving students the opportunity to think about their contributions before sharing them. Forums also allow more time to discuss a topic than designated class time affords. Enabling students further opportunity to explore diverse interdisciplinary, complex and specialised interests provides customised and transformational learning experiences, capitalising on student engagement with high interest topics.

At higher study levels learners are expected to "engage in complex conversations demonstrating intellectual independence" and to "generate content and utilise it as the basis for critically reflective conversations within the discipline" (Mapping the Living Curriculum, 2010). At Unitec the online text assignment activity is often used to engage students in reflective dialogue, usually in response to selected texts, identified learning opportunities, industry or community-based practice. The online text assignment tool enables facilitators to provide feedback and provocative questions inline with the students' own reflections, encouraging learners to further evaluate, challenge, develop and critique their ideas. This is an iterative process which guides and scaffolds students towards developing independent arguments, and high level critical thinking skills.

Complex conversations in the Living Curriculum involve industry and community participation. Forums can be used to interview practitioners, employers, and industry partners. Unitec have many instances of projects conducted in partnership with industry in educating students 'for work, in work, through work'. When completing industry projects a method for communicating between students, teachers and industry project supervisors is integral to the project's success. Industry project supervisors enrolled in the course can participate in collaborative activities and communications throughout the project. These provide a vehicle for communities of practice to develop amongst participants, and relationships to develop between students and key industry stakeholders.

Enquiry

Enquiry considers how learners go about asking and answering questions. Using an enquiry approach involves thinking about the world, formulating a question, finding and organising information about the question, critically evaluating, interpreting and testing ideas and information, generating and synthesising ideas, presenting and reflecting on the process (Willison & O'Regan, 2006).

Learners entering the tertiary environment are expected to engage with questions typically determined by the teacher, but as they progress their studies they negotiate the question and eventually establish specialised questions, guided by the teacher. To facilitate this, the learner needs an environment where they can engage in and be part of decision making. Complex conversations encourage learners to formulate and refine their questions, and reflect throughout the enquiry process.

A student's first experience might consist of answering the set question using one of Moodle's assignment activities. The Online assignment tool means assessment can be iterative with feedback along the way, providing the space necessary for negotiating the question and shared decision making between the teacher and the student. Forums provide a venue for students to share their question and receive feedback from their peers on how they might clarify the question further before investing time in research. Their peers can share relevant resources, providing invaluable discussions in learning how to critically evaluate information. A well facilitated forum discussion assists in learning to take “primary responsibility for generating critically reflective conversations, sometimes in unpredictable contexts” (Mapping the Living Curriculum, 2010).

Following the enquiry process, after formulating a question the students are ready to find information. At early levels of study, students may be choosing from a prescribed range of resources, however in later study a learner needs to source information independently from a range of resources using advanced research procedures. Moodle courses at Unitec support students in being research informed by incorporating tailored links to library resources within an html block. Each is customised to assist students with discipline related research. In courses where students are required to source information independently, a teacher may setup a collaborative database activity for students to share information they have found relevant to the question. Comments and rating options in the database activity provide a channel for peer review of these student sourced resources, identifying the most valuable for their assessment purposes.

Learners initially experience a high degree of prescription, scaffolding and guidance from their teacher. The Moodle course structure allows teachers the flexibility “to construct a shared and active representation of the learning journey” (Pedagogy, 2006). Learners demonstrate intellectual independence at higher levels of study by taking responsibility for determining the direction of enquiry. Some Unitec students use Moodle courses as their research portfolio, indicating the processes they followed. Their courses have provided the means to share their question, gather information in one place, collect data, presenting their findings and reflect on the learning process. These are examples of how Moodle can facilitate an increasing level of independence and self-directed enquiry. There is a close synergy between the Moodle affordances and the gradual scaffolding towards independence.

Autonomy

To enable graduates to take charge of their own learning, a staged process of learning how to learn, plan, manage and reflect on the process and products of learning is necessary (Ako: Learning Together, n.d.). Use of Moodle can help teachers to scaffold learners’ capability and confidence in becoming autonomous learners.

Initially learners develop independence by engaging within a defined range of contexts in largely teacher-directed activities in which constructive feedback by the teacher is given. A quiz incorporating well designed feedback enables students to quickly check their own understanding of a topic and identify focus areas for further independent study. A quiz also provides teachers valuable feedback on their own teaching practice and how well a topic material and associated activities is meeting a group of students needs. Moodle 2.0 conditional activities further allow teachers to develop more individually responsive learning pathways for learners according to their prior experience, and identified needs.

The students’ independence can be built by starting with familiar contexts then including theoretical and unfamiliar contexts. They gain a deeper knowledge of their discipline in a range of contexts as they progress, and learn to operate with some autonomy and responsibility for achieving outcomes of the learning process. The conversations between students in the forums and blogs helps the teacher to gauge the literacy demands of the course and the students literacy levels, enabling them to choose texts, resources and activities as appropriate to scaffold learning.

Moodle forums can be tailored for specific purposes. A single simple forum creates one discussion thread, keeping a conversation focused on one topic. However a forum in which each person posts a new discussion topic is useful for encouraging all participants to share case studies based on their personal experience and background. The other students can then respond, allowing each student the opportunity to receive personalised peer feedback. This process is helpful for students in realising and developing an understanding of their own personal ontology.

As learners progress through study they have increased responsibility for determining the nature, quality and quantity of outcomes, and then explicit and structured input on the process of reflecting and evaluating their own learning. The Moodle blog tool can be used as critical self-reflection tool. “Individual blogs allow people to express things in a public but reflective way, often providing access to thinking that might not normally expressed in, say, a forum” (“Pedagogy”, 2006).

Eventually learners are expected to manage their own learning with some supervision and structured input from teachers on learning strategies. At higher levels they should engage capably in a range of specialised familiar and sometimes unpredictable learning contexts. Helping learners participate in group settings, taking personal responsibility for individual contribution can assist in developing autonomy. Using Moodle's groups and groupings options, mini projects can be managed through Moodle's wiki and forum activities, offering students a safe place to test their ideas. Students can contribute equally to wiki pages for shared assessments, and groups can be kept separate or made visible to the rest of the class.

Students need to be able to evaluate their own work and capably evaluate the outputs of others. This requires self and peer assessment guidelines and skills to be introduced and supported. The workshop module provides a method for peer assessment of students work but is often neglected as a difficult to use Moodle tool. This impression is confirmed in the Moodle Documentation ("Workshop module", 2012) which recommends giving both the teacher and the learner experience with different assignment activity types first. Students can submit work online and via attachments, and receive grades for their own work and their peer assessments of other students work.

To help learners participate in relevant communities of practice within their discipline, the notion of Community of Practice must be introduced and developed, opportunities to operate as a community with direction on roles and responsibilities needs to be given, and guidance provided on cooperatively managing the dynamics of the group.

Discipline

This theme addresses how learners engage with the knowledge that underpins the discipline or domain. A discipline is defined as a "community of practice which has a (contested and evolving) body of knowledge and theory, based on particular ways of knowing and practising, which is taught and applied and researched" (Ako: Learning together, n.d.). Members of the discipline may include teachers, learners, practitioners, and researchers, all of whom help to induct new members into the culture, identity, language and literacies of the domain.

In early tertiary experiences, teachers guide students to engage with knowledge from selected sources with the aim to reach shared understandings. Collaborative glossaries using comments and ratings are a simple but effective means to develop literacies and shared understanding within the discipline. Because the Moodle glossary tool allows for duplicate entries, the teacher can ask all students to define the same term using their own words, and then discuss why their definitions differ. The combination of differing literacy levels, backgrounds and experiences, and context can give rise to engaging conversations among learners about their interpretations. From this process emerges a deepening understanding for all students and the opportunity for students to evaluate and acquire an understanding of theoretical concepts situated within familiar and personalised contexts. These processes are formative to a learner's identity within the discipline because as students develop a 'command' of knowledge in specialised areas they begin to engage in knowledge creation. The learner has to understand the relationship of specific knowledge to the discipline so they can independently and creatively apply conceptual knowledge in complex, variable, specialised contexts (Mapping the Living Curriculum, 2010).

Guided conversations with peers and teachers about analysing and interpreting problems and identifying appropriate responses, lead to learners synthesising disciplinary knowledge and linking relevant disciplines to their practice. The Unitec Department of Performing and Screen Arts have a shared Moodle course which showcases each of the different disciplines within the Department, exposing all students to the news, ideas and culture of related but separate domains, and encouraging cross-hybrid innovations to occur.

Students beginning to construct and reflect on their disciplinary identity in their initial studies subsequently progress to having interdisciplinary conversations about multiple perspectives from a disciplinary base and interdisciplinary collaboration. Learners will construct and reconstruct a disciplinary identity based on their engagement with disciplinary and interdisciplinary knowledge.

To integrate discipline-relevant examples the remote RSS feeds block can be implemented. Unitec's Nursing in Community course incorporates a feed from the Health section of the national newspaper. The course also incorporates international case studies relevant to each topic. Discussions about industry case studies and current news expose students to the variety of options their study can lead to in terms of a career path.

Teachers can collaborate in Moodle courses with industry partners providing external mentors and expertise, and educating students through real-world work contexts. The Unitec Department of Education has initiated a Moodle course to facilitate an Early Childhood Education Network, inviting employers to become part of a community, sharing best practice, discussing industry legislative changes, and providing stronger connections aimed at improved outcomes for students in work experience or practicum.

The value of real world workplace assessment is not missed in Moodle; the offline assignment activity gives teachers a method of advising students on their assessment requirements and recording their grades in the central hub that the Moodle course so often becomes. Another method to facilitate assessments based on authentic scenarios is to use advanced uploading of assignments. This assessment type allows students to submit a portfolio of all the files associated with the assessment. An example might be a project to build a boat, where the student submits a time-lapse video of the building process, along with the blueprints of their design with any amendments made during the process, a spreadsheet of their costings, and a reflective summary of what they learned and how they would like to approach the next project. The student can thus demonstrate their ability to generate and analyse data, come to coherent conclusions about their topic of investigation, and present their findings in discipline-specific formats. Giving employers and industry partners access to the course and encouraging their participation assists teachers in ensuring teaching, learning and assessment are appropriate to the discipline.

Considering Teacher Dispositions

Unitec leadership recognised that in order to fully integrate eLearning into the Living Curricula, institutional capability had to be developed and support structures provided to enable an optimal response to the new demands being posed (Roder & Rata-Skudder, 2012). Whilst some academic staff embraced the opportunity to experiment and innovate independently, many highly capable teachers in the face to face environment were challenged by these changes.

Recognition of Moodle’s affordances may be dependent on the dispositions of the teacher (John and Sutherland, 2005). Despite the design and intent of a tool, it is not necessarily the technology which inherently drives its educational application but the culture, context, and the dispositions of the users which will impact how the tool is employed. Existing Unitec research validates this hypothesis, “the radical pedagogical changes … were not because of the technology itself, but rather how it was used” (Narayan, 2011, p. 899).

Thornton (2006) defines dispositions as “habits of mind ... that filter one's knowledge, skills, and beliefs and impact the action one takes in a classroom...” (p. 62). As observed by Carr et al. (2010) “learning includes knowing why, knowing when and where, and knowing how, to use knowledge and ability” (p. 16). An individual’s circumstance and experience impact their disposition, and therefore the ways in which they approach new and unfamiliar learning contexts. Dispositions therefore “are the source of the recognition (or misrecognition) of learning opportunities and provide strategy and motivation for the inevitable improvisation that is learning” (Carr et al., 2010, p. 15).

It is well known that lack of training and support impacts negatively on teacher competence, confidence and motivation in integrating the use of ICTs (Guskey, 2002, Overbaugh & Lu, 2008). Conversely, teachers who can confidently use technologies in their practice are likely to understand the benefits and pedagogical potential of ICT integration (Bingimlas, 2009). The Ministry of Education (2007, cited in Carr et al., 2010, p. 16) suggests that as learners successfully develop competencies they become more inclined to apply them and recognise the opportunities and reasons for doing so.

However, the dispositions of a teaching practitioner may not be immediately transferable when confronted with a vastly different teaching context. Resnick (1987) found that when people are encouraged to implement a particular learning strategy, they may do so successfully in the short-term or familiar contexts, but will subsequently fail to apply the same strategy to other opportunities. Zhao et al. (2002) concluded that teachers who engaged with new innovations that significantly differ from their usual practices, and the cultural norms of their teaching environments are generally ill-equipped for success. Therefore, where teachers struggle to apply existing teaching dispositions and strategies to new situations, the need for carefully constructed support is paramount. Claxton and Carr (2004) suggest “the environment may need to invite learners to participate, actively engage them and include their prior knowledge in conversations and interactions of joint attention, or provoke them to recognise opportunities that are unfamiliar and new” (cited in Carr et al., 2010, p. 18).

In studying the conditions necessary for technology innovation in classrooms to take place, Zhao et al. (2002) found three significant factors for success: technology proficiency, pedagogical compatibility, and social awareness. They found that "teachers need to know the affordances and constraints of various technologies and how specific technologies might support their own teaching practices and curricular goals" (p. 489). Their studies showed that teachers needed support from people beyond their usual sphere of interaction. Additionally, Tishman, Jay and Perkins (1993) suggest thinking dispositions are learned through a process of enculturation, and use four elements in teaching thinking dispositions: modelling, explanations, peer interactions and both formal and informal feedback. Interviews with Unitec Academic staff have revealed this approach can work in the context of this learning institute. "At the eLearning mini symposiums you see how Moodle can be utilised and hear staff talking about successes they've had, so I see scope for being innovative and creative in teaching" (Unitec academic staff member, 2012).

Summary

Moodle offers a wide range of ways in which people can create representations of their knowledge and share them, and these affordances align closely with the characteristics of Living Curricula. On the one hand, the affordances of Moodle can help encourage specific design-intended behaviours in teachers and learners, and the Unitec experience illustrates the usefulness of Moodle as a Trojan horse for covertly challenging existing technology mediated teaching practices, and introducing those practices in a way that is better aligned with the principles of social-constructivism, and Living Curricula. However the perception of the teacher influences how or whether the affordances of Moodle tools are recognised. Explicit modelling of optimal tool use is likely to encourage users to adopt those behaviours afforded by the technology. In preparing teaching staff to recognise the pedagogical affordances, further intentional strategies need to be employed to address the teachers' perceptions if they are to successfully transfer their teaching dispositions to the new context of learning technologies.

Current discourse suggests that in equipping teachers to identify the pedagogical affordances Moodle has to offer, teachers as learners need to be actively engaged in conversations which connect their prior knowledge and perceptions to new contexts, support their understandings and the pedagogical implications of the technology, and the place of technology in their social context and broader learning culture. Formal and informal interactions with other practitioners, both within and beyond the teacher's usual sphere, are important in preparing teachers to understand the usefulness of various technologies in reflecting, extending and transforming existing pedagogical approaches. Additionally, importance is placed on the provision of best practice examples, feedback, explanations and modelling of the pedagogical affordances of technologies for learning.

The dispositions required in recognising the affordances of Moodle and integrated learning technologies can be learned and transferred, but the processes which encourage application of enabling dispositions need to be iterated in order to encourage ongoing success for teachers implementing technologies in their teaching practice. Through challenging a stance, teachers will gradually change behaviours and acquire the necessary skills, modifying their dispositions as a result. Dispositions can change over time, with the right teaching and technical support, and through facilitating opportunities for teachers to experiment, evaluate and learn from their collective experiences.

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Naming and measuring the elephants: sustainable change for blended learning

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Educational development work to replace traditional campus university teaching with more innovative blended learning activities usually involves articulating and questioning assumptions about disciplinary learning. But the assumptions built into the discipline and institutional organizational systems for managing study times and staff workload planning can block innovation. Several previous projects have established that intensive team workshops over 2-3 days, involving support staff working with academics to produce real outputs, can build sustainable capacity for curriculum innovation within academic units. This paper describes current work in one university that makes use of disciplinary curriculum mapping and explicit planning of academic and student workload in the educational design activity. Two pilots in different disciplines are being used to develop a model that can be applied and contextualized as part of a broader sustainable blended learning strategy.

Keywords: blended learning; teaching workload; student workload.

Background and context

The context is an Australian multi-campus University that recognizes the need to use newer learning technologies to provide students with a more flexible and engaging learning experience. The School of Business is embarking on a major program of curriculum redesign, to address concerns about competition in the market for Business degrees – especially from providers offering more flexible study options. The School of Nursing & Midwifery is introducing two new undergraduate programs in 2013, and has decided to replace all lectures with alternative online activities. Both Schools are being given additional resources to support these initiatives, as part of the institutional blended learning strategy.

Like many campus universities, there are few established processes for substantially innovative blended and online learning design. There is central e-learning and teaching staff development support. But until now the primary mechanism for introducing new methods and technologies has relied on individual teachers as 'early adopters' (Rogers, 2003). As a result, individual teachers can often only make incremental changes within established programs.

Salmon (2005) argues that simply adding e-learning incrementally into existing practices in campus universities will neither improve quality (in terms of flexibility and efficacy for student learning) nor improve efficiency (in terms of costs). She likens the incremental approach to early attempts at human flight based on flapping wings, when a completely new principle was needed to achieve powered flight. Academic communities tend to be conservative in their approaches to teaching and learning, and individual innovators usually encounter resistance when they try to make significant changes to teaching practice. There are good reasons for this. Disciplinary teaching is a complex system relying on distributed expertise and tacit knowledge, at multiple levels of the university (Russell, 2009). Most of this tacit knowledge is about traditional classroom teaching methods. So for blended learning to fly, we need a systemic team-based approach that gives time and space for rethinking pedagogy, with collaboration between discipline academics and with specialist support.

However, staff workload assumptions, and measuring teaching effort is an 'elephant in the room'. Academic departments, and individual academics, are often reluctant to be too specific about how they spend their time. Formulae used in enterprise bargaining agreements include assumptions that may not adequately account for new types of teaching work. Student learning time can be another 'elephant' in that teachers will often struggle to quantify the time that students take to carry out learning tasks, especially in classes with diverse backgrounds and levels of study skill. Sustainable introduction of blended learning requires that these elephants are not only named, but measured up and allowed space, to avoid completely crushing the benefits of blended learning (Laurillard, 2007).

Building on previous work

Figure 1 summarises some of the previous work on blended learning design that can be built upon. The Curriculum Renewal and E-learning Workload: Embedding in Disciplines (CREWED) model piloted at UNSW (Russell, 2008) and the Course Design Initiative (CDI) at Oxford Brookes (Dempster et al., 2012) were both designed to challenge curriculum assumptions through an intensive 2-3-day team-based design and develop hands-on workshop. Both draw on Salmon's *Carpe Diem* model, which is set up to generate tangible products, in the form of an overall plan and reviewed samples of online learning activities in two days. Another model developed at the University of Hertfordshire – Change Academic for Blended Learning Enhancement (CABLE) has an organisational change focus (Anderson et al, 2008). It was preceded by institutional benchmarking on eLearning capacity, includes a two-day residential and aims to establish ongoing relationships with staff in the central Blended Learning Unit. Central to all versions is a shared planning and visualisation exercise, where the overall learning design is developed collaboratively by a team of discipline academics and educational support staff.

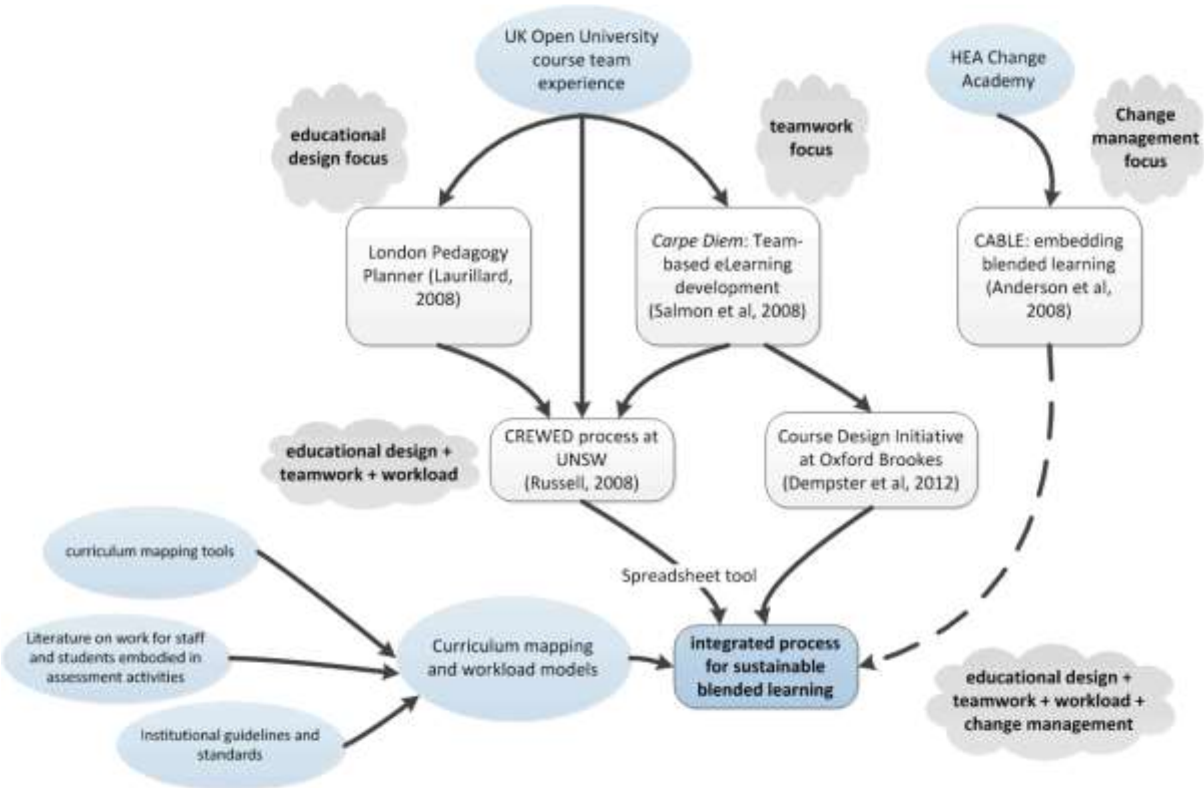

Figure 1. Learning from previous work on curriculum design for blended learning

All of these differ substantially from the more common practice of educational designers and developers working individually with academics through a series of one-on-one consultations. Instead, there is a structured and facilitated process in which a whole team, or in the CDI case sometimes multiple teams, develops a shared visualisation of the learning design. As in the original Open University (OU) course team model, peer review and testing of activities are built in rather than added afterwards. However, the intensive two-day workshop replaces the OU's extended team process, which was developed for large-scale distance education – hence Salmon's choice of the name *Carpe Diem*.

Workload planning in pedagogical design

If e-learning activities in blended learning are treated as an add-on to existing practice, the time required from students and from teachers can blow out to unmanageable proportions. Often there is little hands-on support and teachers have to learn to use the technological tools themselves. A study by Tynan et al. (2012) in four Australian universities found that academic work on online or blended learning 'requires more thorough auditing within specific contexts. Student workloads also need to be managed effectively. Laurillard's Pedagogy Planning (Laurillard, 2008) tool sought to make the types of student work involved in different types of learning design more explicit.

Mapping learning outcomes and assessment

In the original version of the *Carpe Diem* process, Salmon required that all participants had completed her e-Moderating online course. However, this has not always proved feasible (Russell, 2008; Salmon et al., 2009) The 2-day workshop starts by clarifying learning outcomes and reviewing examples of online learning activities before starting on the educational design. In some of the UNSW cases, the first part of the workshop took longer and was more problematic than time allocated had allowed for. When the academic team are both unfamiliar with online interaction with students, and have poorly defined learning outcomes (e.g. focusing on content rather than on what students can do), it is hard for the team to move beyond traditional practices. This is because many of the assumptions about classroom teaching and learning interaction remain tacit, and teachers lack experience of online facilitation. Prior work with the academic teams to articulate and map current practice helps to address this problem.

Current pilot implementation

The current pilot involved running two instances of an intensive design and build workshop process, one for the Property major in the undergraduate Business degree, and one for core units (subjects) in the undergraduate Nursing and Midwifery degrees. The Property program offers distance and campus based study options, and is keen to improve the distance student experience. Three units are being redesigned for semester 2 of 2012, and evaluations of these will be available by November. The Nursing and Midwifery work is for semester 1 of 2013, and is a more radical redesign, in that six core units will be designed to replace all lectures with online activities, while maintaining small group face-to-face tutorials and practical classes. Both disciplines have their own educational models, which can provide starting points for the design process. In both cases there are also external accreditation frameworks that shape the learning outcomes and their assessment.

There are a number of institutional resources available to support the change. We have a comprehensive set of data on the student perspective on use of IT from a survey in 2010, and from routine student feedback systems. Analysis of responses from 1st year Business students has already proved useful in challenging some teacher assumptions about what is feasible. We also have:

- A spreadsheet tool developed by the School of Business for estimating the work embedded in different types of assessment activity, for students and staff, based on published research
- Institutional e-learning quality standards, recently updated
- Curriculum mapping tools to enable each study unit or subject to be designed in a program context (two versions, based on models developed in other universities)
- A spreadsheet tool to capture educational design of each unit, including learning activities, assessment, student workload, staff workload.

The School of Business has been using their 'embedded work' tool for all assessment activities across the undergraduate degree. The School is also using curriculum mapping tools to put assessment activities within units into the context of program learning outcomes. Similarly, the School of Nursing program has had to map its curriculum and assessment for accreditation purposes. Already, some workload planning problems have surfaced, which will need to be addressed to accommodate the shift to blended learning. One is that teaching staff time is allocated only for the semester in which teaching occurs, making it hard to get teachers to commit time to the required design and development in advance.

By including explicit consideration and negotiation of student and staff workloads, we aim to address simultaneously educational design, team-building, workloads (for staff and students) and change management. Each academic unit has established processes for assigning work to academic staff, and there is an over-arching agreement at institutional level on how workloads are allocated. Some of the guidelines and processes will need to be reviewed and adjusted, or at least re-interpreted, to implement blended learning effectively.

Figure 2 summarizes the process being piloted. As with the Oxford Brookes CDI project, it will be necessary to adapt the scale of each two-day workshop to the context. Two pilot workshops were held in July 2012: one for three subjects in the School of Business Undergraduate Property Program and one for six 1st year undergraduate subjects in the School of Nursing & Midwifery.

Both Schools involved in the pilots are planning to roll out further development of blended learning across their undergraduate curricula in 2013 and 2014. Each pilot will therefore inform a School-based version of the process. In both cases there is parallel work going on to map the curriculum in relation to accreditation requirements for the degree programs. Curriculum mapping is an important preliminary step, because it clarifies

Unit learning outcomes. Agreed and well formulated learning outcomes are a prerequisite for articulating and questioning tacit assumptions about learning and teaching practices in the discipline. Once these two Schools have successfully run the process several times, it should be possible to develop a standard process that can be run and adapted as necessary for other programs.

Planning and monitoring of teaching workloads and skill development will be an important part of the pilots. One specific aim will be to identify efficiency gains that will justify investment of time spent in advance work on blended learning design and development. Another will be to identify where planning, workload models and support staff activities need to change to sustain the expansion of blended learning throughout the curriculum.

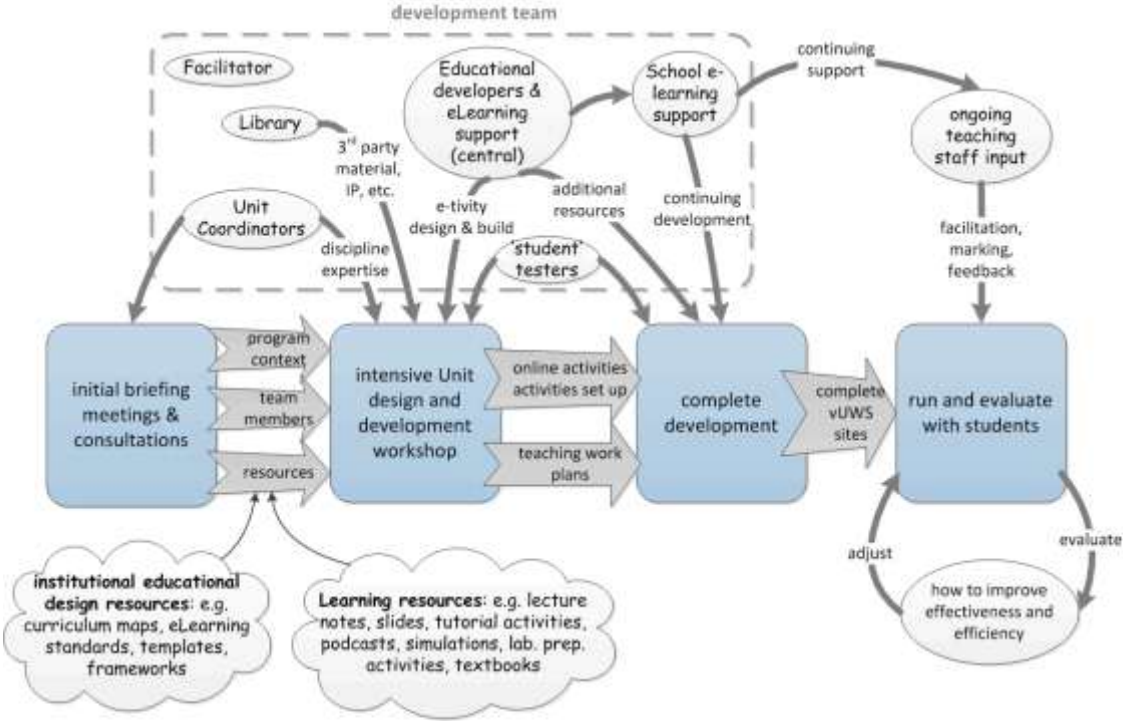

Figure 2. Blended learning design process being piloted in 2012

What we have learnt thus far

The workshop for the Property program took place over three days. The first day involved a program overview session with the whole academic team (6 academics), at which we reviewed the current educational designs and identified three basic types – each with a different assessment pattern. Then we had a two-day intensive hands on workshop with 3 academics to develop new online assessment activities for the three units running in semester 2. While there have a been a few minor glitches, overall the process succeeded in addressing the aims of the *Carpe Diem* process (Salmon et al., 2008), in that the team now has a shared approach that can be applied to other Units for next year. From the School perspective the exercise was extremely successful in that it improved the efficiency and effectiveness of assessment and feedback (for example by introducing group assessment tasks, use of formative quizzes, rubrics for marking). The fact that the School has a clear model for 'embedded work' provided a focus and a driver for the design of new online activities, as did the urgency of preparation for the upcoming semester.

The Nursing and Midwifery workshop was more ambitious – more like the multi-team workshops described by Dempster et al. (2012). We ran it for 6 separate Unit teams over two days. Attendance was patchy, with some staff unable to be there for the full two days – damaging the teambuilding process. Despite much prior discussion about the new curriculum for 2013, there may have been insufficient allowance for up-front planning and design work in the semester before the main teaching work. We were unable to fully 'seize the day' and have had to run a number of separate follow-up sessions (with each Unit team) to complete the work.

These outcomes have confirmed that team-building (Salmon et al., 2008) and workload planning for staff (Tynan et al., 2012) and for students (Laurillard, 2008) are all essential parts of the blended learning design process. We have begun to show how these complementary factors can be managed together as part of the organizational change required for effective introduction of blended learning (Russell, 2009).

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Sustainability of a university designed and developed media annotation tool to prepare learners with skills needed for future employment

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RMIT University's media annotation tool (*MAT*) is a computer software program dedicated to incorporating video footage to the student learning experience in a novel manner. In addition to the usual functions associated with videos, *MAT* allows users to enter written comments at strategic and key positions to emphasise the required learning points. Innovatively introduced to creatively support learning for work-ready skills, in 2011 *MAT* was integrated into courses across nine student cohorts, over six disciplines, in the Vocational and Higher Education (undergraduate and post graduate) sectors of the university. This paper will focus on analysis of insights of teacher experiences using *MAT*, highlighting sustainable ways forward with university designed innovations. It will introduce the context of implementing *MAT* and discuss the process of evaluating the requirements for promoting *MAT* to the wider university community and, more specifically, to embed and sustain *MAT* into the long-term.

Keywords: media annotation tool, implementation, integration, embed, sustain, e-learning.

Introduction

The theory and practice of e-learning is evolving rapidly in tertiary education (for example, Haythornthwaite & Andrews, 2011; Herrington, *et al*., 2010). Teachers as early adopters have a significant role as future makers of educational technology; their experiences informing sustainable innovation. Innovations in educational technology have benefitted from project funding over the last 50 years (Gunn, 2011). Many outcomes of earlier projects will have progressively exhausted their natural life span, while others will have underpinned subsequent projects and contributed directly (e.g., through tool adaptation) or indirectly (e.g., through dissemination of findings) to currently used technology. This paper focuses on a recent in-house innovation at RMIT University in Melbourne of a media annotation tool known as *MAT*. *MAT* is an interactive and innovative tool that enables learners to engage with video. As well as basic learner-control functions (play, pause, re-play, etc.), students can anchor text entries to segments of video. Their peers (within small or large groups), and also their teachers, can add to these annotations to create structured, threaded discussions converging on key points of the footage. The video under learning analysis can be student-generated and uploaded to *MAT*, or teacher selected and uploaded such as in-house productions or third-party videos with correct permissions.

This tool was developed to facilitate deep learning through the annotation to video footage by students. The innovation has undergone various iterations and applications, most notably the recent use of *MAT* in a number of diverse programs from medical radiations to law. It is currently at a post-project funding stage. The challenge for *MAT* now is whether its use is sustainable in a wide range of programs or if difficulties with adoption by academics and students mean it may disappear over time. This paper addresses ways *MAT* can be used sustainably in the future, potentially scaling up to an embedded tool in the suite of university technology, with numerous learning cohorts benefiting across the institute.

Educational sustainability

According to the online JISC 'Sustaining and embedding innovations – A good practice guide':

> Sustainability in innovation projects can be defined as embedding change as well as maintaining and enhancing project outcomes [and] In other words, project teams might well introduce new ideas for teaching and learning but the true "innovation" is about how these ideas go beyond the pilot/test phase and are applied and adopted appropriately throughout an institution. One could therefore argue, that sustainability and embedding are an essential element of any innovation! (Chatterton, 2010).

Gunn (2010) argued that an e-learning initiative is sustainable when three conditions are met. These are related to: (i) course integration and evaluation; (ii) integration and adaption into other learning scenarios and (iii) embedding into university systems and promoting to teachers. In the time since completion of design and development of the first planned stage of *MAT*, 'Stage I' video annotation (Colasante & Fenn, 2009), integration and evaluation of the tool has essentially met the first two Gunn (2010) conditions, and is yet to embark on the third. Table 1 aligns these three conditions to the progress of *MAT*.

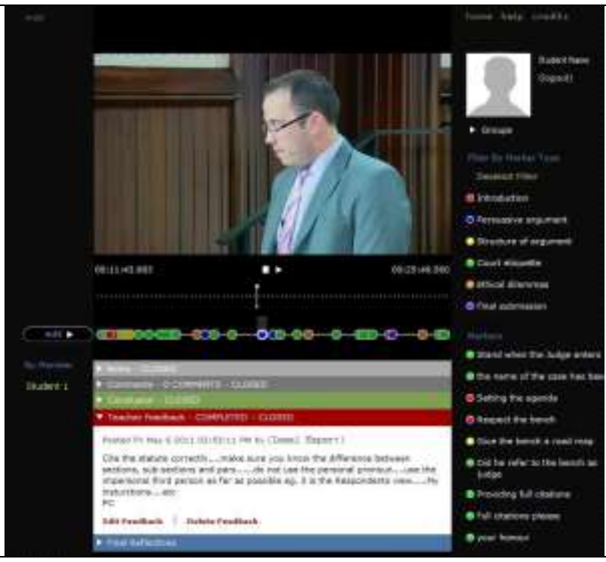
Table 1: The *MAT* initiative aligned to the Gunn (2010) three conditions of sustainability

Three conditions of e-learning initiative sustainability (Gunn, 2010, p.90)	Alignment to *MAT* progress
1. Course integration and evaluation: "A learning design involving information and communications technology has been developed and implemented within a course or courses of study. It has been through a proof-of-concept stage and has been judged, on the basis of evidence produced, to be beneficial to teaching and learning."	***Achieved.*** A pilot study in 2009 saw *MAT* integration in a physical education (PE) undergraduate course; findings were largely positive for active learner-centred engagement with video for pedagogically sound purpose (Colasante, 2011a; Colasante, 2011b). Recommendations from the pilot study included integrating and examining *MAT* in other courses, including work-preparation learning options (Colasante, 2010).
2. Integration and adaption into other learning scenarios: "The e-learning concept, design, system or resources have proven potential to be adopted, and possibly adapted, for use beyond the original development environment."	***Achieved.*** A 2011 university funded project saw *MAT* integrated across a range of disciplines and tertiary sectors of the institute. In execution, the multiple-case study approach also created an effective community of practice for sharing of ideas. Evaluation is progressing, and early data analysis indicates that the tool is more effective in engaging learners where learner-learner and learner-teacher interactions are designed into the learning, where there is clear alignment with assessment, and where video upload to *MAT* is managed by teaching or support staff rather than the students (Colasante & Lang, 2012).
3. Embedding into university systems; promoting to teachers: "Maintenance, use and further development of the e-learning concept, design, system or resources do not remain dependent on one or a few individuals who created them, to the extent that, if their involvement ceased, future prospects would not be compromised."	***Yet to be fully embarked upon.*** Maintenance of *MAT* continues (albeit relies heavily on the initial web developer) and improvements have been implemented as a result of teacher and student feedback across the multiple-case study. The innovation is still only known by a relatively few teachers across the university, although sharing through seminars (recent and planned) should improve this. In the university's educational technology landscape, *MAT* has not yet moved from 'student-facing pilot' to 'ongoing'.

The third condition—that of embedding into university systems and promoting to teachers—is a preferred way forward for *MAT*. Use beyond the university is also not unimaginable, as proven possible, for example, by the internationally deployed *VideoANT* (Hosack, 2010). The post-project stage will likely fall to others, instead of the funded project team. While the project team (primarily teachers and learning support academics/ professionals) were effective in further proving the concept and developing a community of practice, the skills required "to extend use of the product and findings beyond the development environment; that is, to address a key sustainability factor … are not the same as those for promotion or dissemination.", and so "the Principal Investigator or research team are not usually responsible for these later activities" (Gunn, 2010, p.98). Project team members are, however, keen to play a minor and/or hand-over role, to complete the project cycle towards the future success of integrating *MAT* into learning and teaching. This may include providing teacher ‘champions’ in promotional activities, and learning support professionals in teacher professional development and learning design roles, as well as sharing findings. The next section of this paper gives detail of the 2011 project that provided for the integration of *MAT* in various disciplines.

The tool and the funded project

MAT is a web-based annotation tool that currently allows textual annotations to discrete segments of video, which may be further added to by others in threaded discussion panels. The *MAT* project was funded by a 2011 university grant and titled ‘Using a media annotation tool to enhance learning that is work-relevant and enables industry collaboration (A multiple case study evaluation across disciplines and sectors to inform models to achieve this)’. It was aligned to the university strategic objective: ‘To be work-relevant and industry-partnered’, and followed a successful 2009 pilot evaluation of *MAT* integration in undergraduate physical education (PE). The 2011 project incorporated a collaborative approach by academics from varied disciplines and across academic colleges, as well as learning support professionals. Each academic had his or her own specific work-relevant learning needs for integrating *MAT* into learning and teaching, and most included industry representative participation in the learning processes (see example in Figure 1). The participating teachers, from the disciplines of medical radiations, chiropractic, and education (undergraduate); law (postgraduate); property services, and audiovisual technology (vocational); formed key project contributors, plus their student cohorts.



Industry representative participation

Industry professionals participated primarily by involvement in video production (by interview, or demonstrating or role playing practice) and/or providing feedback to students in *MAT*.
In the use of *MAT* for the Juris Doctor (JD) cohort, illustrated here, two legal industry representatives participated by co-scripting ‘moot court’ proceedings with the JD teachers, and then acting as judge and barrister in the video that the students subsequently analysed.
Further, one of the legal representatives provided direct feedback to the student groups on their moot court video analysis work in *MAT* (an example of which can be seen in the red ‘Teacher Feedback’ text panel).

Figure 1: Screen capture (de-identified): Example of the use of *MAT*, with markers and anchored text.

Examination of the project was via a multiple-case study of the varied learning cohorts’ use of *MAT* in their respective work-relevant contexts, to inform models of *MAT* use and to develop guidelines and publications to support wider application of such models. The project produced both process and product outcomes (Colasante, *et al.*, 2012). For example, the process of integrating this new educational technology into nine case cohorts over six disciplines involved *MAT* training and support mechanisms for teachers and students, learning design, and meetings and reflections on the various case applications of *MAT* in a project-wide community of practice. To inform the models (currently in development) of work-relevant learning that optimise virtual authentic learner engagement by integrating *MAT*, a range of data was collected. Surveys, observations, interviews and learning artefacts captured the student experience over two semesters (being reported in other papers). The teacher experience (plus that of industry representatives where possible) was harnessed by ‘interactive process interviews’ and cross-validated by post-subject artefact analysis of learning evidence within *MAT*. These interviews were semi-structured, lasted 30-45 minutes and were audio-recorded. The first 10-15 minutes involved the teacher demonstrating the processes of *MAT* use in their cohort, by a think-aloud walk-through of examples within the tool, followed by interactive questions using a themed protocol. In a minority of cases, the first part of the interview involved observation of active feedback processes in *MAT*. For the focus of this paper, emergent themes from the teacher interviews are discussed and analysed in regards to *MAT* sustainability.

Multiple Cases of *MAT* Curriculum Integration

Below is a summary of the various cohorts using *MAT* including the ways *MAT* was using video content and industry involvement, as well as the number of students (Table 2).

Table 2: The nine *MAT* course integrations

Tertiary sector		Discipline	Work-preparation theme	Video content	Industry involvement	Number of: students in MAT;	teachers in project
Post-graduate	'JD'	Juris Doctor (law)	Advocacy skills	Scripted and acted moot court proceedings[1]	Video co-scripters and informed actors; feedback to students in *MAT*; guest lecture	32	3
Undergraduate	'Education'	Education (literacy)	Literacy teaching skills	Students storybooks in development[2]	Guest lecture from an author of children's books	18	1
		Education (visual arts)	Visual arts teaching skills	Students own art processes and art environments[2]	Practical placement in schools including art classes	59	1
	'Health'	Chiropractic	Clinical thinking for clinical cases	Scripted and acted chiropractic consultation in two parts[1]	Video scenarios co-scripter and informed chiropractic actor	78	2
		Medical Radiation	Image evaluation skills	Senior radiographer critiquing a range of x-ray images[1]	Expert radiographer in videos	57	1
Vocational Education and Training (TAFE)	'VET'	Property Services (Cert IV, traineeship)	Customer service	Teacher interview of 3 professionals across different sized companies[1]	Experts in property services industry in videos	20	1*
		Property Services (Cert IV, owners' corp)	Conducting meetings	Student role-plays of industry-styled meetings[2]	Concurrent employment in the field	29	1*
		Property Services (Diploma)	Customer service and leadership	Teacher interview of a professional from a large company[1]	An expert in property services industry in video	22	1*
		Audiovisual Technology (Diploma)	Quality service	Two commercial videos on customer experiences[3]	N/a	39	1
TOTAL		**9 cohorts (6 disciplines)**	***Notes:*** *[1]Professionally produced videos (in-house or contracted)* *[2]Student-generated videos* *[3]Third party videos*	**Same teacher (across 3 courses)*		**354**	**10**

A major part of the 'process' outcomes of the project involved integration of *MAT* into the curriculum of varied learning cohorts. By integrating this new educational technology into nine case cohorts over six disciplines and across university sectors (see Table 2), direct outcomes included:

- 354 students having access to *MAT* in their learning
- 10 teachers exploring how to achieve various work-readiness learning objectives via an interactive multi-media approach using *MAT*
- project-wide community of practice, with sharing of teaching and learning experiences with *MAT*
- sub-communities of practice: a research group (over 50% of the project team), and a small strategic group (one member from each of the three academic colleges)
- five small group technical training sessions for participating teachers (plus five teaching assistants employed under project funding), over two campuses

- 13 in-class technical training and learning with *MAT* support sessions across the nine student cohorts (including repeat tutorial-sized sessions for the larger classes).

Teacher perspectives on the use of *MAT*

A number of issues emerged from the teacher interview data that raise issues of sustainability. These can be categorised under the themes of: recommending *MAT* to other teachers; technology ease of use; support mechanisms; future use; and professional development.

Recommending *MAT* to other teachers

All ten teachers recommended *MAT* for other teachers to use. Some added qualifiers, such as recommending a pedagogical fit for purpose, not using *MAT* in isolation of other learning strategies, and the need for support, time and cost coverage in relation to video production. For example, participants stated:

> Yes I would [recommend it], but I think it needs to be thought about exactly how it should be integrated into … their learning, their teaching … I don't think it's something that you could just use *MAT* and nothing else, I think it should be integrated as part of your package for your delivery for that particular program. ('VET' teacher-1)

> Yeah, I think it's a great innovation; I think it's a great visual tool; it's a very reflective tool; it's very active learning because you're engaging in dialogue; I love the industry element that we included, the industry representative. … [and advise other teachers] just to give themselves time to prepare; to use the instrument themselves if they can– and also I think to recognise that cost is a big part of any learning and teaching innovation and this is a pretty big innovation. It's been excellent but it's a big leap. ('JD' teacher-1)

Technology ease of use

The ease of using the *MAT* technology was not an explicit question in the teacher interviews, however, six out of ten teachers volunteered in interview that *MAT* was easy to use, and one of these teachers noted a pre-conceived view that the tool would prove difficult to use, and was relieved that it was not. Two teachers offered that the technology was quick to learn, for example,

> it's very easy to navigate through, because as I said, it only took me half an hour to figure out how most of the things work … [and] it was very easy to use, it can be flexible, everything is all there stored, I was able to log onto it ... when I was working from home. ('Health' teacher-3)

Seven teachers noted that time was a factor in their adoption of the tool, in that either *MAT* activities took up a lot of their time, or that they worried about the time commitment once the project supports were removed (e.g., project funded teaching assistant). For example,

> working with *MAT* in the future, we all know how to do it, to enrol the members, to put media in there … [etc.]. But because you have to do one group at a time, that admin aspect is actually fairly labour intensive and we had the luxury of the Teaching Assistant … it's one of those activities that you would have to realise are admin rich … with larger groups. ('Health' teacher-1)

Another factor relating to technology involved student ability. While some student cohorts coped with the technology easily, such as the Audiovisual Technology and Juris Doctor cohorts; other students had some difficulties. For example, the Property Services teacher appreciated in-class technical support for his mature-aged students, as some very basic technology ability gaps were evident and these needs required direct technical support. The Education-Visual Arts teacher felt her students were not the "tech-savvy" digital natives that she expected them to be, and noticed they needed more technological support than anticipated. Uploading student-generated video was a particular frustration for this cohort. In addition to the research interviews, the Education-Visual Arts teacher shared her student experiences in the project-wide community of practice, which helped other teachers prepare and/or arrange additional support to enable a smoother process, for example,

> at this stage, *MAT* needs to download the video overnight – and I really like it as a tool that students can use for videos that have already been downloaded by either for them or by the teacher because I think it's important that they don't get bogged down in the back end of *MAT* …

> If I had of expected my students to download their own videos … [as well as] put in their own markers I wouldn't have had the high participation … that I achieved. ('VET' teacher-2)

Support mechanisms

Technological and video production costs were factors widely raised by teachers. Another concern was the withdrawal of project supports affecting the ongoing use of *MAT*. For instance, one of the Property Services cohorts (Cert. IV, Owners' Corporation) required significant support. This cohort required filming of four student groups' simultaneously conducting role-plays of meetings, in evening classes, using 'Flip' cameras purchased with project funds. The cameras remain available after project funds are exhausted, but funding for additional staffing support is not ongoing. A snap shot of teacher comments, quoted or paraphrased, across the disciplines and related to project support include:

- "it gave me confidence that if something went wrong that I knew he [the teaching assistant] was there … Because I've never used it [*MAT*] before" ('VET' teacher-2)
- the technical support offered in the project freed the teacher to think of the pedagogy ('VET' teacher-1)
- any issues, contacted either project leader or teaching assistant employed by project ('Health' teacher-3)
- teachers within disciplines supported each other ('JD', 'Education', and 'Health')
- "clear written instructions would be helpful, [and/or] maybe one on one if someone could sit down with a teacher and show them how to use it" ('JD' teacher-2)
- support to use *MAT* was not available pre-project, then available in abundance during the project when we didn't have time to take advantage of it all ('Education' teacher-1)
- "the whole introduction to *MAT* and the practicalities of it really came from the student teachers or the teacher assistants … It was good for peer support but then I would say a lot of students were perhaps slightly lazy and took advantage of that and didn't learn how to do it themselves and relied on the two [teaching assistants]" ('Education' teacher-2).

Clearly, ongoing technical support for *MAT* is important to participants but this level of support is unlikely to continue due to the finalisation of grant monies.

Future use

One of the positives of the project was the rich reflection of project team members in relation to the future use of *MAT*. Staff reflection identified future applications such as the following:

> I see that this [*MAT*] could be used in a number of ways for effective learning … [and] could be maintained … as an electronic library but I think it's more flexible than that. The students could use this to apply that skill in a particular setting … [plus as a review tool for] revision for the exams, [and] students could use it as a refresher before next year starts so they can revise this content because next year's content extends on this. ('Health' teacher-3)
>
> it's got so much applicability in different contexts, presentations even; even in this [other] program … our students do so many presentations, because that's what they have to do when they go out there in the field. … [My other program] is Criminal Justice Administration, anything with the criminal justice sector but they do a lot of government projects and presentations and we go out, so being able to see what you can do and how, how to sell something, I'd love to use it here. ('JD' teacher-3)

Such creative applications of *MAT* were, however, qualified by the earlier resources concern. For example, one participant reflected:

> Possibly the problem is cost and resources, how will we pay for that in the future... [video and expert time costs] … there are some resources but … I'm worried about the future and … I'm wondering if we should sit with what we've done; do it again and then move next year – just because I think we need to solidify, consolidate. ('JD' teacher-1)

Professional development

Many of the issues emerging from the teacher interviews can inform professional development options for *MAT* integrations in the future. Some of these issues (paraphrased or quoted) include:

Establish purpose:
- evaluate if suitable, as even though it suited my course, *MAT* may not suit all content in all courses (‘Health’ teacher-3)
- “you have to think about exactly why you want to use it and how it’s going to be purposeful for your course and that’s really constantly articulated across to the students.” (‘Education’ teacher-2)

Learning design and student considerations:
- use *MAT* as one tool in amongst other learning strategies, as one part of a total delivery. (‘VET’ teacher-1)
- “Make it a reasonable percentage of your assessment” (‘Health’ teacher-1)
- plan your usage of *MAT*; develop good, clear instructions for the students (‘Health’ teacher-1)
- go beyond a technical focus in training, for example, structure the pedagogical framework of how the students will interact with the video (‘JD’ teacher 1)
- “if it is student’s work that is being presented, they have to really respect each other and respect each other’s work as well, because being critical of each other can be painful and hurtful.” (‘VET’ teacher-2)

Planning process:
- “play with it first, I think have a trial run, and you really need to practice and … think about every single stage … really think about, ‘Okay, what’s going to happen next; planning’, absolutely planning the life out of it so that you’ve got a contingency plan and ... just making sure the students are constantly kept in the loop about the benefits for them and why they’re doing it.” (‘JD’ teacher 3)

Recommended teacher PD approach:
- use modelling and/or champions: “it would be useful for teachers to look at what we’ve done and what has been done in similar projects, to hear some of the really good things and things that went wrong and the different ways that has been used to get ideas.” (‘JD’ teacher-2)
- “work with someone else and also to have confidence in the person or people that need to give you the technical support … it's not only technical support, because technical support without understanding of the tasks you’re doing isn’t worth a great deal. So you actually need people to engage with you and what you are doing so they understand how you are trying to make the technology work” (‘Education’ teacher-1)

Sustainability of project’s focus and outcomes

MAT has progressed through design and development (Stage I: video), pilot integration and evaluation, to multiple-case integration and evaluation across various disciplines in the most recent project. Embedding into university systems and promoting to teachers has been identified as the next step (Gunn, 2010) and options from this project for sustainability or scaling up supports—further supported by literature—include promotion, professional development in innovative teaching and technical training, as well as general ongoing support.

Promotion

Champions are a key factor in promoting and sustaining technological innovations. There is a learning curve involved with the uptake of a new educational technology and creating a culture of use in the institute is important for its acceptance (Breslin, *et al*., 2007). As a result of the 2011 project, there are now ten newly proficient teachers using *MAT* who unanimously recommended this innovation (with some qualifiers) for other teachers to use. These teachers could become champions, however, it takes more than a champion to effect success in technology integration, including “a complex environment that supports change, with engagement from a number of key players, all working together and developing and sharing a common vision or set of goals for the use of technology” (Bates & Sangrà, 2011, p.84). Positive aspects of appointing champions to promote technology also need to be weighed up with risks, such as champions leaving the institute, or evidencing excessive dedication and time to get the technology to work, which might deter others (Bates & Sangrà, 2011). Time commitment was noted as a factor of concern for the project teachers.

Development of models of *MAT* use from the various cases across the project (in-progress) is another planned step to help promote effective use of the tool, by way of offering pedagogical examples. The intention is to explicitly exhibit ways *MAT* was used to support learning in co-dependant visual and textual forms, which can be accessed via the web or during presentations and promotional activities by the ‘champion’ teachers and other training staff. A University of Reading pilot project in learning design (Papaefthimiou, 2012) found that academics needed to critically think about their learning design decisions, reflect on them, and discuss with others. The report identified that success in their pilot required “[r]epresentations and visualisations of courses or modules … to facilitate wider sharing and collaboration … beyond the localised pockets of good practice identified" (Papaefthimiou, 2012, p.28). A caution offered in the report was that stimulation and subsequent generation of innovative learning design ideas can result in more change than can realistically be implemented. In view of that, refinement stages are required within courses to decide what can realistically be achieved.

Professional development in innovative teaching and technical training

As indicated by the project teachers, teaching with *MAT* requires not just technical training, but a significant, integrated pedagogical component as well. Breslin, *et al*., (2007) noted the need for technical training and funding for embedding technological resources in learning, but emphasised the more complex requirement for pedagogical integration to be of learning value. Bates and Sangrà (2011) examined eleven cases of implementation of technology, and found the optimal position for success is where training is provided along with a focus on learning and teaching. They suggested that redesign of the curriculum is required to benefit current student cohorts, rather than simply adding technology to teaching (Bates and Sangrà, 2011).

To help facilitate *MAT* training (including self-training), technical guides have been developed as part of the project. The suite of guides was completed immediately post-project, informed by the student, teacher and support staff experiences with *MAT* across the nine cases of the project. They were peer reviewed in draft by non-project teachers, then reviewed in final version by project teachers. These include two manuals (teacher and student versions), two quick guides, and two video production technical support flyers. The manuals feature case use examples from the project (and from the preceding pilot) to contextualise *MAT* integration options. The guides have been recently uploaded to the web in a first step to meet the goal to provide "staff, students, and faculty access to information and services easily over the web" (Bates and Sangrà, 2011, p.72). To help facilitate a re-think on teaching involving *MAT*, models of *MAT* use are under development for eventual sharing across the academic community. One such model is already on offer from the 2009 pilot study (Colasante, 2011a; Colasante 2011b), with up to nine models to follow from the multiple-case study to demonstrate various possible approaches and to stimulate new application ideas.

Ongoing support

The data indicates that the success of the *MAT* project in 2011 was dependant on a number of issues, including resource and technical support. However, this level of support is unlikely to be provided by the university into the future as the grant provided a temporary injection of funding. A key positive outcome of the project was the gathering of interested and committed staff to apply *MAT* in new contexts. This group have developed an informal community of practice (Lave and Wenger 1991), and have shared ideas and identified new applications of this unique tool. Further, Owen and Davis (2010) summarised the nature of organically emerging communities of practice as self-sustaining but noted that some sort of formal leadership can add benefits, such as formalising support as needs arise. Indeed, Kran (2010) recommended communities of practice as "the best place to sustain project outputs". The *MAT* communities of practice that formed project-wide and intra-project were valuable for support while the project was active, but have been ad hoc since, although as Kran pointed out, "[s]ustainability does not mean forever; it can mean long enough."

Ongoing maintenance and cost issues are an important concern emerging from the data. According to Bates and Sangrà (2011), teaching technology should be adequately funded as a core rather than desirable activity, and that funding should include identification and budgeting "for the real cost of training faculty and instructors to use technology effectively." (p.93). They pointed out that:

> [w]here these projects operated in isolation of a more general strategy for technology integration, or were the initiative of a single senior administrator, they were more likely to fail or at least to restrict the extent of technology integration within the institution … Thus, while specific projects can be valuable, at the same time it is important to establish ongoing and permanent structures to support technology integration. (Bates and Sangrà, 2011, p.110-111)

Conclusion

The data analysed in this paper shows that *MAT* can be sustainable in the future if a number of strategies are adopted, aligned to the third Gunn (2010) condition of sustainability related to wider uptake and embedding into institutional systems. Firstly, the community of practice established through the LTIF project in 2011 needs to be nurtured and encouraged through continued meetings, with widening participation, sharing of ideas and collective writing. Participants in a continuing community of practice will benefit from reflections about what is successful and what needs fine-tuning in the use of *MAT*. Additionally, several of the project teachers have continued to use *MAT* in their courses in 2012; some have also integrated it into additional courses, and others are planning integration into alternative courses with a better understanding of how *MAT* supports various learning approaches. Importantly, some also intend to continue to evaluate *MAT*'s effectiveness, which will feed back into further understanding.

A notable concern from the data was the sustainability of *MAT* given the cessation of funding with the completion of the 2011 grant, and how the university systems might fill the void. Some of the teachers in the project required technical support in order to successfully implement *MAT*. Other teachers and students were able to quickly adopt *MAT* due to established technical ability and intuitive responses to the tool. As noted, a suite of guides has been produced, informed by the experiences of the multiple-case study and with case examples embedded in order to assist with the use of *MAT* into the future. While these should aid in the issue of reduced support to project teachers post-project, plus help those who are new to *MAT*, they will need updating as the tool matures. The various models of *MAT* use will be progressively available. In another issue of sustainability, this model formalisation process is currently reliant on post-project, spare-time commitment from project team members, with all funding and work-plan support since exhausted. Additionally, practical support for video production, in the form of technical support and/or equipment, needs to be considered on a larger scale as more teachers integrate *MAT* into their curriculum.

The full case models (in development) and the guides (completed) will be available to support further use of *MAT* in the university, and as new products, these will be open to further (post-project) evaluation. Also university IT department staff can be trained in the use of *MAT* to provide a level of ongoing support to those staff and students who require detailed support. These two approaches will assist with the sustainable future of *MAT* and ensure the ongoing experimentation and development of this innovative learning tool. The overall benefits of *MAT* in providing a tool for engagement and reflection in a variety of disciplines can be sustained with the continued good efforts of staff with various skill sets across the university and the acceptance and uptake by teachers and students.

From this research, a number of papers are in progress on specific discipline and/or sector applications, including detailing the student experiences. Future research directions beyond this will depend upon *MAT*'s sustainable growth within and beyond the university.

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Mediated learning in the workplace: Students' perspective on present and future value of knowledge tools

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Work-integrated learning is an essential component of many university degrees. This study examined a range of knowledge tools that are used by students to support their learning during clinical placement. This study showed that expert others in the workplace, print and electronic information sources and to a lesser extent electronic communication tools were utilized by students during their clinical placement to support their learning. The finding support an integration of practice-base learning with learning mediated by information sources to provides further understanding of work-integrated learning

Keywords: workplace learning, mediated learning, knowledge tools, information sources

Introduction

Universities in Australia and internationally have integrated Work-integrated learning (WIL) into programs of study. WIL provides tertiary learners with real world experiences that support the integration of theory with the practice of work (Patrick et al., 2008). This repositioning of learning experiences from university settings into workplaces harnesses the benefits of practice-based models such as communities of practice (Lave & Wenger, 1991) and workplace learning (Billett, 1994, 1995). These models posit that learning occurs through enculturation into practice with a central role afforded to workplace participants who are more experienced, wiser or more knowing, such as 'old timers' and 'more experienced others', sharing their knowledge and experience with learners or 'new comers' during everyday workplace activities. What remains hidden in such models is the importance of other knowledge tools to student learning that occurs in the workplace.

Information sources have an important role in learning. According to Engeström and colleagues (1984) learning "is mediated above all by … knowledge, initially embedded as material tools" (p.140) of information sources. Brookfield (1985) concurs explaining that books and educational broadcasts were "all devised by humans for the purpose of facilitating skill development or knowledge acquisition" (p.7). Across professions seminars, journals and health and medical databases are considered essential tools for learning proving access to new discipline knowledge (Garvey, Lin, Nelson, & Tomita, 1972; Keppell et al., 2001; Shanahan, 2011, 2012). The Internet has also been recognized as an important information source offering immediate access to the most current information through web sites of professional, government, education and commercial organisations (Herrington & Herrington, 2006; Shanahan, Herrington, & Herrington, 2009). Not only local experts sharing their knowledge during workplace activities mediate student learning in the workplace but also there are multiple information sources that similarly could mediate student learning in the workplace. In addition, communication tools such as email provide learners with access to experts and other learners across the world and support knowledge construction through articulation and reflection (D. Jonassen, Howland, Marra, & Crismond, 2008; D. H. Jonassen, 2000). This research sought to examine the perceived importance of workplace experts and information and communication tools to students for their present and future learning. The term knowledge tools is utilized in this study to encompass experts in the workplace sharing their professional knowledge (Eraut, 1994; Higgs & Titchen, 2001; Lave & Wenger, 1991), information sources that disseminate discipline knowledge (Eraut, 1994; Higgs & Titchen, 2001) and communication tools that support knowledge articulation and construction (D. Jonassen et al., 2008; D. H. Jonassen, 2000).

The study

Context

Clinical work placements are an essential component of professional health-related degrees with requirements linked to Program accreditation requirements (Patrick et al., 2008). The health area of the professional degree in this study is Radiography and like other health professions, the clinical placement is an essential element to meet Program accreditation requirements (Australian Institute of Radiography, 2010). The students were in the second year of the Program of study and attended a six-week block of clinical practice.

Research questions

The research questions were:

1. What knowledge tools are utilised by students to support their learning during clinica placement
2. What importance do students' attribute to a range of knowledge tools to support their learning whilst on clinical placement.
3. What value do students' attribute to these knowledge tools for learning as a future health professionals

Methodology

An anonymous questionnaire was distributed to 62 students following completion of their clinical placement. A range of knowledge tools was examined (see Table 1). Descriptive statistics were utilised to determine use of knowledge tools during clinical placement to support learning. A five point likert scale (e.g. 1 *very important* – 5 *not important*) was utilised to collect data on present importance and perceived future value of these knowledge tools for learning in the workplace. The survey data were entered into SPSS 17.0 ® and the Friedman Test (Pett, 1997) was performed to determine student overall ranking of knowledge tools for current and future learning in the workplace. Ethics Approval for this study was granted from RMIT University.

Results and Discussion

Of the 62 surveys distributed, 53 useable surveys were returned. The majority of students (68%, n=36) attended a clinical placement in a metropolitan location. The remaining students attended workplaces in regional (n=7) or rural (n=10) locations. Sixty percent (n=32) of students attended a public sector workplace, with the remaining 21 students undertaking clinical workplaces in the private sector.

Use of knowledge tools during workplace learning

Survey respondents were asked to identify the knowledge tools that they utilised during their work placement to support their learning. Percent and number of respondents that reported using the knowledge tool to support their learning during their clinical placement is displayed in Table 1.

Table 1: Use of knowledge tools to support workplace learning

Knowledge Tool	Percent [a] (No)
Text and reference books	96 (50)
Internet	94 (49)
Workplace experts	92 (48)
University E-resources	80 (40)
Email	72 (36)
Workplace Intranet with learning resources	71 (37)
Electronic journals	50 (26)
Health and medical databases	48 (25)
Print journals	46 (24)
Social discussion forums e.g. Facebook, Twitter	42 (22)
Seminars in the workplace	39 (20)
Journal club	28 (14)

[a] Percentages are based upon number of respondents answering each question

Students utilised a range of knowledge tools to support their learning during clinical placement. Eighty percent or more students utilised textbooks, Internet, experts in their workplace and University e-resources during clinical placement. Workplace Intranets providing access to clinical guidelines and journal articles were also utilised during clinical placement to support learning. In relation to journals both print and electronic were used by students to support their learning. The students also used email and social discussion forums to support their learning whilst on clinical placement. These findings highlight the high level of use of expert others as well and digital and non-digital information sources during clinical placement.

Current importance of knowledge tools during workplace learning

Students were asked to rate on a scale from 1 (very important) to 5 (not important) a range of knowledge tools that may be used to support their learning during clinical placement. A Friedman Test was conducted on this data to obtain an overall ranking of the importance students' attribute to these tools for learning. The ordered ranking is presented in Table 2.

Table 2: Current importance of knowledge tools during workplace learning

Knowledge Tool	Mean Rank
Workplace experts	3.16
Text and reference books	3.55
Internet	3.99
Workplace Intranet with learning resources	5.71
University E-resources	5.92
Email	6.87
Seminars in the workplace	7.42
Health and medical databases	7.50
Electronic journals	7.60
Print journals	7.84
Social discussion forums e.g. Facebook, Twitter	9.10
Journal club	9.34

Difference in ranking was observed across the examined mediating knowledge tools. The observed difference in ranking was statistically significant $\left(\chi^2 = 185.643, df = 811 p \leq .001\right)$. Thus indicating that value attributed to the examined knowledge tools for mediating learning during clinical placement was not homogenous. For example, students ranked workplace experts as having the highest importance for learning during clinical placement. This finding is in agreement with practice-based models of learning that posit that learning occurs through expert others sharing their knowledge and experience with learners or 'new comers' during everyday workplace activities (Billett, 1994; Lave & Wenger, 1991). Books, the Internet and workplace Intranets that provide learning resources such as practice guidelines, journal articles and University e-resources were ranked the four next highest respectively for supporting learning in the workplace. This finding indicate that these information sources are also of high importance to students and suggests that students are as Patrick and colleagues (2008) contend integrating theory with the practice of work during their clinical placement. The findings also highlight the importance of people with expert knowledge, digital and non-digital information sources to student learning during workplace practicum. It is also apparent that students place different level of importance to communication tools with email ranked more highly as supporting learning than social discussion forums such as facebook. This may reflect students' differentiating their preferred use of these tools between learning and socialising.

Perceived future value of knowledge tools for workplace learning

Students were asked to rate on a scale from 1 (very valuable) to 5 (not valuable) the future value of the listed knowledge tools to them as future health professionals. A Friedman Test was conducted on this data to obtain an overall ranking of the value students' attribute to these tools for their future learning. The ordered ranking is presented in Table 3.

Table 3: Future value of knowledge tools for workplace learning

Knowledge Tool	**Mean Rank**
Workplace experts	3.85
Internet	3.98
Text and reference books	4.45
Workplace Intranet with learning resources	5.15
Seminars in the workplace	6.15
University E-resources	7.24
Email	7.49
Electronic journals	6.49
Health and medical databases	7.26
Print journals	7.35
Journal club	8.39
Social discussion forums e.g. Facebook, Twitter	10.20

Difference in ranking was observed across the examined mediating knowledge tools. The observed difference in ranking was statistically significant $\left(\chi^2 = 218.508, df = 11 p \leq .001\right)$. Thus indicating that perceived future value attributed to the examined knowledge tools for mediating learning as health professionals was not homogenous. Workplace experts, Internet and textbooks were again ranked the top three knowledge tools, although there was some slight reordering of ranking between current importance (Table 2) and future value of these tools. Seminars were ranked fourth highest in value as a knowledge tool for learning as a health professional. This ranking of seminars was higher than it was ranked for current importance (seventh, Table 2) suggesting that students are aware of the importance of seminars to health professionals for their continued learning (Garvey et al., 1972; Keppell et al., 2001; Shanahan, 2012). The recent study by Shanahan (2012) demonstrated that health professionals ranked seminars as the most important information source for updating their professional knowledge. A finding that was in accord with the earlier study by Keppell and colleagues (2001). As only 39% of students attended a seminar whilst on clinical placement, the majority of students may not yet appreciate the important role seminars have in professional learning. It was interesting to observe that University e-resources were still valued by students as knowledge tools for their future learning. Cole (2001) identified that university resources such as journals had become less accessible to health professionals as electronic journals required login access typically restricted to student and staff of the university, whereas print-based journals could be accessed by any health professional who could physically attend the university library. The continued relatively high ranking of university e-resources for future value for learning may reflect a naivety that these resources will still be able to be accessed and used after completing their program of study. The findings also highlight the perceived value students' attribute to people with expert knowledge, digital and non-digital information sources for their future learning as health professionals.

Implications for learning theory

This study examined knowledge tools that support learning during workplace practice. Practice-based models such as communities of practice (Lave & Wenger, 1991) and workplace learning (Billett, 1994, 1995) posit that other participants in the workplace who are more experienced, wiser or more knowing such as 'old timers' and 'more experienced others' are essential to the process of transforming learners from novice to competent practitioners in their field. The findings from this study are supportive that expert others in the workplace do have an important role in facilitating learning during clinical placement.

It is also apparent that information sources have an important role in workplace learning. When learning is theorised as an activity mediated by tools (Vygotsky, 1981), information sources become cognitive tools supporting active, intentional knowledge construction (Hill, Wiley, Nelson, & Han, 2004; D. H. Jonassen, 2000). Information changes learners' knowledge in two ways. Information adds factual knowledge (Todd, 1999, 2006; Tynjala, 1999). This type of learning with information sources was termed in-*form*-ative by Kegan (2009) to denote its role in bringing valuable new content that is essential to ensure mastery in the learners field or discipline. Information sources such as books and journals provide the principles or theories, the 'know why' as well as domain content, the 'know what' of professional knowledge (Eraut, 1994; Tynjala, 1999).

Information can also change the way the learner knows and become what Kegan (2009) calls trans-*form*-ational.. In this case, the information does not just expand an already existing knowledge framework but the framework itself is reconstructed or changed (Illeris, 2009; Kegan, 2009). The process of reconstruction can involve linking previously unconnected concepts (Illeris, 2009; Todd, 1999, 2006) deleting previously held understandings and accepting something that is new or different (Illeris, 2009; Todd, 1999) and thinking about the information such as coherency of facts and bias of authors (Kegan, 2009; Todd, 2006). Whilst informative learning is portrayed in an increase in quantity of knowledge (Kegan, 2009), transformational learning suggests an increase in the quality of knowledge (Dole & Sinatra, 1998). Research differentiating novices' and experts' knowledge has shown that experts' knowledge is more detailed and comprehensive (high quantity) with higher levels of coherence, discrimination, relationships and generalisations (high quality) than novices' knowledge (Barba & Rubba, 1992; Bryce & Blown, 2012; Chi, Feltovich, & Glaser, 1981). Thus both informative and transformative learning with information sources is necessary for developing and maintaining expert knowledge in the learner's discipline area. Learning with information sources is always more than just the individual, it is person-plus (Perkins, 1997). The person-plus may include the individual learner plus the information source and their new understanding. Learning mediated by information sources, from this perspective is conceptualised as an individual mental process, such as in cognitivism (Candy, 1991; Jarvis, Holford, & Griffin, 2003; Merriam & Cafarella, 1999). Alternately, person-plus may expand to many learners, their shared learning opportunities plus the information source. From this conception, learning expands beyond the individual's mind and may include shared learning across participants such as in constructivism (Candy, 1991; Hill et al., 2004; D. H. Jonassen, 2000). In this current research students were shown to engage with information sources both on an individual and shared learning basis. On an individual basis, students read books and journal articles, searched the Internet and health and medical databases for needed information to construct their knowledge. Students also engaged in shared learning activities through discussion with expert others, utilising communication tools and participating in journal clubs. Together these activities provided students with opportunities for accessing new information as well as opportunities for articulating and sharing their learning with others.

Conclusion

Work-integrated learning is an essential component of many university degrees. By examining the knowledge tools that are utilised during this activity, which included expert others, and information sources, this research provides valuable insight. The findings from this research support an integration of practice-base learning, where the focus is on expert others and the role they play in facilitating learning in the workplace (Billett, 1994, 1995, 1999; Lave & Wenger, 1991) with learning mediated by information sources (Hill et al., 2004; D. Jonassen et al., 2008; Shanahan, 2011, 2012). This integrative approach provides further understanding of work-integrated learning by recognising the importance of both expert others and information sources to learning that occurs during clinical placement.

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Building an Institutional Reporting Framework for Consensus Moderation Practices

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This poster presents the initial findings from a two year Griffith University research project. The project entitled "*Developing consensus moderation practices to support comprehensive Quality Assurance of Assessment Standards"* is funded through a strategic Griffith Grant for Learning and Teaching, with ethical approval granted under reference number GIH/08/11/HREC. The poster describes the development of, and reports on the initial results from, applying a five level model of consensus moderation to assessment. Each level in the model describes a key stage in the assessment process, and a range of consensus moderation practices that would support quality assurance of assessment at that level. The reporting framework is imbedded in the University's online Course Profile system and requires academics to report on their consensus moderation activities. Initial results confirmed this to be a meaningful reporting framework to gather and evaluate consensus moderation activities in use throughout the University.

Keywords: consensus moderation, reporting framework, quality assurance of assessment

Building a Consensus Moderation Reporting Framework

Qualitative in-depth interviews held with academics in the scoping phase of the project revealed that many are engaging in a range of moderation activities. The initial picture presented of a lack of consistent moderation practices was due in part to the lack of consistent language used; which in turn made identifying and reporting in a meaningful way impossible to date (Nulty 2011a). The development of a framework and common understanding throughout the academic community on the meaning of, and practices consistent with, consensus moderation of assessment was required. Building on Sadler's work on moderation and quality assurance of achievement standards (Sadler 2009, 2010), a multi level model was developed to identify and describe the stages in the assessment process at which consensus moderation should apply (Nulty 2011b).

A mapping exercise was then undertaken to map consensus moderation practices identified in the scoping interviews with the different stages of the assessment process described in the model. This approach of identifying and categorising existing consensus moderation activities created a model that was acceptable and sustainable for academics. Academics 'recognise' moderation activities they already engage in, as well as being exposed to ideas to further develop their moderation practice. A five level consensus moderation model was finally approved and adopted by the University, supported by incorporation in the University's Assessment Policy.

This consensus moderation model then provided the vehicle for constructing a meaningful reporting framework against which Schools and the University could report on the consensus moderation activities they use. The University's online Course Profile system was the platform in which the reporting framework was imbedded. Course Convenors are required to complete and submit a Course Profile (the official and public University document) for each course, each semester. From Semester 1, 2011 the Course Profile document included a section on consensus moderation practice as part of its curriculum initiatives tracking system. Convenors are required to identify the consensus moderation practices used in their courses via ticking checkboxes next to descriptions of practice. The descriptions of moderation practices are consistent with and aligned to all five levels of the University's approved Consensus Moderation Model.

Results

The reporting framework was first included in the Course Profile system for use in Semester 1, 2011. Data was able to be collected showing the % of academics that engaged in some form of moderation of assessment across each level of the University's approved Consensus Moderation Model.

Table 1: The Use of Consensus Moderation Practices across 5 Levels of the Assessment Process

Consensus Moderation Level	% of Academic Use in Sem 1, 2011
Level 1: Course Level Assessment Planning	95.41
Level 2: Marking Student Work	92.25
Level 3: Grading Student Work	91.47
Level 4: Standards Across Courses	62.77
Level 5: Standards Over Time	71.73

Conclusion

The Institutional Reporting Framework for Consensus Moderation Practices allows data on consensus moderation practices to be systematically collected for the University for the first time. Initial results revealed that academics were able to successfully record their consensus moderation activities; allowing the University to collect Institutional data to evidence support of quality assurance of assessment and academic standards.

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Emerging strategies for a sustainable approach to professional development

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Recent elearning trends in higher education are unleashing non-traditional professional development strategies. Employing a pragmatic approach to research, an evolving evidence-based practice within an Australian university is examined to establish a set of guidelines for sustainable professional development practices. A combination of traditional and non-traditional professional development strategies are described and staff participation and strategic impacts are analysed. Whilst current initiatives demonstrate good practice in terms of approach, strategies, contexts, content, and quality indicators, incumbent challenges include a demonstrated preference among staff for traditional workshops, voluntary participation which contributes to uneven elearning development, and the absence of formal follow up on transferability of skills and impacts. The study concluded that a purpose driven, multi-dimensional professional development approach that is embedded across all layers of the organisation advances sustainability. Six design principles are proposed for the achievement of sustainability within a centralised professional development service at an Australian university.

Keywords: elearning, professional development, sustainability.

Introduction

Approaches to professional development in higher education is increasingly influenced by evolving models of teaching and learning, impacted by trends in technology. Four significant technology trends are extended access to educational resources; relationships supported by the ease of internet access; the expectation to be able to study anywhere, anytime facilitated by advancements in mobile technologies; and the capacity to learn in collaborative and engaging online spaces with rich resources using social media and cloud based technologies (Johnson, Levine, Smith, & Stone, 2010; Johnson, Smith, Willis, Levine, & Haywood, 2011). Staff development challenges associated with these trends are the expectation for staff and their students to be digitally literate; for staff to acquire the skills to work effectively within models of education that have emerged from the economic pressures of the last decade (e.g., large classes, diverse cohorts, multiple study periods, offshore partnerships, multiple delivery modes); for staff to keep pace with the proliferation of information, tools and devices integrated within learning environments; and for staff to understand and apply new metrics of evaluation in their work. These challenges are further compounded when the time pressures academics already face are factored into achievement of the common goal of effecting change in understanding, practice and beliefs in technology integrated environments (OECD, 2009; Wells, 2007). Such conditions are driving efforts to obtain new and sustainable ways of approaching staff development in higher education environments.

In this paper we examine our response to these trends to bring about sustainable change in knowledge, skills and attitudes amongst staff, with the use of non-traditional professional development strategies to complement a long standing traditional approach. Whilst 'leading in a climate of change' we analyse the sustainability of these emergent professional development strategies and extract a set of design principles to guide our future work.

Sustainability in professional development and learning

We take a broad perspective on sustainability in our work practice by examining the strategies we employ to promote staff engagement in elearning development that reaches beyond once off training and proof of concept teaching development projects to achieve change that is both strategic and embedded. To fully conceptualise our approach, we draw from three related concepts: professional development, professional learning and sustainability.

The terms professional development and professional learning, although often used interchangeably in the profession, are differentiated in the literature. Authors such as Little (1999) and McLaughlin (1994) suggest that professional development refers to something that one 'does', or that 'is provided', or is 'done to' staff. It involves both formal and informal activities that "engage teachers or administrators in new learning about their professional practice" (Knapp, 2003, p. 112), and includes "activities that develop an individual's skills, knowledge, expertise and other characteristics" (OECD, 2009, p. 49). This traditional approach is generally associated with generic workshops and in-service training, and has attracted much criticism for being fragmented and decontextualised. The use of the term professional learning signals a shift in thinking, as Knapp elaborates, "it refers to changes in thinking, knowledge, skills, and approaches to instruction that form . . . teachers' or administrators' repertoire" (pp. 112-113). This shift signals changes in one's capacity for practice or changes in one's practice itself. We are mindful of the shifts in thinking denoted by these terms and embrace the new directions within our work. To this end, Day and Sachs' (2004), Wells' (2007), Grant's (1996) and Applebee, McShane, Sheely and Ellis' (2005) explanations provide us with a cohesive conceptual understanding. We view professional development as encompassing formally planned and naturally occurring activities that staff may engage in collaboratively or independently, to acquire and develop ideas, knowledge, skills, attitudes and practices that bring about change in their work and foster inquiry-based learning within a supported environment. Therefore, our view of professional development is responsive to the shifts in thinking represented in the literature, and is articulated in our interchangeable use of the terminology within this paper. Our use of the term sustainability broadly refers to the capacity to achieve durability in practice. Our primary consideration of sustainability is from the perspective of achieving shifts in knowledge, skills and attitudes that contribute to lasting change in technology integrated teaching and learning practices. Additionally we consider sustainability in terms of our approach to addressing staff needs and institutional priorities in a timely and resource efficient manner.

We contend that our approach aims to reach beyond traditional professional development strategies that typically involve one-off workshops with limited continuity or contextualisation based on a model of expert-to-novice knowledge and skills transfer. Such an approach offers limited sustainability with its focus on 'just in time', discrete improvements in practice focused largely on individuals, making it resource intensive compounded by scheduling difficulties and low participation (see Kelly, Singh, & Schrape, 2011). In fact, the Westchester Institute for Human Services Research (2012) claims, "such conventional forms of professional development have little effect on educator practices, organizational changes, and student outcomes" (para. 9), raising concerns over strategic impacts and sustainability.

Our approach to professional development and learning aims, therefore, to strengthen links to classroom practices; create ongoing, self-directed and collaborative opportunities for staff to engage in elearning developments; to keep abreast of emergent trends in educational technologies to promote innovative pedagogies; and to enhance research led teaching. This aligns our approach to professional development and learning to some of Hawley and Valli's (1999) influential design principles. The strategies we employ incorporate contemporary approaches such as teacher networks, joint networks, collaborations, action research, mentor programs and peer coaching, as we believe these address complex and multifaceted needs, including that of strategic and sustainable practice.

Approach to the design of professional learning and development

Given the multiple layers of elearning development strategies that have evolved in our practice, we sought an approach that would allow us to derive evidence-based claims about our work. A design based approach was considered suitable as it would enable us to develop a set of principles to guide our practice in iterative cycles (Barab & Squire, 2004). Additionally, this was a preferred approach because it allowed us to address the messiness of real-world practice, recognise the influence of the local context including the multiple dependent variables, and capture the social interactions in which our work is embedded. Most importantly, it values the staff as participants who contribute to the design and evaluation of our practices (Collins, 1999).

This approach enabled us to situate our analysis and reflection in the local context, enabling us to theorise our work by focusing on contextual aspects including staff participation data and our responsiveness to elearning developments, and to uncover a set of guidelines for future work.

Professional development strategies

The complex organisational nature of universities, accompanied by evolving pedagogies, requires multiple professional development strategies to effectively address needs, respond to emerging trends in teaching and learning and facilitate improvements. We 'push' information out to staff by modelling the use of web 2.0 technologies, and we 'pull' staff in through traditional workshops. Our group and project learning strategies combine both approaches. Our use of a combination of 'push' and 'pull' strategies converge to contribute to strategic teaching and learning goals. However, it is problematic to demonstrate a direct link between the professional development opportunities we offer and teaching and learning enhancements (Ingvarson, Meiers, & Beavis, 2005; Meiers & Invarson, 2005). At best we claim a convergence across these areas, evidenced consistently through *e*VALUATE, the university's online system for gathering and reporting student feedback on teaching and learning experiences, and CASS, the Curtin Annual Student Satisfaction Survey data on students' elearning experiences.

e-Newsletters

Electronic newsletters are published monthly in a university blog as well as via a broadcast email to all staff. Topics on emerging educational technologies and their pedagogical applications are strategically selected to raise awareness and stimulate interest among staff. Typically a member of the elearning team volunteers to draft a newsletter on a topic of interest, and the document is then developed collaboratively. To date we have produced 32 e-newsletters on topics ranging from *Using Skype in Education* to *Interactive Rubrics*. Anecdotal feedback from staff suggests this is a highly valued professional learning resource, providing timely information throughout the semester. The collection of e-newsletters is located at: http://blogs.curtin.edu.au/cel/category/cel-newsletter/ and is available beyond the university. Pushing out information and teaching tips in this way, provides an ongoing source of professional learning designed to raise staff awareness, knowledge and skills about teaching with technology issues. Modelling the use of the blog tool tacitly promotes staff engagement with web 2.0. The e-newsletters also serve the strategic purpose of raising the profile of the Centre and its services, mainstreaming elearning. We find this a sustainable strategy as it strengthens team collaboration, disperses the workload, and generates university wide reach in an efficient and effective manner.

Curation – *Scoop.it*

The recent increase in the rise of content aggregation tools has provided new opportunities to quickly and easily organise, summarise and share (republish) information on topics of interest. One such tool currently being trialled at Curtin is *Scoop.it* (http://www.scoop.it/), which offers a magazine style layout of curated topics. Users are permitted to publish up to five topics at no cost, and our subscription at a nominal monthly cost permits the creation of up to 20 Scoop.it topics.

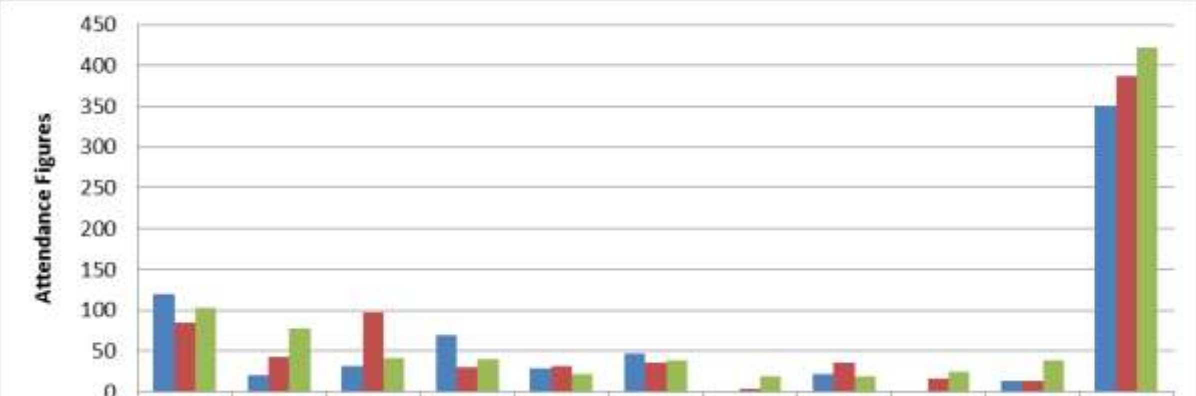
To integrate and facilitate adoption of cloud-based curation tools we are increasingly embedding curated topics within related professional learning resources made available via our website. In the first two months of adoption we are managing 14 topics and we have received over 14,300 views since adoption mid April 2012, with an average of 140 views per day. Our curated topics include current interests in *Mobile Learning in Higher Education*, *Learning Analytics in Higher Education* and *Open Educational Resources*. Curation offers a dynamic and flexible means of extending our professional learning offerings within and beyond the university, making this a sustainable team based strategy that we use to strengthen a range of existing resources, and simultaneously generate interest and build knowledge in current educational trends.

Website Resources

The Curtin Teaching and Learning website (http://ctl.curtin.edu.au) is an information hub where staff can access resources and information. Resources focused on good practice guidelines and tips addressing e-pedagogy, learning technologies and using *Blackboard*, are updated regularly. Information and access to projects, policies and documents, services and news and events are provided. Local case studies are showcased in a gallery area as a further strategy for advancing good practice in elearning. The strategic direction to develop our initiatives in particular areas has meant that we have shifted to tapping into *Blackboard* resources supplied by external providers, as well as continuing to develop 'home grown' tip sheets focused on e-pedagogy. This has enabled us to extend the range of resources to include video and tip sheets covering a wider range of topics, thus adding to sustainability in our practice. The website receives between 3,000-6,000 unique visitors every month, making it a vital professional learning resource for staff. The continuous process of managing the website is highly sustainable as we utilise the web development expertise available within the team, and all team members contribute to content generation and updating of materials.

University-wide Workshops

An extensive workshop program is run throughout the year. The hourly sessions mainly cover topics designed to develop effective use of *Blackboard* and other integrated technologies. The number of workshops offered for the last three years is as follows: 2010 = 165 (75 + 90); 2011 = 162 (74 + 88); and 2012 = 89 in semester one. All sessions are facilitated by two elearning advisors. Staff self-enrol into sessions using an online booking system. Participant numbers are capped at 10 to allow for small group discussions and hands on practice with the relevant technologies (see Kelly, et al., 2011). The range of workshop offerings and attendance figures during Semester 1 2010, Semester 1 2011 and Semester 1 2012 are supplied in Figure 1.



	Introduction to Blackboard	Managing Assignments	Grade Centre	Blogs, Journals, Wikis & Podcasting	Echo 360 - Personal Capture	Elluminate /Bb Collaborate	Tests and Quizzes	FOLT Module 7	Communication & Collaboration	Other workshops	TOTAL
S1 - 2010	119	20	32	69	29	47	0	22	0	13	351
S1 - 2011	84	42	97	30	31	35	4	35	16	13	387
S1 - 2012	103	77	41	40	21	39	19	19	24	39	422

Figure 1: Semester 1 workshop attendance figures over three years

The workshops continue to attract a relatively large number of staff demonstrated by first semester figures for 2010, 2011 and 2012 reaching 351, 387 and 422 respectively. This reflects a participation rate of between 10-12% of Curtin staff (n = approximately 3500). We consider this a reasonably good reach given that less than half of all staff have a teaching responsibility and so the workshops would hold no interest for them. However, the pervasiveness of technology integration across most areas in the university, is contributing to increasing numbers of non-teaching staff attending some of these workshops to further develop their knowledge and skills.

An evaluation survey of the workshop program is undertaken each semester to gauge staff satisfaction. Although participation rates in this survey are relatively low (2010 = 21.7%; 2011 = 26.1%; 2012 = 27.3%), the data provides a snapshot of staff attitudes and the perceived value of this strategy. We attribute the low participation to survey fatigue, timing of the survey, and staff workload issues (see Kelly et al., 2011), and we are cautious not to generalise the high satisfaction results to the population as a whole. Semester-on-semester data for three years supplied in Figure 2 show high overall satisfaction levels drawn from combined ratings of 'good' and 'very good' (2010 = 79%; 2011 = 96%; and 2012 = 90%).

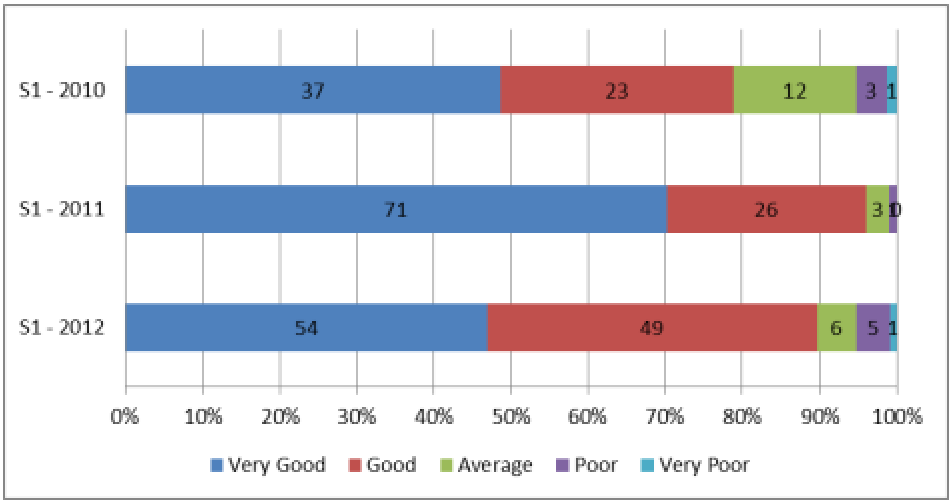


Figure 2: Satisfaction level with workshops attended

Respondents' perceptions of the level of support received (2010 = 89%; 2011 = 86%; 2012 = 83%), and e-pedagogy knowledge gained (2010 = 64%; 2011 = 86%; and 2012 = 87%) was consistently high with an exception in 2010. The latter is likely attributable to the focus on supporting staff to become familiar with integrated web 2.0 technologies as well as developing proficiency in a virtual classroom environment.

The above mentioned evidence suggests that despite being a traditional approach against which much criticism is levelled in the literature, workshops continue to be a much subscribed to professional development strategy at the university, possibly associated with traditional perceptions about 'training' and 'PD' among staff. Despite the criticism that the workshop strategy tends to focus on teaching discrete skills and techniques that fail to accomplish sustained change in teaching practice (Wells, 2007), its usefulness for delivering certain types of information (e.g., when rolling out new technologies) is proven (Little, 1994 as cited in Wells, 2007). However, unlike some of our other professional development strategies, workshops are resource intensive as we offer in the region of 80-90 workshops per semester, each one facilitated by one or two staff. Added to this, attendance patterns and learning needs vary throughout the semester making the workshop program a significant component of our day-to-day workload during teaching periods. They require constant updating of resources, and maintenance of the *Blackboard* training units used for hands-on practice in these lab based workshops. However, staff expectation, satisfactory participation rates, high overall satisfaction and increasing interest among non-teaching staff mean that this is likely to continue to be a core strategy. Criticisms against the conduciveness of this strategy for integration and adoption of new knowledge and skills (e. g., Wells, 2007) are partially mitigated by the complementary strategies emergent within our approach.

Departmental/School Based Workshops

Presentations and workshops are also run for Faculties, Schools and Departments on request and this strategy is particularly useful when rolling out new learning technologies, or upgrading systems. The number of workshops per semester varies from 8-12 with staff attendance ranging from 40 to 84, based on data from the past three years. With representation from Schools across all faculties and more recently non-teaching areas (e.g., the Library and Student Central) as well, this is potentially a powerful means of offering contextualised professional development with reasonably good 'reach,' further demonstrating the impact of our services across the university.

Providing professional development to local environments offers two significant benefits. First, it facilitates greater contextualisation enabling us to more effectively target and address specific needs. Second, it is more likely to generate collegial support and mentoring among staff, with 'early adopters' or more experienced users providing leadership and guidance within specific teams. This strategy facilitates customisation, combatting the limitations of decontextualised offerings. Also, the fact that this is a group based strategy means that we not only reach larger numbers of staff, but also that the potential for cooperative and collaborative engagement within disciplinary based communities is enhanced, all of which make this a sustainable alternative to university-wide workshops.

Communities of Practice

'Communities of practice' are a further professional learning strategy we implement. Borrowing from Wenger (2006), these initiatives strive to "facilitate knowing and learning" to improve practice. Three characteristics apply to this professional learning strategy – (1) The groups have an identity defined by a common interest; (2) Members engage in joint activities and discussions to help each other and share information; and (3) Members are a group of practitioners who develop a shared repository of resources, experiences and ways of addressing recurring problems (Smith, 2003, 2009; Wenger 2006). Building and sustaining relationships among staff across areas of the university and pooling expertise to pursue common interests drives this strategy, making it a sustainable professional learning strategy as the community supports each other in problem solving, sharing information and experiences, reusing assets, harnessing synergy through coordination of efforts, activities and developments, documenting processes, mapping knowledge and identifying gaps, as proposed by Wenger.

The iPad Users Group is one of our communities of practice. Initiated and facilitated by members of the elearning advisory team, this group aims to create a forum for collective learning. An initial meeting was held in March 2012 as a catalyst to bring together as many interested people as possible to share information, ideas and resources on using iPads. A self-sustaining learning group was established to facilitate networking among staff on a variety of topics and issues and a *Blackboard* community space was created to support the group. To meet the diverse needs of the community, multiple interest groups were established with the facility for users to self enrol into the following groups: 'Absolute beginners', 'App development', 'Managing multiple iPads', 'Mine's not an iPad', 'iBooks', and 'iPads in education: Resources, apps, ideas.' The site also provides a range of resources, tips and tricks. In its first week, the community grew to 50+ members and six months later it has reached 227 members. Again, borrowing from Wenger (2006), the iPad Users Group is a collection of people "who share a passion for something they do and they learn how to do it better." Through their regular interactions, they make professional learning a self-driven activity demonstrating the viability of this as a sustainable practice.

The elReps group is our second community of practice. Similar in its purpose to the iPad Users Group, this group, also initiated by the elearning advisory team, is aimed at creating a forum for collective learning. This thematic group was formed in November 2011 to facilitate communication, networking and support among faculty based elearning staff and our centrally based elearning team. Operating as a community of practice, this group identifies key elearning issues and concerns occurring across the university and shares ideas and resources to meet emerging needs. Meetings are held monthly and are organised to incorporate an open discussion as well as presentations by invited guests and group members. The presentations segment has covered topical issues such as 'Uploading of student assignments/presentations (file size issues)' and '*Blackboard* analytics.' Members can attend face-to-face meetings or join in via Elluminate *Live!* All meetings are recorded, with the minutes and recordings made available via the elReps blog available to Curtin staff (at: http://blogs.curtin.edu.au/elreps/elreps/). This initiative serves as a second tier professional learning opportunity, as the focus is on 'teacher-to-teacher' learning to strengthen support and networking through identification of common issues and information sharing to seek solutions. To date, this forum reaches 65 elearning staff located across the university, making it a powerful forum for information and resource sharing and generating good practice guidelines, and is proving to be a highly sustainable practice.

The communities of practice approach, outlined in the abovementioned examples, enhances our 'presence' and allows us to have strategic impact across the university through practices that are highly sustainable.

eScholars Program

A further substantial professional learning opportunity we offer is through the eScholars Program (for more information visit: http://ctl.curtin.edu.au/awards_grants/escholars/eScholars.cfm). As a strategic program supporting the university's flexible learning goals, individual projects implemented by staff, with support from the elearning advisory team, are aimed at promoting quality teaching and learning practices to positively impact the learning experience, student retention, and to support particular cohorts (e.g., first year, large classes, and culturally diverse groups). Aligned to these criteria individual projects also seek to address the technology trends identified earlier. The program is now in its third year, and consists of a $10 000 scholarship grant awarded to 10 successful eScholar individual or group applicants annually. The grant monies can be used for approved teaching buy out or resources associated with the particular project. The projects involve designing, implementing and evaluating elearning initiatives within particular teaching contexts. This strategy provides an enabling environment, which addresses the barrier of academics being time poor and or having insufficient resources to explore new educational technologies (Appelbee, McShane, Sheedy, & Ellis, 2005). The application process is deliberately simple to encourage academics to apply, and the selection process is competitive. Over the lifespan of the project, 95 applications were received, and 20 projects were implemented during 2010 and 2011 and a further 10 are underway. Fourteen projects are reported on in an e-book published in 2012, http://tinyurl.com/escholar2012 with the remaining projects to be included in a later publication. Figure 3 provides a visual summary of the projects, in terms of the primary learning technology integrated. Most projects were strengthened by their integration of multiple technologies to support achievement of student learning outcomes, including the integration of opportunities to build digital literacies and work readiness skills.

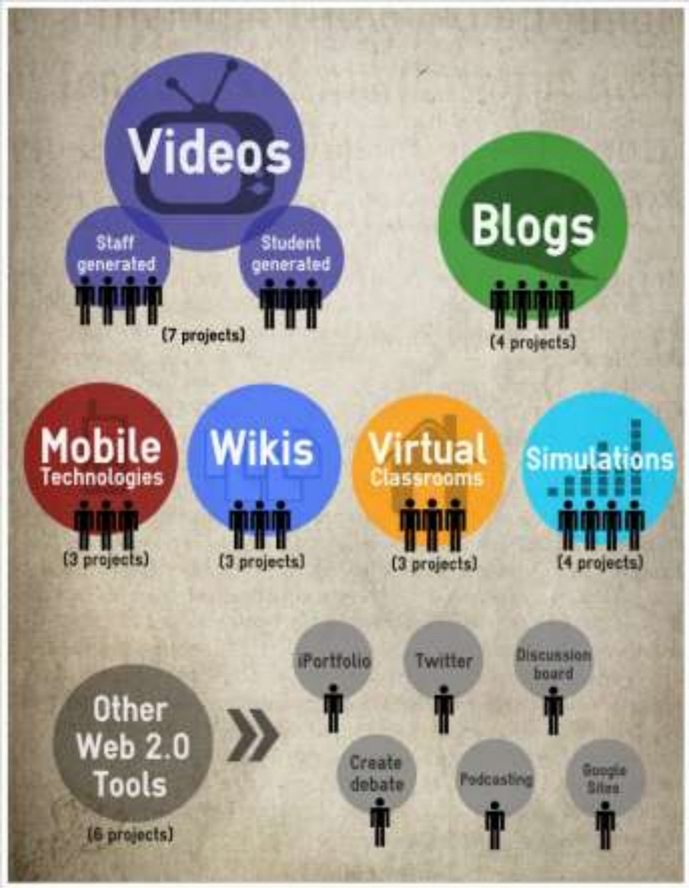


Figure 3: eScholar Projects categorised by learning technology (n=30)

The eScholars program drives professional learning through an integrated approach. It stimulates and gives impetus to improving teaching and learning through an award scheme; it promotes professional learning through action learning (analysing and mapping needs, aligning teaching practice with the university's strategic goals); curriculum development (i.e. designing learning activities, selecting appropriate learning technologies, implementing new elearning pedagogies, and evaluating and reporting the outcomes), and fosters research led teaching. At a more strategic (organisational) level, the eScholars program promotes awareness amongst staff and innovation with educational technologies. Experiences are shared among peers within the university and beyond through video case studies, conference presentations and an eScholar publication. These outputs are reusable resources that are used to showcase innovative teaching with technology at Curtin, and above all, the project makes significant impacts on teaching developments and technology integrated learning.

Discussion

The professional development literature purports that teaching and learning are complex processes that require comprehensive approaches that reach beyond short term, episodic skills training. Traditional one-off workshops of short duration, unconnected to the specific needs of individual teachers and their students and other professional learning activities are viewed as having limited impact on practice.

Therefore, our approach integrates multiple strategies that have been supported in previous research. The diversity in the range of strategies used reflects the different drivers including trends in elearning, the institutional culture and conditions, and responses to local pressures to support staff, similar to issues identified by Applebee et al. (2005). Our approach is aligned with several of the characteristics of professional development identified by Doecke, Parr and North (2008) and Mayer and Lloyd (2011) whose work focused on effective professional learning approaches for school teachers, but their findings are sufficiently broad to have relevance to higher education environments also. These features include collaborative engagement, experiences being anchored in specific contexts and contextually focused, sustained inquiry, and evidence based practice. Our focus on the practice of multiple forms of professional development, namely formalised activities (e.g., workshops, seminars); informal activities (e. g., discussion groups); immersion and problem solving; curriculum development, action research; coaching and mentoring, and professional networks and communities of practice, is also sanctioned by previous work in the schools sector (e. g., Day, 1999; Knapp, 2003; Meiers & Ingvarson, 2005), and sufficiently address the need for multiple approaches and strategies within higher education settings. In its focus on context, our work is aimed at enabling staff to bring about positive student learning impacts. We do this by providing external expertise to local environments, challenging problematic discourses, creating opportunities for professionals to interact within communities, and ensuring our content is aligned with strategic goals, which are further strategies endorsed by Doecke, et al. With regard to the content of professional learning, our work ensures the integration of knowledge in three areas – pedagogy, students, and technologies, aligning it with Timperley, Wilson, Barrar, and Fung's (2007) research that focused on the first two areas, and Applebee et al.'s (2005) work which addressed the third area. The quality indicators that guide our work include alignment with strategic university goals; being embedded within teaching; being diverse in form; being appropriate to both individual and group needs; promoting collaborative engagement; inducting early career teachers and those new to elearning; and demonstrating accountability through evaluation of practice, most of which derive support from both Doecke et al. and Applebee et al. Similarly, McNaught, Phillips, Rossitter, and Winn's (2000) study provided a helpful framework to reflect on and guide the analysis of our professional development approach, particularly its focus on staff issues and attitudes, policy supporting / inhibiting diffusion and uptake, institutional resources, customisation and examples of good practice. We believe the combined elements provide us opportunities to leverage staff engagement to bring about changes in thinking, knowledge, skills and practice.

Whilst our current initiatives reflect good practice principles in professional development with regard to approach, strategies, contexts, content, and quality indicators, it is not without a few challenges. For instance, although we consider the overall participation rate in workshops to be satisfactory, it raises concerns that a large proportion of staff still prefer this traditional form of professional development, which has recognised limitation in terms of transferring and embedding the skills into one's practice. A further challenge is that it is not a requirement for teaching staff to participate in elearning professional development, yet all staff teach online (to varying degrees), and for many this is a new environment requiring different pedagogies. Associated with this challenge is the notion of staff motivation to participate in available elearning professional development opportunities. Currently this appears to be driven by need and the desire to gain new or additional skills among some, in the absence of a reward and recognition scheme. The latter could significantly increase participation rates contributing to widespread and perhaps a more even spread of elearning developments. A final challenge we face is the absence of follow-up on professional development activities, other than the eScholars program, to gain a better sense of strategic impacts on teaching and learning enhancements. We are exploring how these challenges might be addressed as we move forward.

Having analysed our current initiatives and situated our work within the professional development literature, we are able to extract a set of design principles for sustainable professional development focused on technology integrated teaching and learning within our higher education environment. These six principles articulate some of the ideas proposed by Hawley and Valli (1999) and Wells (2007), and reflects our evolving conditions and practices.

To be sustainable our professional development approach must:

1. Be aligned with the university's strategic teaching and learning goals, technology trends and infrastructure;
2. Give staff timely access to professional development opportunities that are integrated into a coherent system of recognition and reward;
3. Afford continuous and ongoing conditions, resources and opportunities for innovation and scholarly activity with integrated support and follow-up mechanisms;
4. Embed participant experience in active engagement with educational technologies;
5. Implement multiple approaches and strategies that are responsive to situational complexity and educational change to support knowledge building and sharing across institutional structures.
6. Integrate accountability measures demonstrated through evaluation metrics and quality indicators such as teaching innovation, learning enhancements, leadership, scholarship and sustainability of practice.

Conclusions

In this paper we described and analysed our approach to professional development by reflecting on the traditional and non-traditional strategies we adopt to respond to rapidly evolving educational technology trends. We have drawn on evidence-based practice to construct a set of design principles to guide future iterations of our approach to professional development. Underpinning these design principles is the understanding that technology innovation is both technical and social, therefore professional development should be built around purpose and simultaneously embedded across all layers of the organisation. From this, we conclude that it is necessary to adopt multiple, relevant and sustainable professional development strategies to respond to issues within a rapidly evolving higher educational climate. Our analyses have identified several challenges and raised the following implications to shape our future practice.

Firstly, our design of professional development has evolved from the traditional approach of one-off workshops to a complex and diverse range of activities. Success of this new approach requires positive leadership, strategic direction and the conditions to make advancements in elearning a core activity within the university.

Secondly, leading in a climate of change demands specific and complementary skills and attributes within the elearning advisory team, which facilitates 'stepping up' as agents of change who simultaneously promote innovation through 'lighthouse' projects, develop capacity among staff and embed quality practices in elearning across the university.

Thirdly, all of our initiatives must foster a culture of digital literacy by influencing how staff 'think' about and 'do' teaching and learning, rather than limit our focus to the tools used. This requires stronger shifts towards technology integration to realise new forms of scholarly collaboration and engagement. This shift has already begun to occur in most of our work, but can benefit from continued development in this direction.

Implementation of our guiding principles and mindfulness of the above mentioned implications provides us with direction to shape the next iteration of our approach to professional development.

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The changing role of learned bodies and membership organisations: some UK experiences

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With the extensive changes to funding and employment security now underway worldwide, membership bodies and learned and professional associations are finding that their role is changing so as better to represent their members' views and respond to their needs. In the United Kingdom (UK), members show increasing interest in acquiring and retaining professional standing. As government selective funding decreases, activities are being displaced from the centre to within the community with the membership body taking an increased organisational and broker role. A new governmental focus on accountability and impact is changing members' priorities leading to revised activities by learned bodies. This paper discusses the changes necessary for professional bodies to continue to lead in the changing climate.

Keywords: funding, accreditation, ALT, professional bodies, impact, membership organisations.

Background

The Association for Learning Technology (ALT) is the UK's membership organisation in learning technology. It aims to ensure that use of learning technology is effective and efficient, informed by research and practice, and grounded in an understanding of the underlying technologies, their capabilities and the situations into which they are placed. It does this by improving practice, promoting research, and influencing policy (ALT, 2011). It is cross sectoral from schools to higher education and also attracts members from industry and government.

In the UK much central government expenditure has supported learning technology across higher and further education for a number of years (see (JISC, 2012) and links therefrom). Activities funded have involved: pure research; seedcorn activities; commissioned surveys; pilots of technologies, techniques and approaches; initiatives where significant sums (in three cases tens of millions of US$) are spent within institutions through bidding processes; and a full scale (and unsuccessful) online university (HEPI, 2005) costing over $100M.

Activities have also varied according to technology, pedagogy, degree of learner focus and style of government intervention. More technological examples include a Centre of Excellence for Reusable Learning Objects at London Metropolitan University (RLO-CETL, 2009) funded by the English Funding Council, work on Flexible Service Delivery and shared services (JISC advance, 2012) funded by the Joint Information Systems Committee (JISC) and work in developing European and other standards for exchanging learner information (Dempsey, 2010) also part funded by the JISC. Less technological are Higher Education Academy (HEA) and JISC work on Digital Literacies (JISC, 2011) and work on learner experiences (JISC, 2009).

All this has led to a considerable growth in the learning technology community and in its activities as institutions have evolved structures (research and practice), in part to respond to government funding opportunities. ALT members have been major recipients of funding with ALT occasionally acting as a communication channel with funders or as a broker bringing together groups of bidders.

With the contraction of the central funding base over the past 3 years, both individuals and units have tended to refocus on more institutional matters. More higher education money will now "follow the student" with English tuition fees increasing by a factor of about 3. A corollary is less money from central funders. JISC in particular has had a major review (HEFCE, 2010) by its main contributors leading to clear decisions that "Research and Development activity should focus on horizon-scanning and thought leadership" and that "services and projects should be rationalised with a view to significantly reducing their number".

Contraction is painful for central funding bodies which have previously provided control and support for their funded work. Funders have now instituted charges for events and services that had been free. They are also archiving significant quantities of completed work (JISCmail, 2009). Initiatives that remain such as the current Digital Literacies Programme are less fully funded and involve community bodies as participants, as brokers and as disseminators. There is thus a growing need for self help and mutual support in the community, including in staff development. ALT's role is developing to provide efficient mechanisms for this to happen.

Institutional emphasis

Government and central funders have changing policy language from that of having their own policy objectives and priorities, reflecting their own beliefs and the advice of expert consultants, to that of helping institutions and individuals to meet their own objectives. The current JISC strategy (JISC 2010) has five strategic objectives of which three begin with "Help institutions to" and the other three stress value for money and cost effectiveness. More money is given directly to institutions and less retained in the centre. This results in changes in whence learning technology researchers and units within institutions seek funds - away from a concentration on specific outside funders towards more support within the institution for activities more closely aligned to the institutions stated objectives, and to diversifying appeals to external sources, including international and European ones.

This leads to a growing role for the professional association as a facilitator and broker. This is evidenced by the facts that the number of Special Interest Groups in ALT has trebled within a short period, demand for free development webinars has escalated, events providing advice on how to bid more widely have been repeatedly oversubscribed, and the wish to work as a community facilitated by the membership body, always present in the learning technology community, has taken a higher profile with increased electronic activity in diverse channels.

Institutions in the UK are subject to other pressures as a result of changes underway. One is responding to the needs of learners. For this and other reasons, as elsewhere, many now articulate the provision of learning supported by technology as a clear part of future offerings (Purcell, Beer, Southern & Chipperfield, 2011). Most include some reference to it in institutional strategy documents. Some articulate that the way to achieve this is to do away with specialised units and expect every teacher and learner to "just do it". Others expect units to remain involved but with a more delivery oriented and support focus. Yet others expect central pedagogic and technology leadership. All anticipate a lot of staff development and seek options for its provision.

Such pressures are neither unique to learning technologists within education nor to education as a whole. They are certainly not unique to the UK. Major changes in job security, expected role, funding sources and the perceived need to take control of one's own development occur more widely, including in Australasia.

The changing financial model for professional bodies

Learned bodies need to remain solvent. Traditionally there was a simple activity and financial model outside certain "license to practice" disciplines such as medicine or engineering where the audience is captive and so fees are high. The traditional sources of income are membership (individual and organisational), events, publications, and occasionally grants. For ALT (and others) the largest contributor to central running costs has been an annual conference. With most funding bodies using their own staff for community activities, direct awards to ALT were small and usually restricted to those areas where ALT could act as a broker/aggregator. An example of this was the wiki on "What research has to say for practice" (ALT, 2010) where leading researchers were financed to produce guides and ALT took funding from three sponsors and distributed to the researchers.

More recently attitudes have changed, with the help of a not inconsiderable push from a government which is more widely seeking charitable bodies to take over the provision of services to save money (Cabinet Office, 2012). Thus for ALT the number of funded dissemination and brokerage activities has increased (from perhaps 1 a year in the period 2006-2009 to 4+ a year in 2010-2012). The new roles include putting together a reviewing structure for products produced under initiatives, organising user involvement in trials of service sharing projects, organising the production of a MOOC, and taking a significant role in dissemination. This last partly results from the realisation by funders that, by consistently relying on their own support and dissemination mechanisms, they may largely be disseminating to their own perhaps small and closed "supporters club".

ALT represents a wider community, solidly based within institutions and "is its members". This has been brought about by a culture of openness and community building. As a result, overall income has held up despite rapidly moving to an open access journal, changing the membership structure and remodelling the conference and other events to be more online as attendance budgets are threatened. ALT has also been gifted money.

Increasingly ALT has been contacted by funders and national bodies who are anxious to be seen to be consulting the communities for which it is a, hopefully faithful, proxy. Previously, ALT views were interposed opportunistically. This has led to some nominating rights to national bodies which in turn leads to more interest in membership and a virtuous circle.

Increased emphasis on professionalism and membership

As job security diminishes, individuals are keener to be seen as professionals who keep up to date with practice, and have their professionalism recognised. One way of doing that is to engage with a professional and learned body. Another is to sign up within that to a professional development scheme within that body. Even though Learning Technology is not a "license to practice discipline", it is nevertheless one in which a need for continuous updating is recognised. The Certified Membership of the Association for Learning Technology Scheme CMALT (ALT 2012) recognises this and provides peer-based professional recognition embracing the all practice in the context of Learning Technology. It is widely applicable and is not specifically UK oriented.

CMALT is a portfolio-based professional accreditation scheme developed by ALT to enable people whose work involves learning technology not only to have their experience and capabilities certified by peers but also to demonstrate that they are taking a committed and serious approach to their professional development. It has developed into a community drawn from across educational and commercial sectors, committed to professional and personal development. Participation in the scheme has steadily increased over the past years, with many members achieving accreditation and continuing their involvement with the scheme as assessors (See Table 1).

Table 1: ALT Membership numbers.

Year	**2006/7**	**2007/8**	**2008/9**	**2009/10**	**2010/11**	**2011/2**
All Individual Members	496	433	474	661	926	1195
Those Involved in CMALT	18	18	56	165	332	422

The upward trends have continued into 2012/3. While some of the overall membership is undoubtedly to do with identifying a better set of membership benefits and taking on new and less expensive classes of member, the overall membership increase is considerable. Churn in individual membership has decreased since the early noughties. A new research strand in CMALT is under design after an initial primarily practitioner focus.

A further CMALT driver has been a UK move for institutions to provide comparable Key Information Sets (KIS) for potential students and the public, following a US model and some previous attempts such as the Teaching Quality Information and UNISTATS (for the current version see (UK Government, 2012)). Statistical information on the professional standing of all those involved in teaching and supporting learners is required in many accreditation processes and may be added to the KIS.

A further major shift is in recognising the role and importance of learners in quality processes. The introduction of the National Student Survey in 2005, (Richardson, Slater & Wilson, 2007), modelled in part on Australian instruments, has led to changed behaviour by institutions, for instance in the area of assessment and feedback which was perceived as weak in many institutions (Williams, Kane, Satya & Smith, 2008). There is increased enthusiasm for obtaining the considered views of learners. However, data still suggests that many students can be single minded in seeking to maximise face to face one on one contact with lecturers (Shift Learning, 2012). ALT is working with the National Union of Students (NUS) on attitudes, surveys and codes of practice and regularly has NUS officials on its committees and as invited speakers at its events. While student politics can sometimes be treacherous to navigate, we have successfully worked jointly on several activities. Having such relationships is especially desirable at a time when learner control is seen as increasingly important.

Conclusion

In times of austerity with contraction of the opportunities from central government, the role of the professional membership body has changed and increased. This is happening across the developed world. Bodies need to represent their members with government, institutions and funders, support them fully in their drive for professionalism, and take over evaluation and dissemination activities from government in a more cost effective fashion. They need to act as aggregators and as brokers between policy makers, learners, practitioners and researchers. Sustainability follows if a body leads appropriately for its community of members and remains respected as representing them. It is possible to do this successfully.

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Towards a sustainable support strategy for online students

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Helping first year students develop the sociological competencies required of 21st century engineers, such as professional reflection, effective teamwork and cross-cultural sensitivity, remains a challenge, particularly for external students. This paper reports on the experience of conducting an online engineering practice course, which focusses on these competencies, for external students and on the strategies adopted to support and encourage student participation. Some of the strategies and practices which were implemented were successful in the short term, but many will not be sustainable. However, it is hoped that the lessons learnt from this development will improve future offerings of the course and generally enhance the way we support online students.

Keywords: supporting online learning, Group work

Introduction

In 2012, The University of South Australia offered full time external students the opportunity to complete a professional practice course *Sustainable Engineering Practice*. This course introduces students to the engineering profession and how it is practised within a ‘sustainable’ context. They learn about their possible future roles, the current engineering work environment, professional attributes of engineers, engineering ethics and sustainability. The embedding of these concepts into the course learning outcomes at an early stage is important, because it introduces students to the notions and processes required to manage their future careers. The course also aims to develop core professional skills and personal attributes, such as sourcing and using information, critical analysis and reflective practice, effective teamwork, cross-cultural sensitivity, engineering report writing, and effective presentations. The teaching and learning strategies are centred on team and collaborative project work, consultation with cultural and professional advisers and problem based learning, as students work on real engineering problems in Australian and international contexts.

Helping first year engineering students develop such skills presents difficulties and challenges, since cohorts are diverse and many students enter their degree program with a narrow view of engineering and poor communication skills (Kelly, Smith & Ford, 2012). However, the challenges become even more pronounced when presenting courses which develop these skills in off-campus students and, due to the practical difficulties involved, this is an area which is largely neglected in online engineering courses and subjects (McIntosh & Weaver, 2008). Online learners may also feel a sense of isolation that can lead to lack of engagement and an unsuccessful learning environment for them, but this can be minimised if a sense of community exists in the online course and productive social interaction can occur (McInnerney & Roberts 2004). A feeling of belonging, enjoyment and interest in the tasks will all help with engagement in online courses (Libbey 2004, Furlong 2003 & Kahu 2011)

Assessment strategies

Student achievement of the *Sustainable Engineering Practice (SEP)* course learning outcomes is measured by three assessment tasks, as shown in Table 1. The first task involves the submission of an individual report and forum discussion contributions which focus on the role of the engineer within local communities and the importance of communication and cross-cultural sensitivity within engineering projects. Students must define their ideas of culture and communication, present their own perspectives, and reflect on the perspectives of others.

The second task requires students to work progressively on a learning journal, and to begin their own professional development plan for the skills, attributes and knowledge they will need to develop before entering the profession.

The final assessment task is an authentic project based learning task in which students work in teams to develop a sustainable engineering solution to an Engineers Without Borders problem (EWB, 2012). The design projects are based in locations and subject areas which are unfamiliar to the students, and for which the design solutions require considerable research, creativity, teamwork and communication.

Each assessment as described above is thoroughly scaffolded, with detailed instructions and support resources. Within this type of supportive environment, the progressive development of student skills has been mostly successful for on-campus students; however, as can be seen from the discussion below, replicating this success within a purely online environment has been difficult.

Table 1: 2012 Assessment breakdown for [Course Name]

Assessment Task	Description
Individual Report 15%	1000-1500 word report on the role of the engineer and importance of cross-cultural awareness and communication in team work.
Development Portfolio 35%	• Engage with the lecture videos and set readings to complete a series of quizzes; • To work progressively on a learning journal submitting at least 5 entries; • To reflect on their own professional development by producing a resume and preparing a development plan for the skills, attributes and knowledge they will need to develop before entering the profession.
Engineers Without Borders Group Project 50%	Work in groups of 4 to 6 to complete a project report and presentation.

Student Engagement

At commencement of teaching, 39 students were enrolled in the course. By Week 6, 29 students were still enrolled. By the final week (week 13), this had dropped to 24 students. Unfortunately, only 6 out of the 24 students passed the course. This was despite extensive measures put into place by the teaching staff to contact, encourage, engage and support students to help create a sense of community and an opportunity for students to develop a sense of online self. Some of those measures included:

- Extensions of assignment deadlines with no penalty
- Provision of formative feedback for all assignments, to improve final submissions
- Email, personal messaging and personal telephone contact with the students
- Adjusting of submission methods and group reassignment
- Reduction of minimum group numbers, to make collaboration easier
- Staff assistance and support with group work, including management of collaboration tools
- Posting of continuous reminders and warnings about module work, assignment work and deadlines.
- Provision of live online helpdesk sessions via Adobe Connect virtual classrooms.
- Monitoring of forums and personal journals and messages of those students who have not participated, encouraging them to involve in activities.
- Monitoring of group work online tools.
- Simplification of some tasks to encourage motivation.

However, despite this support and encouragement, the majority of students did not engage with the course. The numbers of students who were motivated to study and were submitting work progressively declined over time. Through casual conversations with other external course teaching staff, teaching staff realised that a 30% success rate is common in fully external courses. While teaching staff were able to implement these support measures for the relatively low numbers in this course, this level of personal interaction would obviously be unsustainable for large classes.

Methods used to support student engagement and development of reflective practice, cross cultural sensitivity and teamwork activities are discussed in more detail below.

Reflective Practice

Students are required to submit an online learning journal containing at least five entries. Careful design and support of reflective writing is essential, so each entry is supported by scaffolded templates, including open-ended sentences for those who needed them. Students are introduced to the process of reflection and the reflective writing style via videoed lecture presentations, resources on reflection processes, and examples of good practice. Because the reflective writing style may be new for many students, early formative feedback and on-going regular feedback are crucial to increase their confidence in this writing style. Consequently, the marking is labour intensive, requiring confident, competent, empathetic markers with high level personal and professional skills (Kelly, Smith & Ford, 2012).

In the online course, teaching staff provided formative feedback for early journal submissions, and summative feedback for later submissions. Because the journal entries reflect on the students' progress and engagement with the course, they gave very early valuable feedback on the course, which teaching staff would not otherwise have received. From this feedback, the staff made early adjustments, such as modifying the online learning environment to make it easier for students to find information.

Despite intensive support and feedback from teaching staff, the online students found the progressive nature of the journal to be demanding, and many had ceased to participate in the course by the time the professional development submissions were due. The journals were an excellent way of keeping connected with the students, but they did not always provide evidence of lacking motivation or struggles with the course. The number of journal entries submitted dropped from 19 out of 24 for the first entry, down to 12 for the second, 7 for the third, 6 for the fourth and 5 for the final reflection.

Cross-Cultural Sensitivity

Engineers are required to work in multidisciplinary and multicultural teams and for a wide range of diverse clients. Consequently, a good understanding of diversity and cross-cultural awareness is important. The course integrates diversity and culture through activities which focus on the meaning and definition of culture, and the key considerations for engineers working with culturally diverse groups. Indigenous advisors and the students share perspectives on culture, and students use the learning from these sharing activities to inform their individual report assignment.

This assessment has been reasonably successful in the online course for several reasons. Course staff, advisers and developers were able to develop learning activities such as guided and moderated online discussion boards, which promoted frank and thoughtful discussion of sensitive issues such as cultural awareness. Secondly, the assessment tasks were produced as individual work, with resources provided by staff, which gave online students more flexibility and support in their research and writing. However, the intense nature of the student/teacher interaction would be difficult to sustain if this part of the program were not already supported by the Indigenous Content and Service Learning Advisors.

Supporting Teamwork

Embedding teamwork skills in an online environment is very difficult when students are scattered around the country and possibly worldwide. Six groups were allocated by staff, based on geographic location (in the hope that geographical proximity would enable group face to face meetings). To support the early stages of teamwork the following strategies were used:

- Students introduced themselves via an introductory forum where 18 out of 24 students responded
- Students then contributed to an 'ice breaker' wiki, for which 6 out of 24 students responded
- Early virtual helpdesk sessions were scheduled where students could meet teaching staff and other students, (only 4 students participated in the first three weeks of these sessions).
- Students completed a Belbin inventory, which is a personality trait test assessing team functionality. This proved popular and encouraged self-awareness, with many students discussing their results in their learning journal. Where 16 out of 24 students participated.

Out of the six groups that were established only one completed the project as a group. The other groups collapsed due to lack of participation amongst members. Consequently, several students worked on the project by themselves and only two of these completed enough work to pass the course.

Teaching staff have examined the factors which promoted the functioning of the one successful group, with the aim of replicating these factors for future groups. Several critical factors were identified. For example, this group made regular use of real time online collaboration tools (particularly the virtual classroom) to meet and discuss the project, and to prepare the report and presentation. The group also made regular use of asynchronous collaboration tools (such as group forums) to discuss project progress and allocation of tasks. However, use of the tools alone does not explain the variation in effectiveness. After all, these tools were available to all groups, were marketed to all groups, and training was offered to all groups, but they were only used effectively by one group. The most significant success factor appeared to be that this group had an obvious leader, who motivated the members to keep on track with the project.

Steps to improve student engagement

The teaching and development staff have identified several ways in which they hope to improve the retention and engagement rates in this course. The first is by redeveloping some of the assessment and learning activities, while maintaining the integrity of the course learning outcomes. The content of the group project (although not the tasks) will be simplified, so that students can focus more on developing their teamwork, their report writing, sourcing information, reflective practice and referencing skills, rather than devoting all their efforts on providing engineering solutions. Future group report submissions will be produced using wiki and ePortfolio tools, to enable easier collaboration. Teaching and program staff are also considering an assessment model in which students have the choice of submitting work progressively through the study period, thus getting early feedback on their progress, or electing to submit all assessment items at the end of the study period, which gives them more flexibility in their study pattern. Other, more individually focused courses will be recommended as pre-requisites for this course, allowing students to become familiar with the online environment and tools before having to use these online tools for teamwork and group collaboration. Students will also be allocated to groups later in the course, once enrolments have settled and student participation is confirmed.

The second issue, which we need to approach, is that of sustainable teaching staff interaction and support. We have discussed the various extra-ordinary measures which were taken during this course to initiate contact with students, manage their study, guide their time management, support their group work, etc. These measures were possible given the small numbers of participating students, but would be difficult to sustain with large cohorts. Some possible strategies include the expansion of current tutor training to include training in producing efficient and effective formative feedback which is supportive and timely for students, and quick and easy for staff (greater use can also be made of electronic feedback tools). The online environment will be restructured to highlight collaborative tools such as forums and virtual classrooms, in the hope that this will better market them to students. Support websites will also be emphasised, to give students additional practice and training in using these collaborative tools.

Conclusion

Student retention and engagement has proven to be difficult in an online engineering course which focusses on development of professional skills and teamwork, despite an intense level of teacher support and management. However, these are essential skills for future engineers. A number of strategies have been implemented to encourage student participation and enable the development of these skills in an online environment. It is hoped that future iterations of this course will be able to intensify and sustain these strategies and offer adequate support to online students. This will be especially necessary as class sizes increase.

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Exploring and applying the 3E Framework for technology-enhanced learning

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Intended audience and degree of expertise/past experience required

Lecturers, Staff Developers, Learning Technologists, Heads of Department, and other participants who have an active role in using or promoting technology-enhanced learning, or who lead institutional strategy in this area.

Statement of objectives for the workshop

The overall aim of this workshop is to engage participants in exploring a framework for good practice in technology-enhanced learning that is based on principles of active engagement, learner autonomy, and students as co-creators of learning resources and experiences, and which has successfully been used and adapted within a range of Higher Education and Further Education institutions within and also beyond the UK.

The key objectives for this interactive workshop are for participants to:

1. Identify a range of key ways in which technology-enhanced learning can help meet learner needs, common teaching challenges, and institutional challenges in Higher Education

2. Discuss how Higher Education institutions have tended to approach introducing minimum benchmarks and quality guidance for the use of technology in learning, teaching and assessment

3. Explore the rationale and design of the 3E (Enhance, Extend, and Empower) Framework for embedding the active use of technology in learning, teaching and assessment, and the range of ways in which it has been adapted to support good practice within and beyond the UK

4. Consider how the 3E Framework as a Creative Commons open educational resource (OER) could be adapted to their own teaching practice, programme design, and institutional strategies in TEL

Detailed description

For a number of years a 'minimum' online presence for all modules was an institutional target at Edinburgh Napier University, as it has been within many other Higher Education institutions. However in response to staff and student feedback from an evaluation of technology-enhanced learning (TEL) in 2009, and our increasing institutional knowledge and experience in TEL, a new benchmark for the use of technology was approved by the

University. This proposes that all modules make an *active* use technology to enhance key aspects of the learning, teaching and assessment (LTA) experience, and to engage students with their subject,

The 3E Framework, based on an *Enhance-Extend-Empower* continuum of TEL that in an earlier form had been successfully implemented in a cross-institutional e-learning transformation project funded by the Scottish Funding Council, was developed as the basis for the benchmark and a means for staff to consider aspects of their modules that could meaningfully adopt technology to benefit the LTA experience.

The 3E Framework (Smyth et al, 2011) provides guidance with examples across a range of LTA activities that show how technology might be incorporated at a minimum level to increase active learning (Enhance), through to further developed uses of technology that underpin more sophisticated, higher level learning that reflect how knowledge is created, shared and applied in professional contexts (Extend and Empower).

This session explores the ethos and design of the 3E Framework, including illustrative and real examples which demonstrate how technology can be used across a range of LTA activities and disciplines at each of the 3E stages. Session activities will allow participants to engage with the Framework from strategic, educator and staff developer standpoints, and explore how the 3E Framework as a Creative Commons open educational resource (OER) has been used for a range of purposes, in a range of contexts, across several institutions. This will include applications of the 3E Framework in course design, teaching, staff development, evaluation, and quality enhancement projects and initiatives in the UK, New Zealand, and Greece.

Participants will also be supported in exploring how the 3E Framework, or key aspects of it, could be used to inform TEL practice within their own professional practice and institutions.

This session will be highly participative, and involve interactive exploration of online resources, individual activity, and group and open floor discussion as follows:

Part 1: Introduction to session including discussion of TEL in today's Higher Education context

Part 2: What does TEL mean in your institution? (Open floor discussion of approaches taken, experiences in implementation, and institutional guidelines and expectations)

Part 3: Introducing the 3E Framework. Interactive exploration of the 3E Framework including how the Framework is being used at Edinburgh Napier University to underpin the transition to an increasingly active use of institutional and other technologies to engage and support students

Part 4: Short break

Part 5: Exploring the 3E Framework in different institutional and cultural contexts. Facilitated activity exploring and drawing lessons learned from the application of the 3E Framework within a range of different contexts and institutions, with participants working in small groups to identify aspects of the approaches explored that they feel could be usefully adapted.

Part 6: Applying the 3E Framework. Individual activity in which Participants with primarily teaching interests are asked to map their teaching to the 3E Framework in terms of their current or planned use of technology. Participants with primarily strategic or staff development interests are asked to explore the illustrative and real examples in the 3E Framework, and consider how these may map to strategic aims or could be used in supporting staff development provision.

Part 7: Benefits and implications for institutions. Participants work in groups to consider the challenges that need to be addressed in adopting an active 'benchmark' for the use of technology within institutions. (Group discussion with open floor 'report back').

Part 8: Concluding evaluation of session.

Toward a framework for evaluating blended learning

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Blended learning for some is the future of education itself (Brown & Diaz, 2010). However blended learning lacks a coherent body of research that unequivocally demonstrates learning benefits over traditional modes of instruction. Yet there is a growing volume of evidence to support the view that blended learning can result in improvements in student learning outcomes and enhance student satisfaction (Dziuban, Hartman, Cavanagh & Moskal, 2011; Garrison & Vaughan, 2008; Graham, 2006; Sharpe, Benfield, Roberts & Francis, 2006; Vaughan, 2007). The means to evaluate its effectiveness is frequently lacking since there are a relatively limited range of tools and methods that support staff in designing blended learning curricula. This paper describes one component of a possible framework for evaluating blended learning – the use of a course design rubric. A new rubric is outlined that attempts to represent a range of good practice in blended learning design derived from the literature and evidence-based research.

Keywords: blended learning, quality evaluation, rubric.

Introduction

The use of blended learning has been targeted by many education institutions as a way to integrate pedagogy and technology with teaching and learning. It is also considered a method to provide a more flexible and sustainable educational model for educational institutions by reducing students' time and space commitment (Dziuban, Moskal & Hartman, 2005).

The 2011-2013 NMIT (Nelson Marlborough Institute of Technology) Investment Plan included a target of 50% of courses using a form of blended learning by 2013. One element that was identified to successfully implement this strategy at a programme and course level is the adoption of an effective method to evaluate the quality of blended learning. After completing an extensive literature review it was considered that a new, customised course design rubric was needed as part of a broader framework for the evaluation of blended courses.

Blended learning dimensions

Although there is little consensus around a definition of the term blended learning it has become widely accepted and is ubiquitous in all forms of education and training. Blended learning at its simplest is nothing more than employing a variety of media and methods, most often a mix of online and face-to-face learning. However this combination is subject to a range of permutations in technologies, pedagogies and contexts (Garrison & Vaughan, 2008; Graham, 2006). These permutations, or dimensions to blended learning, are found to be common within a number of tertiary educational institutions such as;

- **Modes of delivery** - The combination of traditional learning with web-based online approaches
- **Technolog**y - The combination of media and tools (technologies) employed
- **Pedagogy** - The combination of a number of pedagogic approaches irrespective of learning technology use
- **Chronology** - Synchronous and asynchronous approaches

(Oliver and Trigwell, 2005; Sharpe et al., 2006)

Evaluating quality in blended learning

The issue of quality in teaching and learning environments is a subjective and multifarious concept, dependent on a range of factors relating to students, the curriculum, faculty, technology and learning design (Meyer, 2002). Chickering and Ehrmann's (1996) seven principles of good teaching often forms a basis for the quality evaluation of many blended learning courses and their impact on students. The Sloan-Consortium quality framework (The Sloan Consortium, 2011) is another structure often used to evaluate online courses in particular, but is also used for blended environments and is built around the 'Five Pillars of learning' - effectiveness, faculty satisfaction, student satisfaction, access and cost effectiveness (Shelton, 2011).

Despite these efforts in defining and examining quality issues concerning online courses, a defining instrument to evaluate quality is one of the key challenges for blended learning since it incorporates both traditional and online instruction methods. Aspects not obvious to instructors or learners, such as instructional design, course development, and the use of technology are commonly ignored. In order to define the quality of a blended course, therefore, requires a comprehensive framework to identify these issues along with appropriate guidelines, as well as to devise an instrument and method for measuring the hidden aspects of quality.

Although there is no systematic, determining methodology to measure and ensure quality in blended courses, course design rubrics are capable of operating as an effective tool to support a quality framework. This framework needs to include a combination of quality assurance processes in addition to pedagogy-oriented approaches such as evaluation of course development and instructional design.

Using rubrics to evaluate quality in blended learning

What is a rubric?
Traditionally, a rubric is a scoring guide that sets out specific performance criteria. It defines precise requirements for meeting those criteria, and often assigns numerical scores to each level of performance. This provides evaluators with an effective, objective method for evaluating items that do not generally lend themselves to objective assessment methods. A rubric for online instruction can be designed to provide a common set of evaluation criteria for a diverse set of situations evaluating the readiness of an online course.

How are rubrics designed to be used?
A course design rubric is designed to be used as part of a comprehensive institutional e-Learning strategy. With a strategy in place, a well-designed evaluation rubric can be used as an instrument in blended and online course design as well as to provide guidance while developing courses. It can also act as a tool for periodic evaluation and improvement. This can be achieved by building in good-practice standards into a rubric which are well supported by the literature. Rubrics at the course-level are designed to be used in the following ways;

Table 1: Uses for evaluation rubrics

Use	Purpose
Self-evaluation tool	• To provide a framework for new courses • To inform reworking of an existing course
Institute-wide evaluation tool	• As a means to assist in the development of 'quality' online courses
Exemplars	• To identify best practices in online courses and recognise those that are creating quality courses

To be useful a rubric should not only be based on empirical-research but integrate a range of accepted pedagogical knowledge and principles. It should also able to be used in a variety of situations, within an array of review methodologies and operate as a free standing document to be used in both formal and informal contexts. Course design rubrics in general attempt to provide a frame to answer the question - *What does a quality blended course look like?*

Rubric origins

The most popular rubrics used in higher education for the quality evaluation of e-Learning are those developed by 'The Centre for Excellence in Learning and Teaching' (CELT) at California State University (2009) and the Quality Matters rubric (Maryland Online, Inc., 2009). Both of these are designed to be used as part of a systematic approach to online evaluation which includes peer review that use similar criteria and dimensions. Although there is relatively little research providing evidence as to the effectiveness of rubrics there is some empirical research supporting the use of the pedagogy nested within a number of these rubrics (Quality Matters, 2008). Most published rubrics include quality criteria that evaluate learning, learner support, course organization, assessment, design and the use of technology.

The New Zealand experience
The CELT rubric in particular forms the basis for most of the rubrics used currently in evaluating online courses in higher education including that used by a range of NZ-based institutes. For example, the NMIT Learning Design and Facilitation Rubric, the FLI rubric used by Lincoln University (FLI, Faculty of Commerce, Lincoln University, 2011), and the EIT rubric (Seitzinger, Jamieson, & Forlong-Ford, 2009) are all derived from the earlier CELT version.

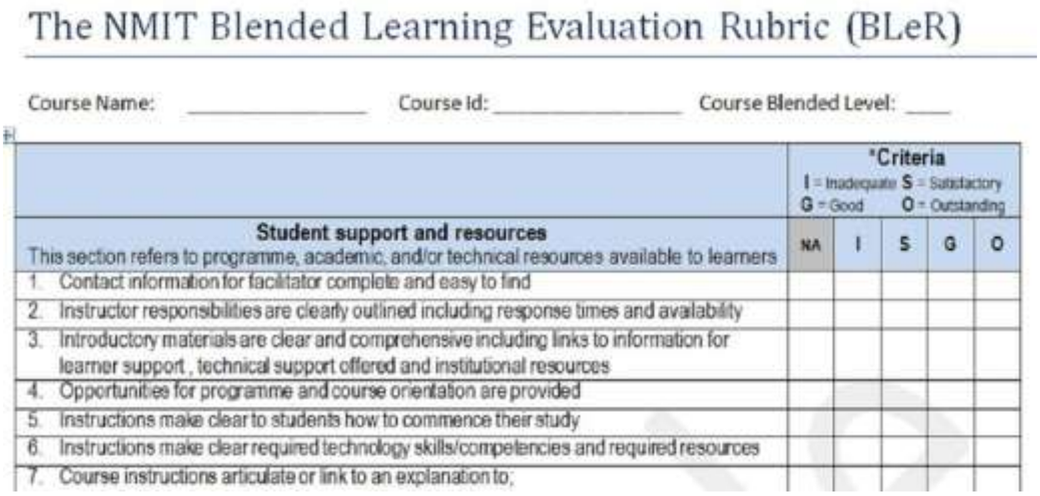
The principles outlined in the New Zealand e-Learning guidelines (NZ ELG, 2011) are aligned closely with the CELT rubric. These guidelines were developed partly to provide evidence-based effective practice guidelines and case studies. Since these reflect contemporary thought and empirical research they provide a sound basis for designing e-learning materials in a NZ setting and should be integrated into any proposed rubric.

A new blended learning rubric

This paper outlines a new Blended Learning evaluation rubric (BLeR) that is intended to assist in the design, redesign, and, or evaluation of blended and online courses. The rubric can be used in a range of contexts including as a tool to aid course creation and for self-evaluation of existing courses. It is also possible to obtain some measure of the quality of course facilitation and therefore aid in the creation of effective delivery methodologies. In summary, this new rubric aims to:

- Allow for a range of learning theories but embed a number of good practice principles
- Connect with any existing institutional flexible learning strategy
- Place learning design at the center of instruction
- Emphasize learning ahead of technology
- Be adaptable to support a range of individual and institutional needs
- Reference the New Zealand e-Learning guidelines (NZ ELG, 2011)
- Create a relative simple tool optimized for self-evaluation

It is intended that using a course development process which integrates the use of such a rubric should result in well designed courses that are organised, provide sufficient learner support, focus on the learners rather than content and are pedagogically sound.



The NMIT Blended Learning Evaluation Rubric (BLeR)

Course Name: ________________ Course Id: ________________ Course Blended Level: ____

	*Criteria I = Inadequate S = Satisfactory G = Good O = Outstanding				
Student support and resources This section refers to programme, academic, and/or technical resources available to learners	NA	I	S	G	O
1. Contact information for facilitator complete and easy to find					
2. Instructor responsibilities are clearly outlined including response times and availability					
3. Introductory materials are clear and comprehensive including links to information for learner support , technical support offered and institutional resources					
4. Opportunities for programme and course orientation are provided					
5. Instructions make clear to students how to commence their study					
6. Instructions make clear required technology skills/competencies and required resources					
7. Course instructions articulate or link to an explanation to;					

Figure 1: NMIT Blended Learning Rubric (BLeR) screen sample (Page 1 of 4)

Integrating blended learning within existing evaluation processes

Most blended learning evaluation rubrics take a process-orientated approach where a 'whole-of-course' view is used to assess learning design (but not to assess how well this design is being applied). Blended courses contain course-related documents and activities in e-format along with evidence of student engagement and participation. This affords the opportunity to assess the learning process over time rather than as a snapshot by the use of a rubric. In addition it may also be possible to evaluate a range of other factors such as the student experience and their relationship to the curriculum.

Blended delivery has two main teaching components - a classroom-based one and the online or 'e-bit'. The assessment of teaching practice in a classroom-based lesson is often subject to existing evaluative processes which can be complemented by an additional process such as a rubric, to evaluate the online part of the teaching and learning equation. Both processes can be reconciled by using the same or very similar criteria, while the facilitation aspect can be either evaluated as part of an amended teaching observation process or integrated within a rubric.

The use of the BLeR rubric in practice

To date, the BLeR has been tested across a limited range of diploma and degree level courses at NMIT during 2011 and 2012. A number of changes have been applied as a result.

- The rubric has been modified to include a more explicit scoring system after feedback from management and academic staff
- A more prescribed set of criteria to evaluate course facilitation have been added to broaden the range of uses for the BLeR
- A number of criteria have been simplified to lessen the need for evaluators to have extensive experience in online teaching and expertise in a range of theoretical areas

To date the rubric has encouraged the use of a team approach to course development and enabled a wider community of interest in blended learning to emerge.

Discussion

Blended learning offers the potential to completely rework the teaching and learning relationship thereby becoming part of a potentially transformative redesign process (Sharpe et al., 2006). The strategy of using the introduction of blended learning to rebuild courses, as opposed to just adding on technology to existing content, is becoming one of the defining characteristics of blended learning (Garrison and Vaughan, 2008; Littlejohn and Pegler, 2007; Sharpe et al., 2006).

It is apparent that to take advantage of this opportunity for redesign, blended learning needs to reference sound pedagogical approaches and practices that work together, to leverage educational technology and ensure the best conditions exist for learning. Technology itself is considered to be pedagogically neutral (Nichols, 2003). Consequently there needs to be an emphasis on pedagogy to prevent unsustainable technology-driven blended learning initiatives.

It is recommended that one of the foundations of a framework to achieve best practice in blended learning is the appropriate use of an evaluation rubric such as the BLeR. This provides the ability to underpin the transformative potential of truly sustainable blended learning.

From the preliminary use of the BLeR, it appears that such rubrics are capable of operating as an effective tool alongside a range of other initiatives to lead and encourage evolution in teaching and learning through the introduction of blended learning.

Looking forward

The key points to be derived from this study that could be relevant to policy and practice for tertiary institutes considering the adoption of blended learning are:

1. The role of pedagogy has a critical role to play in using blended learning as part of a transformative redesign process. One way this can be applied is through the use of a course design rubric that incorporates the use of pedagogy.
2. To build and maintain quality standards in a flexible learning environment an evaluation instrument needs to be part of an integrated course of action that includes attention to institutional capability, content development processes and most importantly, practitioner skills and knowledge.
3. Decisions regarding the use of evaluation tools and specific blended learning approaches within the curriculum design should be guided by a range of institutional documents such as blended protocols and good practice principles written into a wider policy.

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The design and development of a suite of online professional development resources for academic staff: Framing the project

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Professional development for teaching staff at Massey University has been comprehensively remodelled in order to foster teachers as "future makers", exponents of models of teaching and learning that are suitable for effective 21st century knowledge creation and distribution. Given that the remodelling programme has strong support at significant levels of the university's leadership, it has a high chance of succeeding in its aims. This paper traces the initial stages of one project in the programme: the production of a suite of online resources featuring successful academic staff discussing aspects of their teaching. Loosely modelled on other online teaching development videos, the videos in the suite were envisaged to provide staff new to teaching, and those wishing to improve their teaching practices, with a readily accessible, practical explanation of how some of Massey University's leading practitioners operate. To help staff understanding at a deeper level, the suite included a series of brief information guides ('flyers') aimed at helping staff understand the theoretical terms underpinning the video discussions. This is an initial report on an on-going project.

Keywords: Teaching staff, professional development, videos, flyers, Massey University

Introduction

> The environment of further and higher education is changing in response to economic pressures, government policies and changing behaviours influenced by greater ownership of new technologies. In turn, this is encouraging institutions to review key aspects of their provision and to reassess what is delivered, to whom and in what ways (JISC 2011, 6).

Increased demands placed on tertiary teachers due in part to the increasing emphasis on the use of digital technologies, and in part to the shift in accompanying pedagogies, were factors that led to a recent reassessment of how professional development for teaching staff occurred at Massey University ("Massey"). The challenge for Massey, as with many universities, was to create a sustainable model of professional development that utilises the features of the digital educational environment in a way that is both inspiring and motivating to those participating. By combining face to face professional development with a suite of online digital resources, Massey hoped to inspire and motivate academic staff to transform their practice and re-conceptualise their learning designs in ways that are increasingly seen as critical to facilitating teaching and learning in the student-centred and technology-enriched learning spaces of the future (see for example Steel & Andrews, 2012).

The Massey University response

The challenge of providing a sustainable model of professional development that meets the on-going and evolving day-to-day needs of academic teaching staff led to shifts in both the underlying philosophy and the provision of staff professional development at Massey. The new model for the Massey Teaching and Learning Centre could be characterised as a shift from what Holt, Palmer and Challis (2011, p.6-7) label the "traditional paradigm" to what they describe as the "new emerging" paradigm, which positions such centres "at the heart" of teaching and learning within the institution rather than on the margins. The remodelling provoked a programme of change initiatives at all levels of the university, ranging from new policy documents to shifts in organisational structure and everyday practice. Significant initiatives at institutional level included:

- the development of policy documents that impacted directly on the expected provision and outcomes of staff development (*The Road to 2020, The Teaching and Learning Development Framework*)
- the establishment of College Directors of Teaching and Learning whose role included working closely with academic staff and staff developers to identify and provide appropriate and timely professional development

- the defining of a Massey University model of teaching and learning
- the restructuring of professional development services from a centralised to a ‘hub and spoke’ model, with regional centres established to meet immediate teaching and learning needs as and when they arise
- the integration of student learning services into core business of each regional centre. This change reflected the Massey philosophy that teaching and learning are in essence inseparable, and as such should focus on the needs of learners as well as those of teachers.

Such institutional change initiatives, with their positive impact on support for teaching staff, are evidence of the kind of distributive leadership that Steel and Andrews assert bodes well for successful change in teacher practice: “Changes in teacher practice require different levels of distributive leadership that can empower, enable and support teachers” (2012, 244).

In its policy document *Teaching and Learning Development Framework: Defining Directions for 2012-2015,* Massey established guidelines for how to “fully exploit opportunities provided by new digital media” and “provide enhanced professional development and lifelong learning opportunities for staff” (Massey University, 2012b, 6). The strategy further elucidated the university’s core principles of teaching development in terms of its effectiveness, range, scope, and capacity for provision that was both multi-faceted and grounded in meaningful contexts. Acknowledging staff as lifelong learners, the strategy was explicit about expected delivery modes and purpose. Based on “a philosophy of providing customised and flexibly delivered teaching development that can meet staff needs on request” the strategy was intended to “model and embed the use of educational technology in ways that promote a more collaborative, interactive, media rich and personalised learning experience for academic staff” (Massey University, 2012b, 6).

The underpinning philosophy that informed the restructuring of the Massey professional development model combined with explicit directives around delivery found in the Teaching and Learning Framework (2012b) saw the implementation of a new approach to delivering professional development for teaching staff. Customised workshops and one-on-one consultations concentrating on the pedagogy of educational technologies, blended delivery, and curriculum design and delivery replaced generic workshops around teaching practice. Not only were these new offerings tailored to the needs of new tutors and lecturers, they were also able to be utilised by experienced teaching staff looking for new ideas to reinvigorate their teaching. It meant that academic staff could access discipline-based workshops that supported their teaching, just-in-time, as and when required.

Similarly, recognising that learning to teach also occurs informally (Ling, 2009; Remmik, Karm, Haamer & Lepp, 2011), staff were encouraged to talk about issues and aspects of their practice with their colleagues through a range of interdisciplinary professional conversations facilitated by the Centres for Teaching and Learning. Academic staff were also urged to participate in peer mentoring activities with both academic colleagues and teaching consultants, where reflective practice was encouraged through the sharing of positive teaching experiences, and the exchange of advice and support for challenging and/or problematic teaching and learning situations. Such informal building of a network of peers valuing feedback and reflection is noted as an important underpinning element in sustainable change in teaching practice (Steel & Andrews, p. 254).

Complementing the face-to-face services, and in response to the requirement of the Teaching and Learning Framework to model and embed educational technologies, Massey’s National Centre for Teaching and Learning offered a suite of less formal, online modules that provided staff with the opportunity to engage with professional development materials. This three-pronged suite comprised:

- an introduction to the use of Massey’s Moodle-based learning management system
- a series of modules on the pedagogy and advanced operations of teaching online
- a series of staff development modules purchased from Epigeum concentrating on more generalist teaching practices and selected as appropriate for the Massey environment.

The project to produce a further suite of brief videos and accompanying flyers was thus the fourth prong of these online resources. Intended to enable academic staff to access the philosophies, ideas and experiences of their colleagues, the project provided a vehicle for selected skilled Massey teaching staff to share their practice both with their university colleagues, and with the wider educational sector via the Massey University website. Such resources could be utilised by educators as online simulations of professional teaching and learning conversations, and as stimulus and inspiration around specific areas of teaching and learning.

The development of a new resource

While the production of online videos and flyers to serve as a resource for professional development in teaching is far from an original idea, it has proven benefits. Providing teachers with new ideas and information, particularly around teaching pedagogies, in a readily accessible web-based format has proved to be a useful and successful teaching development tool worldwide (McIntyre, 2011). Although such a project requires careful planning, particularly in the pre-production stages, it was hoped that the bite-sized videos and flyers would be easily consumed as and when required, particularly by those McIntyre (2011, 10) describes as “time poor teachers feeling resentful and overburdened” by institutional demands on their time. Massey’s goal was to ensure that each resource would meet a specific pedagogical need, and highlight to staff that the content was not abstracted theory, but showcases of practices already happening in their institution, by colleagues they were working alongside. The resources were to be practical, concentrating on real world applications, and largely free of subject-specific references to enable easy transferral of skills between disciplines.

Planning for the videos began with the inclusion of two unique, unrelated projects in the 2012 National Centre for Teaching and Learning *Priority Initiatives Plan:* the “Spotlight on Teaching videos” project and the “In a Nutshell” flyers project. Both videos and flyers were intended to be displayed and downloaded from the Massey website. However, the obvious synergies between the projects led project leaders to quickly agree that the advantages of combining both into a more complete package were too great to ignore and they were consequently positioned closely together. It was recognised that there was a need to integrate the content, with the flyers becoming the theoretical underpinning of the (practice-based) videos. This reciprocity would enable the easy cross referencing of material from one format to the other. If a theoretical term arose within a video, it was important that a quick and easy definition was available from the flyers. Similarly the videos should contextualise underpinning theory found in the flyers.

Deciding on topics

The starting point for establishing what topics should be prioritised in the videos and flyers was the daily practice of the project leaders and authors of this paper, Teaching and Online Consultants at the Massey University Albany Campus. We were guided firstly by our perceptions of professional teaching development needs and of which resources would thus be most useful in our daily practice with academic staff. We also needed to consider the ‘big picture’: how the resources would fit with the overall staff professional development approach and offerings, and how the resources would be used. Key questions for consideration included:

- What professional development themes and issues were arising regularly in dealings with teaching staff, as well as in conversations with learning consultants about student issues?
- What tools would be useful when working with teaching staff, i.e. what could be given to staff as a “takeaway” from any professional conversations and/or workshops?
- Where did topics fit in terms of the domains and criteria for the Ako Aotearoa National Tertiary Teaching Excellence Awards (Spiller, D. et al, 2011), used as a framework for the Massey model of teaching?
- How would these resources reinforce teaching and learning techniques necessary for the 21st century, ie active, flexible and social constructivist learning that models and embeds the use of educational technology?

With these questions in mind it was possible to work through further details around which audience the resources were to target, and the purpose and approach of the resources. It was agreed that the resources would target multiple audiences and provide a showcase for effective practice occurring at Massey. Three target audiences were identified: Massey staff new to teaching; Massey academic staff looking for ways to change their practice, particularly those attempting the move to blended delivery; and the wider public, particularly tertiary educators. It was evident that, through highlighting specific acts of teaching, and articulating effective pedagogy, one main purpose of the videos and flyers would be to provide a useful resource for Teaching Consultants to “surface and resolve tension around teacher beliefs” – a significant first step towards change in teacher practice (Steel & Andrews, 2011, p. 247). They would also support Teaching Consultants’ demonstration of and promotion of ways to provide the kinds of “participatory, facilitated learning environment” essential for 21st century teaching and learning. (Diaz et al., 2009, in Steel & Andrews, 2011, p. 246). To remain consistent with the Massey approach to teaching, topics needed to be organised according to the Ako Aotearoa domains - Design for Learning, Facilitating Learning, Assessing Student Learning, Evaluating Teaching and Learning, Professional Development and Leadership. Finally, the videos and flyers needed to be closely aligned, with practice articulated in the videos demonstrating concepts in the flyers. It was important that the flyers offer an easily accessible, comprehensive glossary of key concepts and cover a wide range of teaching and learning terms and topics so that academic staff could gain basic information quickly, including how and where to get further information and help.

Video design

The format of the videos was described in general terms in Massey's priority initiatives document (2012b). They were to be brief (five to ten minutes each) and feature interviews with leading Massey practitioners talking about innovative aspects of their teaching practice. However, the document provided no definition or specific details of specific topics these experts were to talk about. Having considered established general parameters for topics, based on our daily practice as Teaching Consultants, the next step was to establish criteria for deciding specific topics for videos and flyers. The video interviews needed to cover:

- genuine teaching and learning strategies that met Massey expectations and desired outcomes
- demonstrable, specific and effective acts of teaching
- key content that matched the theoretical underpinnings of the flyers
- domains used as criteria for the Ako Aotearoa National Tertiary Teaching Excellence Awards

Video topics were thus drawn from the Ako Aotearoa domains using guidelines for effective teaching practice articulated in the *Portfolio pointers* (2011) to flesh them out. For example, points around encouraging active learning, creating and fostering unique learning environments and responding to feedback, guidelines specified in the Design for Learning domain, were combined to form the video entitled "Engaging students in the learning process." These points were then used as the basis for interview questions focussed on key areas of content. For ease of management and consistency, it was decided that there would be five open-ended questions per topic. At this stage feedback was sought from colleagues within both the National and campus-based Centres for Teaching and Learning on appropriateness of topics, key content and questions.

Identification of suitable participating staff was the next task. Selection criteria included those who had won internal Massey and/or external national teaching and learning excellence awards, staff that the Albany Teaching Consultants had worked with and thought displayed exceptional teaching skills, and those recommended by colleagues through targeted feedback. These people were then approached via email to gauge their willingness to participate, and those who expressed interest were sent a more comprehensive outline of what was involved including: the topic of the video, an outline of the key content they would be interviewed about, and the five key questions they would be required to answer.

Flyer design

The layout "look and feel" and content of the flyers were developed in close consultation with Massey's Materials Production Unit and the Centres for Teaching and Learning of each campus. Using a discussion forum in the Centres for Teaching and Learning online learning environment, both Learning and Teaching Consultants gave initial feedback on three draft flyers over a period of two weeks before any further development was undertaken. This process identified key elements to incorporate in the design of all subsequent flyers. The process also created a norm of, and process for, on-going feedback and collaboration which in turn enhanced a sense of shared ownership of the flyers among all Learning and Teaching Consultants. Such ownership is essential if the resources are to be used widely and effectively by these professionals in their day-to-day dealings with academic teaching staff.

Where to from here?

Planning was completed and videoing commenced in June. The first two videos and accompanying flyers were ready for use by October. By the time of the paper presentation, the authors expected to be able to report orally on progress with production, deployment of the resources, feedback received and initial evaluations. Given the project's alignment with principles for sustainable change creation including strong support at significant leadership levels, they expected to be able to report positive progress in their quest to support teachers' development into future makers for Massey University.

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5 innovative ways to use virtual classrooms in Higher Education

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With constant pressure for higher education institutions to increase (or at least retain) student enrolments across the sector, many institutions are opting to keep up with demand by offering alternate methods of education provision and facilitation. By providing tools and resources such as Blackboard Collaborate and Blackboard Mobile Learn, staff are able to engage and communicate with their students; anywhere and anytime. Encouraging staff to move away from the traditional lecture-theatre and tutorial based model and to instead embrace the opportunities provided by a virtual classroom is not always easy; however some staff have been re-invigorated by this teaching method and are trialing new and innovative ways to teach their students virtually.

Background

Curtin University has been utilising web conferencing for a number of years. In 2006 a 50 seat license for Elluminate *Live!* was purchased in order to trial using the software with a common 3rd year Business Capstone unit delivered through the Curtin Business School. In 2009, following the success of the initial trial, a business case was put forward to adopt Elluminate *Live!* throughout the Business School. In 2010, the rest of the university followed suit and a site license for the whole campus was purchased. The product moved to a managed hosting environment and was also integrated into the Blackboard Learning Management System. In May 2012 the university made the decision to upgrade from Elluminate *Live!* to Blackboard Collaborate and we are currently using Version 12 .

Usage statistics show that there has been constant growth and utilisation of the tool, particularly since it was rolled out to the whole university in 2011.

Period	Rooms Started	Max Concurrent Rooms	Re-joined Attendees	Unique Attendees	Total Attendees	Recordings
2008 - 2009	0	0	608	5747	6355	0
2009 - 2010	902	7	1799	6220	8019	50
2010 - 2011	2124	8	1394	7672	9066	905
2011 - 2012	4945	15	2302	14165	16467	2225
2012 - 2012	4516	13	923	9976	10899	1521
	12487	15 (max)	7026	43780	50806	4701

Trends and new usage patterns

From 2008 to 2011 the virtual conferencing software was primarily used to:

- conduct and record online lectures
- facilitate online meetings (between students and staff members, or internal staff meetings), and
- provide virtual office hours to students studying externally, allow them the opportunity to ‘drop in’ and ask questions.

Since then, a number of staff have trialed using the software in a number of unique (or non-traditional) ways; taking advantage of the new functionality provided to enhance their teaching and learning practices. Some examples of how the tool has been utilised at the university include the following.

1. Combining on campus and online students

A lecture in Sexology is bringing together the online and face-to-face students by conducting a weekly Blackboard Collaborate session during the on-campus tutorial. A webcam is pointed towards the class and the Collaborate session is projected onto the screen in the seminar room. The online students take part in the tutorial by asking questions and communicating and interacting with the lecturer and fellow students. The sessions are also recorded, ensuring that the recorded lectures can be used for revision purposes and are accessible to students who were unable to attend.

2. Library online training sessions

Library staff constantly receive questions from online students asking how they can use the library, and its resources without coming onto campus. As a service to the students library staff run training sessions using Bb Collaborate where students are shown how to browse the databases, catalogues, and e-Reserve as well as informing them of information retrieval resources that are available to them. This is predominately achieved using application sharing and web tours where the staff present a demonstration and then the students application share and demonstrate what they have learnt.

3. Using a tablet and stylus for calculations

A lecturer in Mechanical Engineering has trialed the use of a stylus and WACOM tablet in Bb Collaborate. In on campus tutorials, the lecturer would use a traditional whiteboard to set engineering problems for his students to solve. He would then demonstrate the solutions using prescribed formulas learnt throughout the semester to arrive at the correct answer.

He wanted to take this traditional technique into the online environment and to use the virtual whiteboard instead. The decision to use a stylus with the virtual whiteboard was made very early on; as writing calculations on the whiteboard area with a mouse proved to be extremely difficult. The recorded sessions then provided an excellent revision tool for all the students.

4. Creating student presentations and recordings for assessment

The UniReady Program (http://curtin.edu.au/uniready) is a short program consisting of six online units which, on completion, provide alternative access into Curtin University. Within the online program students are required to use Bb Collaborate to meet and work on group projects. Once the project has been completed they access Bb Collaborate as moderators conducting and recording the group presentation as part of their assessment. Students are allowed multiple attempts at producing the best possible presentation, prior to the assignment due date. Once groups have created and reviewed their recordings, they nominate the recording that they like the best and then submit the link to the recording to their tutor.

5. Managing regional and international staff

Bb Collaborate is also being used extensively for tutor meetings where teaching staff of large units located all over the world are brought together to discuss strategies, identify how the unit is managed, conduct moderation of assignments and exams and define unit administration processes. Application share is often used to show sample assignments or exams, collaboratively construct marking guides or rubrics and to achieve a uniform marking and feedback strategy.

Conclusion and future plans

The provision of training and support to staff around Bb Collaborate is an area that has proved vital in encouraging the successful use and adoption of virtual classroom software. Professional development is provided throughout the semester in a number of formats including face-to-face computer workshops as well as online tutorials run virtually in Collaborate.

As the tool grows in popularity and demand, more innovative ways using Bb Collaborate are surfacing and being trialed by university staff. It is envisaged that successful case studies will be captured and shared among the Curtin community via the 'Showcase' section of the Curtin Teaching and Learning website (http://blogs.curtin.edu.au/cel/showcase/).

With the release of a mobile version due later in 2012 the accessibility and adoption of virtual classroom software is likely to increase dramatically. Along with the implementation of mobile access, Curtin also intends to investigate the introduction of Blackboard's Instant Messaging system which connects directly into Bb Collaborate and the LMS.

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A Brave New World: introducing the planets online

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There are numerous challenges facing a class at university: limited access to tutorial rooms, fewer tutors and low student attendance in traditional lectures. A further challenge in science is the need to facilitate the learning—and develop the science literacy—of non-science majors, who in the case of this paper elect to study astronomy as part of their academic program. On moving a class online, the challenge includes finding, and becoming confident in using, effective methods and tools. This paper traces a process of review and collaboration between an educational development team and faculty academics to reconfigure an introductory astronomy unit. Part of the approach is to engage students using concept mapping to underpin enquiry-driven pedagogy using the university's learning management system.

Keywords: concept maps, peer instruction, educational design, astronomy, science education.

The Project

The project started with a teaching development grant in mid 2011 that brought together an Educational Developer (ED), Online Educational Designer (OED) and Convenor. The aim was to investigate how to take an introductory astronomy unit into a blended mode in Semester 2, 2012 and prepare for a wholly online unit in 2013, for students majoring in both science and non-science subjects.

A number of meetings over several months followed a process of sharing issues, perspectives and ideas, leading to a draft plan for the unit. The educational designers needed to understand the Convenor's style, perspective and issues with the unit, as well as her ideas for its improvement, while the Convenor needed time to understand and experiment with unfamiliar teaching approaches, such as the use of concept mapping and the various inter-connected technologies which would support individual and group enquiry-based learning.

The Unit

The Convenor reported a belief that students memorise facts but do not understand the inter-relationships of scientific phenomena. While they could demonstrate knowledge of individual aspects of astronomy, they often struggled to explanation how solar systems and planets develop and work in connection with each other. Students had reported trouble dealing with the volume of material covered in the course. Those with a non-science background, in particular though not exclusively, lacked tacit knowledge and carried a measure of naïve misconceptions. Although the Convenor was highly rated by students as a lecturer, many key concepts were not understood sufficiently, resulting in low test scores. The Convenor was already in the process of reducing the spread of content and increasing the depth in which some concepts were explored, but at the same time wanted to develop a framework which would promote active learning.

In end-of-semester surveys, students reported being unhappy with the limited tutorial support afforded by the unit: in a previous year tutorials ran a few times per semester and in 2011 there were none at all. A significant proportion of students did not attend lectures, and the audio recording of lectures was perceived as inadequate because lectures feature live prop-supported demonstrations.

As a popular introductory course open to students from across faculties, the plan was to make it available as a fully online offering. The unit required a new approach to delivery, student support and assessment.

From the Literature

The aim for the unit was to facilitate deeper understanding. Meyer and Land (2006) describe a threshold concept as one that is likely to be 'troublesome' for students to grasp in that it runs counter to their preconceptions, but that can be transformative and 'exposes the previously hidden interrelatedness of something' (p. 7). In dealing with threshold concepts, Meyer and Land advocate active learning methods and creative tasks to encourage understanding. It is challenging work to construct new understanding.

The practical application of constructivism in education has been problematical (Perkins, 2006); it is easier to 'talk the talk' than 'walk the walk'. Perkins highlights the importance of bringing tacit knowledge to the surface by asking students to discuss their ideas, that is, by 'surfacing and animating' the tacit knowledge, students 'play the game knowingly' (p.40), developing metacognitive skills. More specifically, the teaching of science to non-science majors has been a problem acknowledged by a number of scholars (Prather et al., 2004). Mazur (1997) suggests memorisation tends to be the way students tackle subjects like physics or astronomy, leaving them with little true understanding of the basic laws and concepts. This aligned with the Convenor's observations.

We decided to use in-lecture questioning and concept mapping. Concept maps have been used in a number of introductory university astronomy classes (Newbury, 2010; Zeilik, n.d.). Concept mapping enables students to organise and explicate knowledge, highlight gaps in understanding and provide a shorthand visual representation of non-linear knowledge (Novak & Cañas, 2008). They differ from less structured mind maps by generally answering a specific question and joining concepts by 'linking words or phrases', forming 'propositions' (Novak & Cañas, 2008, p.1; see figure 2). The Convenor was especially interested in how the maps make student knowledge visible, showing how students' conceptions develop and helping identify material that might require further support in lectures or through online resources. Concept maps would be constructed in groups, with the associated student-to-student explanations, debates and negotiated answers.

Peer Instruction (PI), developed by Mazur (1997) for the teaching of physics and adapted by Green (2002) for astronomy, involves asking a question that integrates the previous 10-15 minutes of lecture material, where each student answers individually first, discusses with neighbours and then answers again. It is also called 'think-pair-share' (Prather, Rudolph & Brissenden, 2009, p.43). The value is in having to articulate the knowledge and hear an argument from someone at a similar conceptual level, rather than passively listen to a lecturer (Mazur, 1997). We purchased clickers to use in lectures to gather responses and to evaluate the type of questions that promote productive results (for example, questions that elicit around 30-70% initially correct answers from individuals (Mazur, 1997; Green, 2002)). When the unit is wholly online, this approach and findings will inform how we set up the online environment. Lecture-tutorials (Prather et al., 2004), in which students work in lectures through a series of problems that build upon each other, may also be adapted for online interactive exercises. The Moodle Lesson module was identified as one possible method for this.

Our re-development approach

Example of concept map development in the project

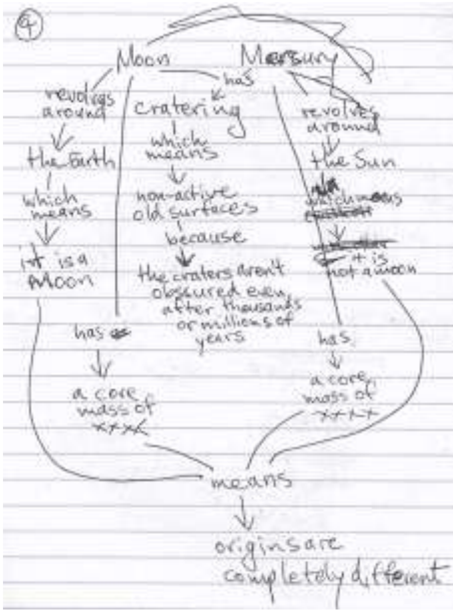

Figure 1: Initial freehand concept map attempting to answer: 'The Moon and Mercury look alike, but how are they different?'

From the outset, the team worked in small stages, with regular meetings to explore ideas and allow the Convener to experiment with the various elements being proposed - both technological and pedagogical. This process provided a context to critically review existing materials and to assess their potential to be re-used or omitted in the new schema, for example dropping details of some of the gas planets. The review was for relevance to learning objectives but also to consider their discover-ability by the students using the concept mapping scaffold being developed. This strategy was used to reduce the 'taught' material such that students are afforded the time to find linkages, gaps and relevance between concepts, ideas and observations.

The Convenor made a journey with the ED on the idea of concept maps. A significant enabler of the project was her openness to exploring unfamiliar educational theories and their relationship to proposed instructional technologies. As educational theory is itself broad and contested, we see constructivism, like Perkins (2006), as 'more like a Swiss army knife with various blades for various needs' (p. 45) and worked to apply solutions to our specific situation.

In our process it was vital to include the Convenor as an integral part of the design team. For example, the Convenor developed ten draft questions for the proposed concept map assessment task. The OED, in the role of novice-student, attempted to create the concept maps freehand (figure 1) and then using the free software CmapTools, based on the guidelines of Novak and Cañas (2008), hints from the Convenor and a certain amount of Googling. This proved a good, quick way to test the idea and to give the Convenor a better view of how concept mapping might work. Later, the OED and Convenor worked together on refining the map (figure 2). While this did not mirror exactly the planned peer-to-peer interaction of the assessment task, the experience of talking through the ideas and how to map their relationships was a reassuring confirmation of the value of dialogue in knowledge creation through the collaborative development of mediating artifacts (Paavola & Hakkarainen, 2005).

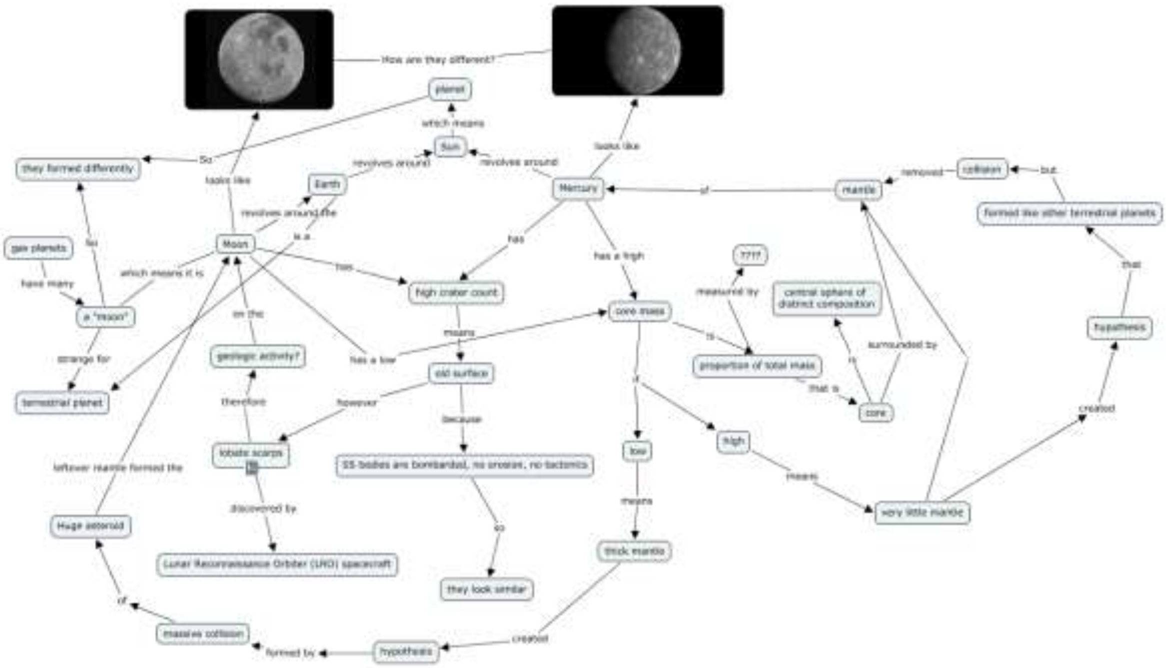

Figure 2: A more detailed concept map created in CmapTools (http://cmap.ihmc.us/)

A sustainable approach

Increased support for students can be achieved through several approaches, including making lectures a little more tutorial-like through peer instruction, teaming students in groups to work on concept maps, formative feedback and through offering online tutor-attended chats at specific times.

There were a number of strategies to enhance sustainability and lower barriers to adoption. One approach was that of minimising the changes needed to lecture material. PI and lecture-tutorials can be utilised with existing lecture materials with minimal work. As there are problems and questions already developed for astronomy, together with guidelines in their use, they won't need to be developed totally from scratch. This is a less confronting or time-consuming way of introducing change, as Lecturers can still use most of their existing lecture material and benefit from the experience of tested methods. The Convenor will not teach the first offering of the unit with the planned changes, so introducing the Lecturers to the fundamentals and bringing them to a level of comfort with the approaches is a further strand to the project.

We aimed to fit activities, marking time and online support for tutorials within available resources, balancing the need for tutor access and feedback with an acceptable budget. Calculations were for a cohort of around 250 students (session 2, 2012 ended up with enrolments of over 400) working in groups of eight, with a non-compulsory weekly one-hour tutorial, repeated four times a week, run by synchronous online chat.

We put the three existing paper quizzes online, using only questions within the automatically marked options available within Moodle, the LMS, removing short answer questions. This freed up some marking time for formative feedback on group work.

A new group project based on concept mapping and pieces of related and reflective writing was introduced, with each group receiving two instances of short formative feedback before final submission. While group work helps manage marking time for large cohorts, we wanted to ensure that groups were given assurance and support in doing the unfamiliar task of mapping. Each student is also required to produce a short reflection on their role in the group project, which gives students a chance to outline their project 'soft' skills and is a source of information for us on how the task worked from their perspective.

Re-development of learning materials

The default recordings of lectures are audio with computer screen capture. A number of the key concepts in lectures are demonstrated with props and physical enactments, which will need to be captured on video (which may be 'quick and dirty' webcam productions) and/or supplemented by existing or created online animations and interactive questions. It is important that the Lecturers and Convenor are able to create video content themselves. A learning and teaching centre video production support project is developing training and resources.

Support materials for students on how to collaborate, build concept maps and use concept-mapping tools were developed by the OED. They are fairly generic, so can be re-used in other units. The OED has also produced an animation to support the unit's practical assignment involving mapping the phase and position of the moon over time—a troublesome task that requires some reorganisation of spatial concepts in order to plot on a sky map.

This unit is being delivered in a blended mode in Semester 2, 2012 using online group collaboration and tutorials. In addition, some remote students–and a proportion of on-campus students–are participating without coming to lectures. Another step in the iterative re-development of the unit.

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Review It: a learner-led course evaluation

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Review It is a learner-led course evaluation tool providing advice from students to students who are finalising paper/offering choices as they progress through their study. Review It encourages reflection of the student's learning experience, and asks what advice that student would give other students. Survey results are moderated and made public online. By directing students to consider how they engaged with the learning material and delivery of an offering, Review It provides prospective students insightful advice from a student perspective. Students may also choose commend a lecturer or offering. The Review It question line also captures student perceptions of weekly workload, how close the offering matched their expectations, and whether there were unforeseen additional costs in study materials and resources. The benefits of the survey extend both to students and the institution; students have access to first-hand course testimonials, while the institution benefits from the first hand reports of students' satisfaction or dissatisfaction with their courses.

Keywords: course review, learner-led, Review It, course advice, student reflection.

The Review It Survey

Review It is a learner-led course evaluation developed by EXMSS with support from Ako Aotearoa. Review It provides advice from students to students who are finalising paper/offering choices as they progress through their study. Review It encourages reflection of the student's learning experience, and as a part of that process asks what advice that student would offer other students. Survey results are moderated and made public online.

Perceived Need

In 2010 EXMSS developed Review It in response to enquiries from distance students who did not have the benefit of advice from face to face discussions with classmates about what elective papers to take as they progressed through their degree. Distance students consistently place a high value, and comment positively, on the Review It service.

Review It Survey Goals

1. Provide students with trustworthy and relevant advice that assists students in making paper choices;
2. Provide an opportunity for students to reflect on their learning experience;
3. Make available to lecturers feedback that may help improve future delivery;
4. To ensure the needs of all stakeholders are balanced with the project outcomes; and
5. Offer an opportunity for students to recognise individuals that have contributed to an exceptional learning experience (and recognise a good learning experience itself).

The Review It Cycle of Contribution and Support

In order to deliver on the Review It survey goals a cycle of contribution and support, of giving and receiving, has been developed. This enabled the question line to be considered in terms of two-way engagement and necessitated consideration of both what the student is seeking as information and what the student would benefit from giving.

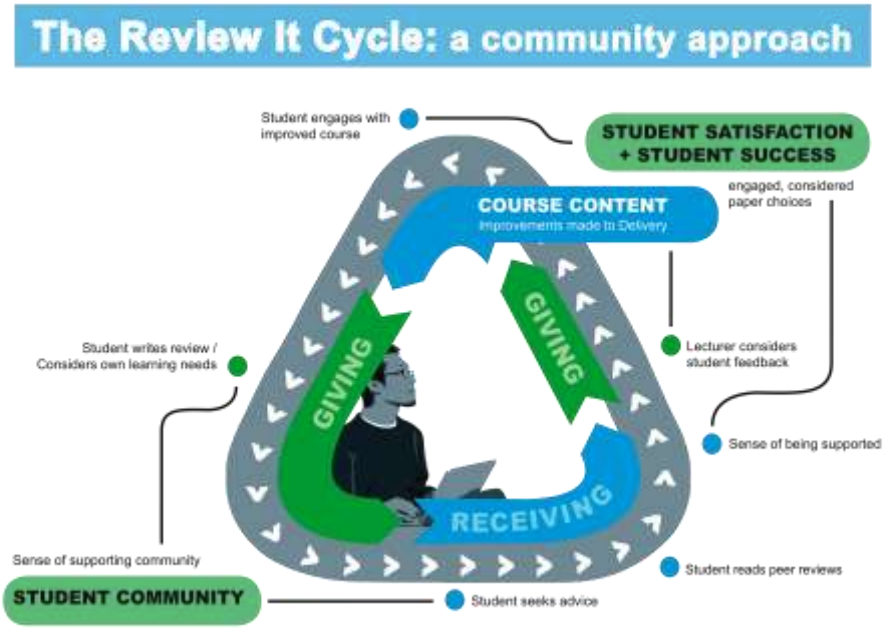

Figure 1: The Review It Cycle of Contribution, support and Improvement

Offering an Ongoing Cycle of Improvement

Part of this Review It cycle involves an opportunity for lecturing staff to review the course content and delivery in light of feedback received. Lecturers who make changes to course delivery have the opportunity to place feedback on Review It results pages. The public nature of the survey adds an element of scrutiny not present in most institution surveys.

The Survey Process

Students are invited via email to review the papers/offerings they are enrolled in. Surveys open for approximately six weeks and close following the release of examination results. Reminder emails are sent prior to the close of each survey. Student media announces when the survey results are available online.

The Survey Questions

Question Text	Answer style
On average how many hours of independent (not tutorials, lectures or labs) study per week was required?	
Other than the fees were there additional costs (such as textbooks, fieldtrips, contact courses or lab costs) for this paper?	
How would you describe the learning resources (printed and web material) of this paper?	Four point scale
How would you describe the process of assessment for this paper?	Four point scale
How would you describe the academic support for students in this paper?	Four point scale
Thinking about the previous questions, if you were to describe your academic experience in this paper what would you say?	Free text
The thing that helped my learning most was…	Free text
The thing I would like to see improved is…	Free Text
Would you recommend this lecturer for ‘lecturer of the semester’?	Yes/no
Would you recommend this paper for ‘paper of the semester’?	Yes/no

University Support

Massey University provides the database that Review It utilizes to complete each survey. Without institutional support the Review It would not be able to operate.

Best Paper, Best Lecturer

Awards are generated and presented annually for Best Lecturer and Best Paper as determined by student feedback. These awards are the students' opportunity to publically recognise good teaching.

Student Comment Moderation

Student responses remain anonymous. Prior to publication, survey comments are moderated
Moderation Guidelines. Comments should:

- Focus on the learning experience;
- Not speculate on or presume the reasons why an offering was delivered in the way it was;
- Offer constructive advice;
- Be free of expletives and terms that are generally considered offensive;
- Be free of libellous, personal or derogatory comments;
- Not disclose information that is private or personal;
- Be free of comments that contravene human rights; and
- Not name and shame.

Data Use and Ethics

Students agree to terms and conditions that allow the use of data for research. Ethics approval for the use of the Review It data has been granted.

Conditions of Publication

Moderated results will not be published if the number of respondents is less than 5% of the enrolled numbers or if there is only one response.

Conclusion

Review It, with its offering-specific feedback, takes student reviews a step further. Not only does it inform students' academic choices at offering level, it supplies a real connection between students' experiences, and the lecturers who are seeking to satisfy both the learning requirements and the students' desires for a positive learning experience.

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Fitting learning into life: Language students' perspectives on benefits of using mobile apps

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For university students, the availability, convenience and low cost of mobile applications (apps) present new opportunities to fit learning into their busy lives outside class. Studies of teacher-led mobile learning in universities abound while few studies explore students' own use of mobile apps and their perspectives on how these apps can benefit their learning. As we consider learning for the future, it is crucial to partner with students to build a picture of emergent technology practices beyond our classrooms and institutions. However, discipline-specific studies are required to gain an understanding of the ways apps are used to acquire specific disciplinary knowledge and skills. This paper reports on how 134 language learners used mobile apps to profit from their available learning time outside of class. It provides insights into student perspectives on the benefits of using mobile apps for foreign language learning.

Keywords: mobile language learning, MALL, language learning, student perspectives, university

Introduction

> Pockets of time available at certain times of day can become profitable moments of learning, and places that were previously dedicated to one purpose can assume a different role.
>
> Kukulska-Hulme, 2012

Beyond formal institutional settings, university students make their own choices about how they fit learning into their busy lives. Some five years ago, James, Bexley, Devlin and Marginson (2007) reported that 70.6% of full-time Australian undergraduate students worked an average of 14.8 hours per week with nearly 20% working 16 to 20 hours per week during semester. Recent surveys (Coates, 2011) have shown similar trends. On top of university studies and work, students need to juggle other aspects of their lives including friends, family, social and other commitments. Our busy students need to find ways to 'fit' learning into their lives. For students, mobile devices are obvious tools that can help maximise their time-on-task wherever and whenever there is time and opportunity to learn. Pricing and mobile connectivity for these devices is rapidly becoming more accessible to students. Smartphones now outnumber laptops and ownership is exceeding saturation (Traxler, 2011). In Australia, smartphone ownership increased by 36% from 2010 to 2011 and is predicted it to grow to 60% of the Australian mobile population by 2012 (Telstra, 2011). Simultaneously, mobile applications (apps) are proliferating exponentially and experiencing extremely high take-up with predictions that they will soon eclipse desktop computing (Perez, 2010, Godwin-Jones, 2011).

For our busy university students, mobile apps offer a wide range of learning tools they can be downloaded to their mobile devices and used productively at opportune times in a variety of settings and on-the-go. Yet few studies have investigated students' personal use of mobile apps for learning and the learning benefits students perceive for their university studies. Indeed most studies of mobile learning in university settings have tended to focus on teacher-led mobile initiatives. Disciplinary context is also often overlooked. The discipline is important here as learning is experienced differently in different fields of study. This paper reports undergraduate students' use of mobile apps for foreign language learning. It describes how students use their apps to maximise the effectiveness of their out-of-class learning time and how students perceive these apps benefit their foreign language acquisition.

The nature of foreign language learning outside class

Learning in different disciplines is dependent not just on how students learn but also on what they learn. Whilst more generalist educational theories such as Social Constructivism have broad applicability for language learners, the ways in which students acquire languages has demanded language specific learning theories (Chapelle, 1997, 2005). More recent examples of these theories include Second Language Acquisition Theories (SLA), Communicative Language Teaching (CLT), Content and Language Integrated Learning (CLIL) and Intercultural Language Teaching and Learning (ILT) (for an overview of these theories see Lo Bianco with Slaughter, 2009). Such theories highlight a range of pedagogical approaches that were created specifically for the discipline of language learning with a view to language acquisition.

Extending language learning outside of classroom time, especially where in-class language practice time is limited, is essential to language acquisition (Kennedy and Levy, 2009). Foreign language mastery requires frequent informal practice (Kukulska-Hulme, 2012). In non-language-immersive environments this means trying to maintain a more continuous connection with the target language by locating time and opportunities for self-regulation and practice. In this context, mobile devices and their applications hold potential affordances for language learners (Kukulska-Hulme & Shield, 2008). In relation to these affordance it is useful to consider major language areas and skills that are central to language acquisition. Levy (2009), discussing computer assisted language learning, categorises these areas and skills as grammar, vocabulary, reading, writing, pronunciation, listening, speaking, and culture. This study considers these areas and skills in terms of students' reported use of mobile apps and the learning benefits they perceive. The types of apps that are used by language learners are described in the student quotes in the results and findings section.

Methodology

A mixed methods research project called 'The beliefs and experiences of language students in their early years of transition to university-level study' was conducted at an Australian university from May to August 2011. Employing an online survey, 2,114 language students were invited to participate and a 28% response rate (N=590) was achieved. Ten foreign languages were represented across the sample with highest representation from students studying French (175), Japanese (163) and Spanish (116) (see Figure 1).

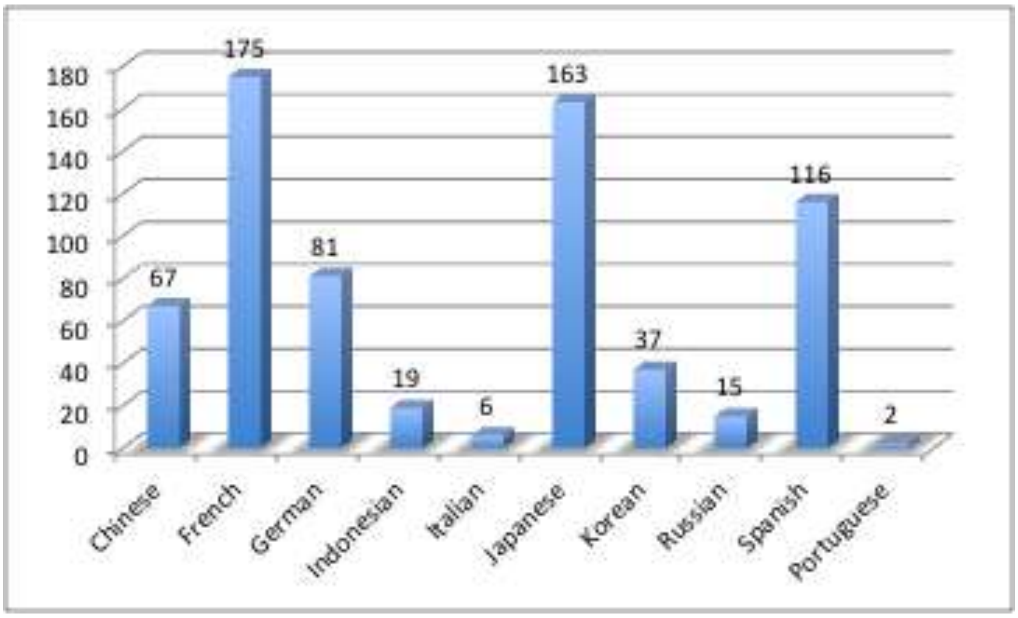

Figure 1: Languages studied across the sample

In one section of the survey, students were asked to identify the technologies they used to support their language learning (inside and outside of class) and then rank the top three technologies they perceived as most beneficial to their language learning when used outside their formal class settings. Students were then further prompted to type qualitative comments explaining the learning benefits they perceived from their top three technologies.

Whilst 331 (56%) students reported using mobile apps to support their university learning, 134 (23%) students ranked mobile applications in their top three technologies. Qualitative analysis was conducted inductively on student comments to find out how students use mobile apps to profit from learning time available outside of class and the benefits they perceived from using mobile apps for language learning. Data was handled interpretively through different levels of coding, categorisation and reduction until clear themes emerged. This analysis is ongoing and preliminary results form the basis of the discussion below. The themes reported describe: (a) the ways students used mobile apps to maximise time, location and opportunity to fit language learning into their daily lives, and b) the specific learning benefits students perceived through their use of mobile apps for language learning.

Results and findings

Student comments on mobile apps highlighted some of the key overall advantages often associated with being able to learn on-the-go as well as learning benefits that enabled the development of specific language learning areas. The more general benefits are discussed first as they emphasise the ways that students fit learning into their busy schedules and utilise 'pockets of time' to connect with, and learn languages. The more language-specific benefits are then examined with reference to language learning areas and skills that students reported mobile apps helped address.

Fitting learning into life

The ability to practice language anywhere and anytime was a strong theme in the student data on mobile apps in this study. Students appreciated the flexibility and convenience of using their apps to meet their personal learning needs at times and in places that suited their lifestyles.

Students often mentioned the convenience of using their apps to gain time efficiencies thus exemplifying how students can utilise pockets of time profitably: '*I downloaded various dictionary apps for the language that I am learning so I can check and refer to it whenever and wherever I am. It is very convenient*'. Learners could embrace opportune moments in varied locations without a lot of forethought and preparation:

> Allowed me to build custom decks of kanji & vocab cards, which I can review nearly anywhere - on the bus, on a break from work or in-between classes. It's turned my transit time into 80% study time - a huge reclamation

Students often referred to the fact that they tended to carry a mobile device like a phone with them anyway which increased their access to their apps. '*I always have my phone with me so my phone apps for my language learning are with me as well'*. This kind of portability extended to their workplaces and enabled students to revise and review their in-class learning. '*It is accessible to me during brief breaks in my work schedule and allows me to revise points quickly*.'

Overall, students found mobile apps '*easy-to-use and understand*' and '*accessible anywhere anytime*'. Students commented that apps were generally free or low cost and '*are often many things in one: dictionary, text-book type exercises, flash cards, audio, writing practice devices etc*.' Additionally, students expected apps to continue to improve and to offer more opportunities for learning. As one student said '*there are so many apps out there that help assist me in my language learning, and there are always new apps being released*.'

Convenience, portability, and being able to learn-on-the go were important factors for students who ranked mobile apps as beneficial to their language learning. These features are not new to mobile learning and their benefits have been espoused for some time (e.g. Alexander, 2004). However, recent changes in the ownership patterns of smartphones, and the availability of a large range of mobile applications that cater to a wide range of languages has meant that this potential can now be realised by more university students studying foreign languages. Students in this study also realised the potential of being able to personalise their learning to achieve learning tasks quickly and easily, spontaneously and habitually, so that time could be used profitably for language acquisition. For learners in this study, being able to use one small and portable device anywhere and anytime meant that learning languages could be less compartmentalised and less tethered to time and place. This also meant that students could more readily immerse themselves in their target language.

Language specific learning benefits

Of the language areas and skills discussed earlier in this paper, mobile apps reportedly benefited most with vocabulary (particularly for memorization, accessing meaning and contexts for use) and with reading, writing, grammar and translation tasks. Specifically, apps that offered mobile versions of language dictionaries, translators and verb conjugators were indispensible when available via one highly portable device.

> Phone apps can be used as dictionaries, help with verb conjugation, hanja help (chinese characters) ... It's language tools whenever I need them, wherever I need them and that makes it really useful to have.

These kinds of apps enabled students to quickly and easily check the meaning of vocabulary whenever they needed to: '*if I hear a word that I don't know i can just easily look it up*'. And many students claimed that the use of these apps had a positive influence on their vocabulary acquisition. '*I was able to use these apps on the bus to and from university which helped me cement some vocabulary and grammatical skills*'. Facilitating vocabulary acquisition, on-the-go, also meant that students had more opportunities to remember words in context:

> When i want to know what a certain word may be for a situation and i am out and about i can look it up straight away. I find i remember it better because i can remember the situation as well, so i am constantly expanding my vocabulary.

Mobile apps for vocabulary acquisition (such as flashcards and games) were perceived as highly beneficial to students' learning. Many of the language apps offered flashcards and games that could be personalised to assist targeted vocabulary acquisition.

> I have an app on my phone which works exactly like an electronic dictionary for Japanese, except better. I can store vocabulary lists on it and it will make an automatic flash card game to help me memorise new vocabulary.

Many apps combined a number of features in one app which meant that students could use multiple functions in integrated and seamless ways. Reportedly, the availability of these functions helped their learning.

> There are several apps which have flash card or select the right answer games on important vocab or grammar, as well as supporting a dictionary/translator. I find these help solidify what is learnt in class.

> I have a mobile phone app that does everything. its a dictionary for both jap to english and then english to jap. it also shows examples of words in a sentences, you can look up kanjis, it shows functions and grammar formats. its just extremely helpful and i use it all the time

Students often related their use of apps to the content or the way they were learning in class. '*You can use them while travelling, makes revision slightly easier and can be fun*.' Sometimes, being able to work at their own pace rather than the class pace was perceived as beneficial '*it "teaches" me outside the classroom and at my own pace, as sometimes the lecturer moves too fast for me to understand*.'

Importantly, students valued the opportunity to intellectually connect with the language beyond the classroom. '*Sets me words to learn, quizzes me through flashcards and games on the words - gets me thinking in German outside the classroom*'.

Depending on the language under study, there are different linguistic characteristics and challenges. Being able to access apps that helped students directly with some of these known challenges was perceived a beneficial. For example, languages that were gendered or had character-based writing systems. '*I also have some language learning apps to help remember vocabulary and to help memorise gender of nouns - these are really helpful.* '*Applications allow users to handwrite simplified or traditional characters on the screen as an input option for dictionaries, along with pin yin or English typing*.' Locating characters in traditional dictionaries can take a lot of time, so being able to quickly search for and identify Chinese and Japanese characters was very helpful and time efficient. '… *it also has an excellent Kanji search that can be text based, multi-radical, JLPT level and a number of other ways*.'

Many students had a variety of language apps on their mobile devices. '*I have approximately 6-8 apps on my phone relating to language learning. These are dictionaries, flashcards, conjugating apps, games, mp3 etc*.' However, apps that promoted vocabulary acquisition were frequently mentioned in the student data. A potential limitation of this study though, was that most students (just over 70%) were in the first or second year of their university study. While some of these students may have been taking more advanced language classes based on prior studies or experience, it is likely that a majority of students were closer to beginner to intermediate levels. This may account, at least in part, for students' focus on vocabulary acquisition over say more authentic or communicative language learning. Vocabulary acquisition through mobile devices has been emphasised in other studies of mobile language learning (e.g., Levy and Kennedy, 2005; Thornton and Houser, 2005, Stockwell, 2007). However, few studies, with the exception of Song and Fox (2008) have reported on students' personal use of mobile devices to acquire new vocabulary (Kukulska-Hulme, 2012).

While other language areas were addressed, such as reading, writing, grammar and translation tasks, it was notable that few students mentioned using these devices that were originally intended for communication for phone calls and texting. Again, this could have been a constraint of the language levels surveyed. A further limitation may be the types of foreign language apps currently available to language learners and their pedagogical designs. Many apps are still designed using behaviourist algorithms.

Conclusions and implications

Kukulska-Hulme (2012, p.1) suggests that ‘by reviewing individual learner experiences in learner-determined contexts, researchers and the language teaching community can work together to build up a picture of emergent practices’. This study has contributed to understanding how foreign language students are currently using mobile apps to support their language learning. It highlights how these devices are making a difference to the ways that students fit learning into their busy lives as well as describing the dominant uses of these apps in the context of a specific discipline. For language learners and teachers the future holds great potential. As this student’s comment underscores:

> Mobile apps are beneficial because you can access them anywhere, meaning you are more effective with your time. Successful language learning occurs mainly in immersive type environments, so I think that mobile apps are most beneficial because they bring more exposure and engagement with the language than just the time spent in the classroom.

However, more studies of students’ personal use of mobile apps and devices are required for the discipline of language learning and for other disciplines too. For language learning, further studies could be conducted with more advanced language students to see whether there is more variation in their usage patterns and the skills and language areas that are targeted. Additionally, more studies need to examine the pedagogical premises that underpin the design of current mobile apps and to suggest improvements. For example, are language learning apps being developed based on narrow interpretations of language pedagogies and theories? Further, teachers need to be more aware of the language apps their students are using and how they are using them so they can provide some guidance and recommendations on how their learning benefits could be extended.

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The affordances of web conferences in online pre-service mathematics education

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In their books ‘Teaching the digital generations: No more cookie cutters’ (2008) and ‘Windows on the Future’ (2001), Ted McCain and Ian Jukes discuss the change that is necessary in education to respond to technological change. Web conferences are emerging as an important pedagogical tool for pre-service teacher education. In this study pre-service mathematics teachers shared their views of the benefits and limitations that web conferences offer. The collection of data for analysis was from students experienced in web conferences and was obtained by, appropriately, a web conference where questions were presented on the web conference whiteboard and responses and discussion were given using the text, talk, polling and whiteboard tools embedded in the web conference software. This paper will provide a synthesis of the findings and explore the implications for online pre-service teacher education programs.

Keywords: Web conference, online learning, student evaluation, pre-service teachers, teacher education.

Introduction

It could be argued that the venue and structure of a mathematics class has changed little over the last one hundred years. The advent of increased technology into our society and the impact that will have upon a mathematics class is hard to predict. Online possibilities are plentiful but changes to incorporate this into schools have not been universally accepted. A person entering a mathematics class in the 21st century may see very little outward difference from the class of the 20th century and perhaps even the 19th century (McCain & Jukes, 2001). Other professions have changed radically in both equipment, style and environment (consider a doctor's surgery). The plethora of new technologies that can be utilised in a classroom are perhaps still 'hiding under a bushel'. Mathematics classes can still be viewed as a place where information is just transmitted and received (McCain & Jukes, 2008). The task to consider all of the new technology that could or should be incorporated into a new pedagogical approach for mathematics teachers would be enormous. This study considered a case study involving pre-service mathematics teachers at the University of Tasmania who had studied at least one secondary mathematics education unit online. The students were asked to discuss the benefits and limitations of web conferences that were experienced using Blackboard Collaborate Live (consisting of interactive chat, whiteboard, instant polling and live discussion) which had been used as part of their online secondary mathematics education units. The terms ‘web conference’ and ‘webinar’ will be used synonymously in this paper as both are used frequently by the participants. Pseudonyms have been used in this paper for the direct quotes from participants.

Literature review

The consideration that webinar and online class offerings may be an integral part of all classrooms in the future should not be ignored. Conclusions made after a trial of web conferencing software by the University of Queensland indicated that Blackboard Collaborate can enable new ways of teaching and learning as well as encouraging innovation pedagogical and collaborative teaching methods (Reuschle & Loch, 2008). An online professional development program for mathematics teachers in the United Kingdom (de Pomerai & Tripconey, 2009) received feedback about the use of Blackboard Collaborate for instruction. The collaborative nature and accessibility were seen as significant advantages whereas the lack of class type demonstrations and technology concerns were highlighted as disadvantages of this program. The individual tools within Blackboard Collaborate such as the audio, the shared whiteboard and application sharing were mentioned but not analysed or compared. A study of synchronous and asynchronous online learning (Ichinose, 2010) indicated that synchronous online activities were effective in teaching and learning mathematics. Previous studies (Collinson, Elbaum, Haavind and Tinker, 2000; Cox, Carr & Hall, 2004) saw the asynchronous nature of online learning to be a leading motivator for course participation. The capacity of Blackboard Collaborate to be able to be used synchronously and asynchronously (as a recorded class) could provide a good balance.

Web conference questions

The starting point for the research was a web conference where a semi-structured interview was initiated with the participants. The whiteboard, polling/voting, talk and chat tools were used with the participants in the web conference to record the responses for the four qualitative and two quantitative questions. The category of research was expected to be predominately descriptive and a qualitative analysis of the descriptive responses would be conducted. Questions using the polling tool obtained some Likkert data for quantitative analysis. The audio recording of the web conference was used to procure data for the study.

Qualitative questions

Q1. In what ways do you consider the webinar class different to a face to face class for studying techniques and knowledge about mathematics teaching?
Q2. What do you consider are the benefits of studying mathematics education in a webinar class?
Q3. What do you consider are the limitations of studying mathematics education in a webinar class?
Q4. Which of the tools in the Collaborate program do you consider most useful in being able to study the teaching of mathematics?

Quantitative questions

Q5. Web conferences were beneficial to studying of mathematics teaching?

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
○	○	○	○	○

Q6. I believe that I am likely to need to use a webinar in my future teaching career?

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
○	○	○	○	○

Methods

Research site and the participants

This research study took place at the Faculty of Education at the University of Tasmania. The University of Tasmania is a mid-size university in Australia catering for approximately 15 000 full time equivalent students. The faculty has an enrolment of approximately 1900 full time equivalent students. The students who participated in this study were enrolled in at least one of three units in secondary mathematics education that form a part of the Master of Teaching course during 2011. These three courses are usually studied sequentially over an 18 month timeframe and are compulsory units to qualify as a teacher of mathematics at high school level. For this study, six students volunteered to provide in depth feedback on their experiences with web conferences. The web conference to obtain the data for this research was held on Wednesday July 4th, 2012. The web conference was recorded and verbal responses were later transcribed. . The verbal responses and the text responses formed the majority of the data for analysis.

Findings

The students in the study indicated that web conferences provide a positive connection between both the students themselves and the lecturer. It was readily apparent that isolation was a common theme when online courses did not include web conferences for these participants. The personal nature and connectedness that were important features of the web conferences and that had been identified in other studies (Reuschle & Loch, 2008; den Exter et al, 2012). A comment from one of the students typified their views:

> Being an online student you can feel very isolated. The webinars have been really helpful in feeling connected. The feeling I have is that the setting is more intimate than a large lecture, with more interaction than in a regular setting. This has made learning the content more interesting and hence easier to assimilate. Also you can ask questions or participate without feeling like everyone

> is looking at you. (Mark)

Students who had completed online courses in the Master of Teaching program that did not have web conferences as a component commented on a feeling of isolation. There is evidence that a connection is established with the use of weekly synchronous web conferences (den Exter et al, 2012; Heirdsfield et al, 2011). It is generally agreed by researchers that knowledge is founded in discourse in social interactions and not just in the minds of individuals (Hrastinski, 2008). This capacity to connect with discourse and social interaction must be an important component of not only face to face classes but also of any online class. To support any online education, online participation must be encouraged and developed (Hrastinski, 2008). The design of the learning environment is important to encourage this participation and needs to support interaction from all participants using synchronous and asynchronous learning tools. Synchronous tools such as the web conferences have been successfully used with small and large classes to allow instant communication and promote collaborative learning (den Exter et al, 2012). Evidence that collaboration was used effectively was highlighted by one participant: “The webinars were definitely a step up from just having an online course. I liked having a ‘room’ where we as students could also meet at other times – we used it in the organisation of group planning assignments” (Jan). With the ability to meet in the 'web room' at any time the students had unlocked a potentially powerful collaborative student-to-student tool. The advantage of students being able to use a synchronous tool such as the web conference without the lecturer as well as the asynchronous use with the recording was further reinforced with comments from students such as

> The webinars have been great in the ability to offer distance students more collegial experiences than units that do not utilise them. The units that do not use them would benefit distance students by utilising them or at least by recording tutorials so that online students can observe (Peter).

Another communication benefit seen by students was the openness and freedom that the synchronous nature of the web conference allowed. This was well articulated by a student who stated that: “The webinar format allows you the freedom to question and discuss any areas of concern, and to use the whiteboard to clarify the issue” (Scott).

Although web conferences were seen as beneficial the connection to future teaching was not considered by some of the students interviewed. All of the students interviewed agreed that web conferences were personally beneficial with the majority strongly agreeing. Some benefits that were listed by students were related to classical distance education issues such as providing access for rural and isolated students. One of the students reported that

> I think the idea of a teacher standing up the front and talking to a set group of students may change in the future. Rural or isolated students would benefit. Being able to do special classes in a regular school would be cool. (Jan)

Some of the drawbacks that currently are preventing the use of web conferences such as technology were outlined in comments such as “teaching mathematics might be more challenging but only because I find using a mouse/trackpad gets in the way of drawing, writing, etc. As a student it might be harder to communicate ideas, or show working” (Scott) and “as it stands now though, you can't assume that every student is going to have the means, facilities, or even technical knowledge to be able to be able to study like this” (Peter). Such comments clearly indicate that there are still hurdles in place preventing the acceptance of web conferences as part of learning for the future with teachers in schools. This is well articulated by Heirdsfield et al., (2011) with the recognition of the one of the hurdles is that staff need more training and support in order to see opportunities to incorporate new and innovative technologies into existing practice.

Conclusions

The use of web conferences as a valuable tool in online teacher education has been demonstrated in numerous studies (den Exter, 2012; Heirdsfield et al, 2011; Reuschle &Loch, 2008) and has been reaffirmed in this study. The comments in regard to the collaboration, interactivity and removal of the feeling of isolation that were made by participants in these earlier studies resonated with comments by students in this study. Comments from participants in Reuschle and Loch (2008) such as “The Elluminate events were a highlight of this course for me. I enjoyed the interaction and hearing the fellow learners' voices. It added a degree of humanness to the virtual environment.” voiced similar views to this study. Terms such as ‘intimacy’, ‘connectedness’ and ‘collaboration’ were frequently used by the students in this research. The reduction of the isolation that is often associated with online learning was identified by Reuschle and Loch (2008) and was a common theme in the responses given in this study. The increased communication and collaboration possible in the web conferences were highlighted with the web conferences lauded as the closest possible replacement for on-campus tutorials. This view was supported by comments expressing the view that ”face to face is probably the best way to study any subject, but this excludes people in remote areas. I believe that the webinar is the next best thing” (Anne). Learning and teaching are changing rapidly and features that are available for web conferences continue to increase. Teachers of the future will need to be prepared to teach in a variety of ways and are likely to include the use of web conferences. With the rate of online education growing much faster than 'bricks and mortar' education (Chau, 2010) it is appropriate to implement and model collaborative tools such as web conferencing in pre-service teaching programs to equip the teachers of the future. Teachers need to be prepared to teach in an ever changing technological landscape and teacher educators need to consider new approaches to online teaching and be given the support to model and manage new and innovative approaches (Downing & Dyment, 2012; Saltmarsh & Sutherland-Smith, 2010). Web conferences are an ideal vehicle to provide the collaborative and interactive tools needed to support current and future teacher educators as they prepare for imminent pedagogical and technological change.

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New approaches: Embedding on-line interactive scenarios as core course components for international biosecurity practitioner training

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Interactive scenarios were used in an on-line international Masters degree programme for veterinary and public health professionals launched in 2010. For two courses in the programme, students were required to play the role of a senior advisor, analyzing data, determine the cause of an unfolding disease outbreak and critiquing recommendations. The scenario was presented in six episodes. Each episode was designed to be completed in one sitting and these also contained the history of previous episodes. On-line forums were used for group activities which included a vote on the diagnosis. Students were also required to give a critique of the diagnosis and solution proposed in the scenario. A student survey rated the use of the scenario-based approach highly with motivation and engagement being the most obvious benefits. This paper illustrates how an interactive scenario can deliver student outcomes when be embedded at the very core of a course.

Keywords: interactive scenarios, case-based learning, scenario-based learning, course design, SBL interactive, biosecurity training, epidemics, health professional training, authentic learning

Introduction

Learners need to see relevance in the tasks they are set. There is general agreement in educational circles that student engagement is enhanced and better learning is accomplished where groups of learners are immersed in authentic, real-world problems (Barnes, Christensen & Hansen, 1994, p. 1-6; Herrington, Reeves & Oliver, 2010, p. 216; Jonassen, Peck & Wilson, 1999, p. 229). One way to facilitate this in an on-line setting is to use interactive scenarios or cases, where students are required to explore, investigate and analyze an unfolding situation (or crisis!). However, it is also recognized that benefits from any "active learning" approach are not automatic, and it is important that such activities are designed carefully, and embedded (and scaffolded) correctly in the context of the course as a whole (Hmelo-Silver, Duncan & Chinn, 2007; Kirschner, Sweller & Clark, 2006). Failure to do this can confuse the student and undermine the learning objectives.

The following case study reports on the design, implementation and evaluation of two sequential courses which had an interactive scenario (or case) at their core. It illustrates how these scenarios, properly embedded and supported as a core component of the course, can interest and motivate students. Furthermore, they can also be used as an engaging platform to facilitate other activities important to the learning outcomes, such as collaboration (groupwork) and report writing.

Background

Recent years have seen a number of human diseases emerge which have their origins in animal populations. Some examples include the SARS virus, HPAU and N1N1 influenza. Furthermore, these global threats often arise in developing countries where limited capacity exists to deal with them. Sophisticated interdisciplinary training is required in disease surveillance, investigation and control, along with institution and policy building. In 2010 Massey University launched a "One Health" for Asia program to strengthen the response to outbreaks of major human and animal infection diseases in three sub-regions of Asia (South Asia, Central Asia and East Asia). Part of this program provides Masters level training of public health doctors and veterinarians. Of the eight papers offered in the two-year Masters programs, seven are taught entirely on-line whilst the eighth is a combination of on-line and regional face-to-face training. The first four courses provide a foundation in epidemiology and are common to both degrees. The remaining four courses address specialised topics related to human or animal health. Each of the eight courses is delivered over a six-week period with a study load of about 20 hours per week, using the Moodle Learning Management System. Intensive student support is provided online, with tutors overseeing groups of students at a ratio of approximately 1:8.

It was decided to use an interactive scenario as a core component in two of the four compulsory courses titled 'Epidemiological Techniques for Disease Investigation' and 'Principles of Disease Control and Management'. The overall purpose of these two courses was to give students the skills to prepare an outbreak investigation plan, manage an epidemiological investigation, develop hypotheses regarding risk factors, recommend control measures and evaluate their success, and communicate the outcomes to different stakeholder groups. Such outcomes fitted well with a scenario or case-based approach. Also, teaching an almost fully on-line Masterate program of eight courses to working professionals in developing countries is a daunting challenge. Notwithstanding potential technology issues, there is a mix of languages, cultures and pre-knowledge. Consequently, it was important to develop lessons that incorporated activities and examples that had current relevance and that engaged and motivated the students.

The outbreak scenario

Description

The scenario was based on an actual disease that emerged in South East Asia during the 1990s, killing both humans and animals. In essence, very early reports of an unfamiliar disease in animals were not investigated thoroughly and were not identified by authorities as being unusual. The early stages of the ensuing outbreak showed a pattern similar to a commonly occurring endemic disease, although some epidemiological evidence did not support this hypothesis. Intensive control measures were implemented, but these failed to contain the disease which spread to become a major epidemic. This example was chosen as it contained the ideal ingredients for an authentic online learning scenario that would address the learning outcomes. These included knowing how to deal with complex epidemiological problems involving humans and animals, compounded by socio-cultural and socio-economic aspects.

Development

Two people were involved in the creation of the interactive scenario. One was the subject expert responsible for developing the activity; the other was the e-learning instructional designer whose main role was to author the scenario. Both were working from different geographical locations.

The scenario was initially "mapped out" using storyboarding techniques at face to face meetings. After the structure of the scenario was agreed on, development of content was facilitated using a scenario schema. The schema was a Microsoft Word document which initially was a template. Specifically it just contained headings laid out sequentially representing specific information and activities students would be exposed to as they progressed through the scenario. Text was often included under these headings which elaborated on the content the scenario authors wanted to put there.

The schema was split into segments. Work on the content then progressed section by section. Each section was initially filled with draft content by the subject expert then provided to the instructional designer by email for comment. The document would then be passed back. It was a collaborative process, and each section of the schema would often pass through several iterations before being finalized. Once it was deemed ready, the content was cut and pasted from the schema to the scenario authoring and delivery tool. The tool of choice was Scenario-Based Learning Interactive (SBLi) (Unversity of Queensland, 2012) an e-learning software package designed for presenting storyboarded scenarios. SBLi gave a structured interface to the scenario, allowing students to always see where they were in the timeline of the case. Furthermore, it facilitated an interactive learning process by integrating narrative, activities, and reference material into one environment.

While the scenario was modelled on the actual sequence of events that unfolded during the outbreak, fictional place names and dates were used to reduce the opportunity for students to identify the cause of the outbreak through Internet searches, and increase the probability that they developed their own hypotheses based on their interpretation of the data with which they were provided.

Pilot

Once developed, a draft scenario was piloted using a group of campus-based Master of Veterinary Science students with similar backgrounds to the students in the 'One Health' Masters degrees. The students were observed as they worked through the scenario, their progress was timed and their experiences recorded. The developers questioned the students on coherence of the interface, ease of navigation and whether the tasks and their purposes were clear.

Some important modifications were made as a consequence of this trial. One major modification was to break the large and complex scenario into a series of separate installments or 'episodes', each of which could be completed in two to four hours. This served to maintain the students' interest in the scenario. It also enabled tighter integration of the scenario into the course, by interspersing the episodes with relevant teaching material and resources in the Moodle environment using a combination of formats including web pages, discussion forums and activities, primarily to facilitate group discussion (Figure 1). Each successive SBLi episode contained all the content of the prior episodes for student review, but excluded the tasks or questions contained in these as they added scaffolding (hence extra work) which was no longer required.

Another finding from the pilot was the necessity of familiarising the students with the SBLi interface and its functionality. Navigation in SBLi was not always intuitive to those familiar with standard web browsers, and certain conventions were used such as color-coding text boxes to represent hints, tasks and navigation instructions. An introductory SBLi training scenario was developed which introduced the interface and conventions used. This introductory "training" episode was worked through prior to commencing with the scenario, to reduce the extraneous cognitive load which would come at the expense of learning (Van Merrienboer, Kirschner & Kester, 2003).

Delivery

In the Moodle course page of the 'Epidemiological Techniques for Disease Investigation' course, each episode of the scenario was prefaced by a static webpage that presented teaching material related to the relevant stage of a disease outbreak investigation (Figure 1). Clicking on the scenario icon launched the scenario in a new browser window.

Working through the scenario
Students were introduced to the crisis in the first episode of the scenario (Figure 2). They subsequently worked through the scenario step by step, as participants or actors in the story. Narrative was written in the second person to enhance engagement. At almost all stages of the scenario, students were required to complete a task to reinforce the learning. This could take the form of selecting options from tick-boxes, developing definitions or conducting analyses as the data became available. Feedback was provided to each question.

Students sequentially worked through the activities which gradually appeared from left to right across the top of the screen. Each activity would include a series of action links which would appear from top to bottom in the left-hand window. As with the activities, these links would not become visible until students had completed the work under the previous one. Resources could also be included from within the scenario. For example, clicking the link in the main page shown in Figure 3 brought up a Microsoft Excel spreadsheet with data that students subsequently used as they were guided through descriptive analyses of the data.

Students worked through the first five episodes of the scenario individually, gathering data about the outbreak, conducting descriptive analyses and interpreting disease spread patterns. Having completed the five episodes, the students were challenged to interpret their findings and develop a hypothesis regarding the cause of the outbreak. Also they were required to summarise their thoughts on the most likely factors causing the disease together with the supporting evidence.

Figure 1. Flowchart showing the staging of the scenario across the two sequential Moodle courses, including the different activity types.

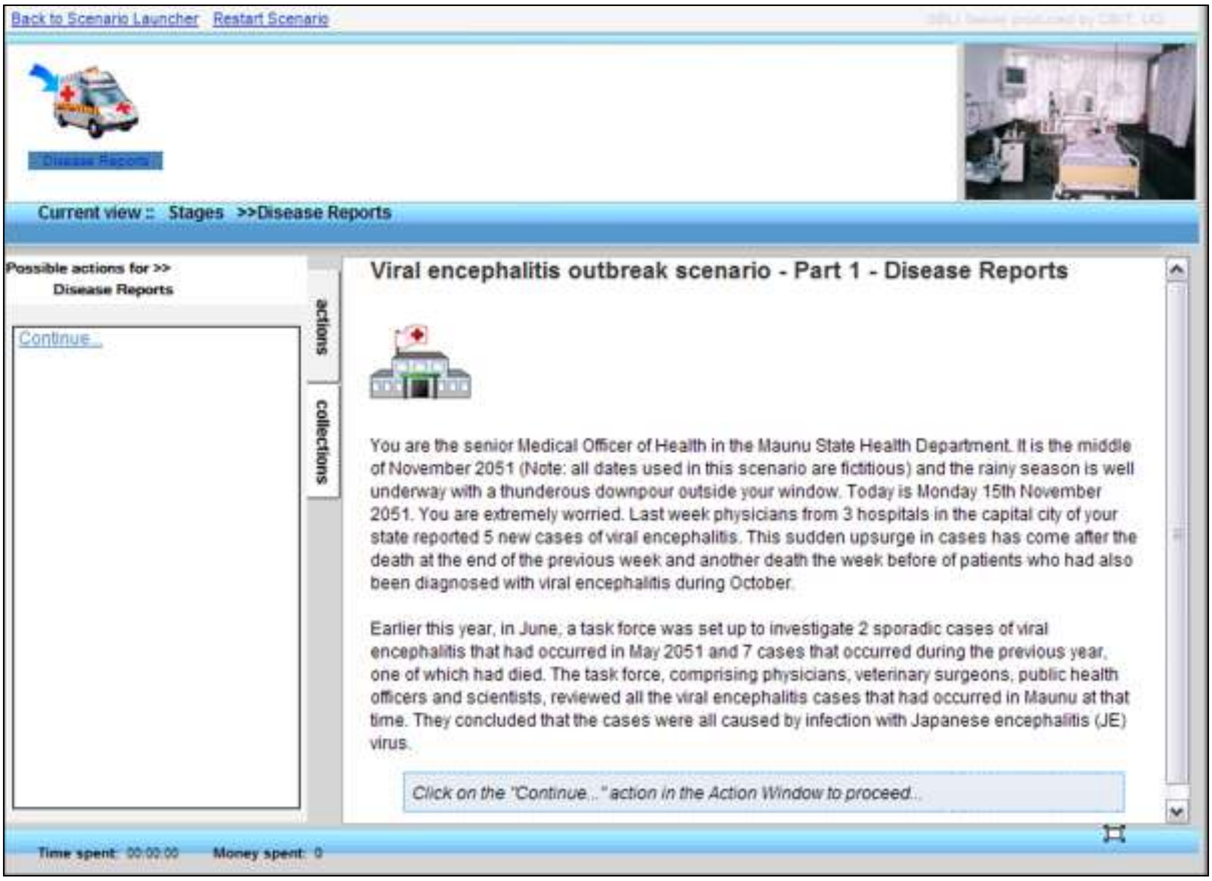

Figure 2. Introducing the scenario in SBLi

Group work

Subsequently, the scenario moved into small group activities for which students were placed into 11 groups of 6 to 7 students, comprising an equal mix of doctors and veterinarians from different countries. The members of the groups were asked to discuss their hypotheses and supporting evidence, and produce a group report. All students were then asked to peer review the other groups' reports and finally to vote on their hypothesis regarding the cause of the outbreak. This task was designed to mimic a situation of an investigation team discussing the results of their investigation and coming to a consensus with respect to their conclusions and recommendations. All discussion amongst group members was via separate group forums within Moodle.

Assessable output: An outbreak report

The final episode in the 'Epidemiological Techniques for Disease Investigation' course provided context and content for the development of skills in communicating the findings of an outbreak investigation to a key decision maker such as the Minister of Health. The students were required to submit an individual outbreak report, which was to clearly communicate a conclusion regarding the cause of the outbreak, support this with appropriate epidemiological evidence, and recommend further investigation and / or control measures.

Carry through to subsequent courses

To assess the effectiveness of the implemented control measures, three additional episodes were integrated into the subsequent course 'Principles of Disease Control and Management' (Figure 1). The emphasis of these episodes was placed more strongly on the affected livestock populations. The final episode presented new evidence showing the consequences of the incorrect diagnosis and inappropriate control measures that resulted in spread of the disease to a new area and development of a major epidemic. The students were given the opportunity to re-evaluate their initial diagnosis in light of this new evidence, and vote again on the group hypotheses developed previously.

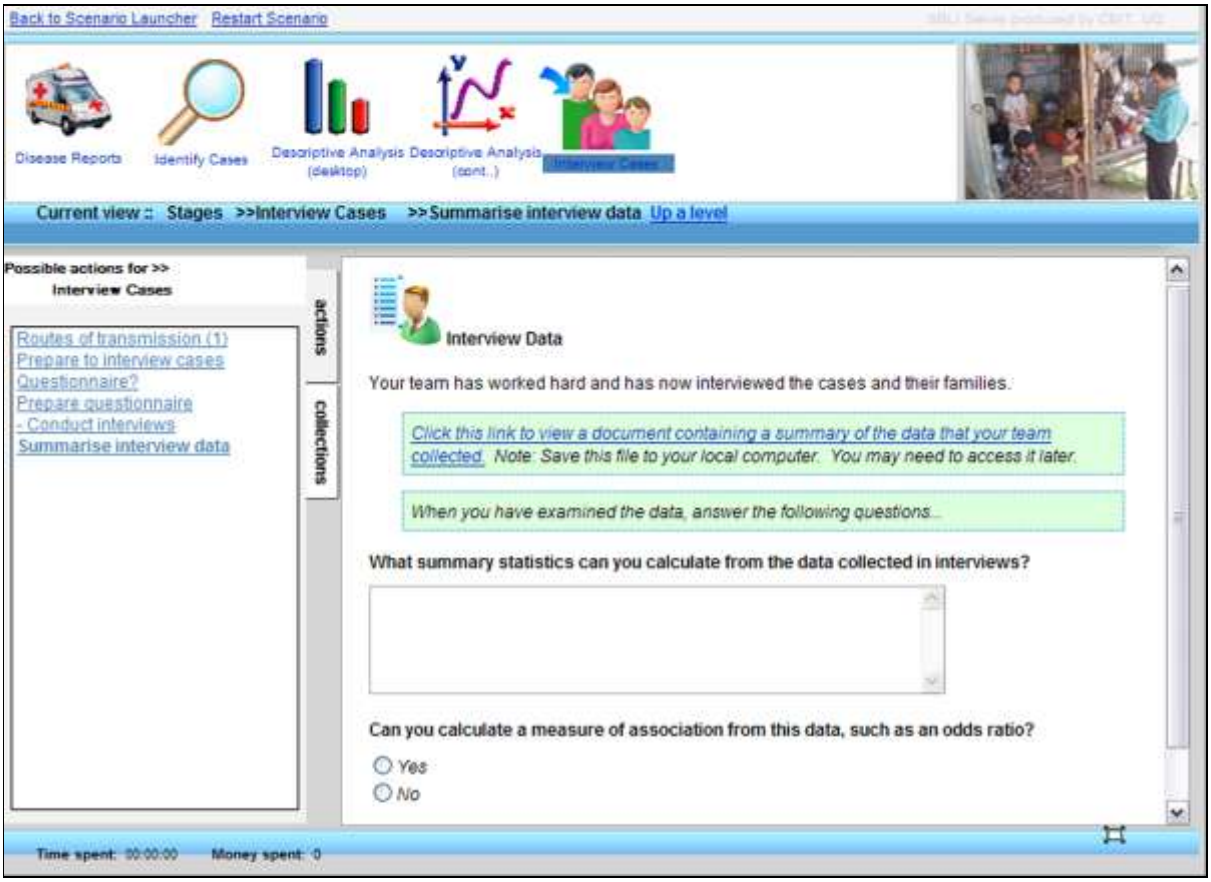

Figure 3. Scenario content screen showing link to data resources and questions

Face to face work
This course incorporated an intensive two-week face-to-face training component. During this workshop, the students were shown a documentary which provided footage of the outbreak, and disclosed its cause. This brought the scenario to life and showed the impact of the outbreak on peoples' lives and livelihoods. It also discussed the mistakes made during the investigation and diagnosis of the cause. It presented the likely involvement of wildlife as the source of infection, bringing the scenario into the full context of the 'One Health' programme.

Later in the face-to-face workshop, the scenario was used during a session on effective management of the media during an outbreak crisis. Student pairs comprising a doctor and a veterinarian were interviewed and asked to prepare a joint press release for the Ministry of Health and the Ministry of Agriculture, providing information about the disease, how people could protect themselves and how spread could be prevented.
In a later course ('Public Policy in the context of Disease Management'), the scenario was revisited and used as a case study to discuss and identify behavioural changes that would assist early detection of a new disease.

Results

In an evaluation questionnaire of the 'Epidemiological Techniques for Disease Investigation' course, students were asked to evaluate the following four aspects of the learning approach used:

1. Embedding the problem-based learning (SBLi scenarios) with the course material (web pages)
2. Using the SBLi interface, and quality of the scenarios
3. Preparing the investigation report
4. Discussing the hypothesis

A total of 46 out of 67 (69%) students completed the course evaluation questionnaire. The majority of respondents found the four aspects of the scenario to be either very effective or quite effective (Figure 4).

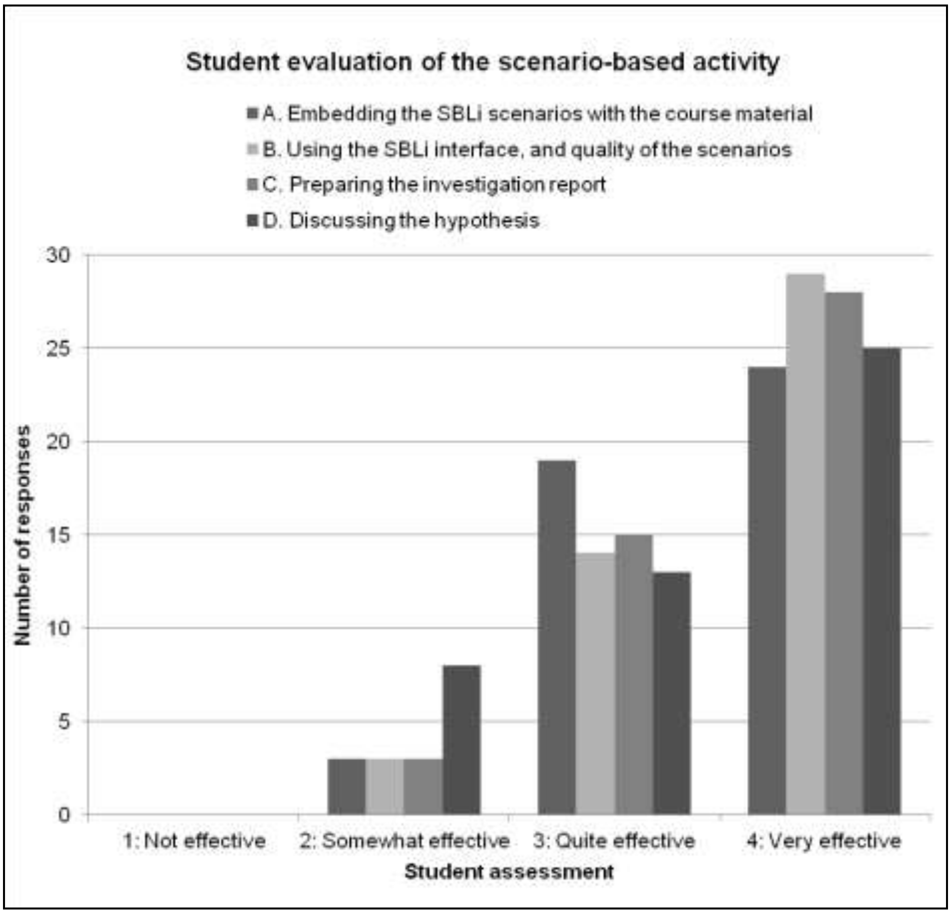

Figure 4. Chart showing student evaluation of the scenario and SBLi. Students were asked for their opinion on the effectiveness of the scenario and SBLi related to presentation of content and facilitation of activities (n=46)

Students were also asked open questions about what they enjoyed most about the course and what they enjoyed least. As these were free-form questions, the results were parsed and categorised into a series of identifiable aspects. Many respondents agglomerated several aspects into one response. Twenty-five respondents (56%) explicitly considered the most enjoyable aspects of the course to be related to the scenario and related activities (Table 1).

Table 1. Responses from the evaluation questionnaire to the open question, 'What did you like most about the course? '. 46/67 (69%) students completed this question. The 25 responses that refer specifically to the interactive scenario are presented in bold font.

Q. What did you like most about the course?	**Number**
SBLi scenario	**16**
SBLi scenario and group work	**6**
Group work	9
Capacity development and the concept note	4
Logical framework analysis	1
SBLi scenario and report writing	**3**
"Activities"	3
Almost all	2
Report writing	1
"We were forced to work"	1
Total responses	**46**

Some reported that almost everything was enjoyable. However, three students cited the scenario-based lessons as being the worst aspects of the course! Four others mentioned that there should be more scenario based lessons in future courses.

Discussion

While it is not possible to quantify how much the interactive scenario contributed to learning per sé, it was clear that a majority of students enjoyed this aspect of the course. This is reflected in 54% of the course evaluation respondents ranking the scenario and its activities as the most enjoyable aspect of the course (Table 1), indicating a high level of satisfaction with this approach to teaching. Motivation and engagement are both important elements for learning (McMillan, 2010, p. 1-13) and it is clear the scenario provided both. This is typified by one student's comment in the feedback which said "[The SBLi scenario]…was really practical, inspiring and interesting! ". The following comments indicate that some students enjoyed the novel teaching method and found it stimulated them to think about the problem: "The scenario was interesting as well as confusing, helping to think more to probe the situation" and, "This is the first time I have encountered scenario based learning and found it very useful as an effective learning tool".

Given students were unfamiliar with SBLi, a walk-through scenario to get the students used to the SBLi interface before the real lesson also proved to be worthwhile. This is reflected in the following student comment: "I was so scared to open SBLi. But once opened - nothing to fear". Navigation through an interactive learning environment can be cognitively challenging and students benefit from prior exposure to it and the conventions used (Liang & Sedig, 2009).

Presenting this large scenario in sequential workable units (i.e. episodes) was decided upon after running the pilot. This change proved to be extremely valuable. It facilitated tight linking of the teaching material in Moodle with relevant episodes of the authentic activity-based scenario in SBLi. Students could complete these episodes at one sitting which assisted focus.

Using a mix of resources and activities in Moodle also contributed to variation. Rolling out the scenario episodes over time meant that students were all more or less at the same place within the scenario, which assisted the tutors in providing support. However, having split the episodes, it was important that students had the ability to revisit earlier parts of the scenario; this was not straightforward, as much of the episode content (when first visited) was bound up in the feedback to questions (some rhetorical) which students needed to answer. The solution to this problem was to preface each scenario episode with a history of those before it, but with the content explicit, which could be revised or skipped depending on the inclination of the student.

Integrating both the scenario narrative and related exercises within SBLi, rather than splitting these between SBLi and Moodle, minimised the "split attention effect", which can arise where students jump between systems to obtain information and to conduct activities using this information. This has been shown to have a detrimental effect on learning by adding extraneous cognitive load (Van Merrienboer & Sweller, 2005). The use of narrative in the scenario, rather than just presenting plain facts, was designed to immerse the student as a participant or actor in the story where events unfolded over time. Hazel (2008, p. 199-213) discusses the importance of narrative in interactive learning environments, where it can build both coherence and context.

It should be mentioned, however, that developing this narrative was quite time-consuming. The story had to have integrity and credibility. It had to "feel" real. The cause of the outbreak was a puzzle and clues to the solution lay scattered throughout the timeline. The skills to produce such work are more akin to storytelling or film and these requirements need to be factored into any design budget using this learning design.

The use of a scenario schema was extremely beneficial to facilitate communication between the subject expert and instructional designer as they crafted content before it was entered into SBLi. Furthermore the schema holds the whole scenario content as a flat file in an easy accessible format. This is valuable in case the scenario (or parts of the scenario) are reused in a different authoring/delivery package . Using scenario schemas is now a standard practice at Massey University for developing SBLi scenarios with a team. (Stewart, 2011; Stewart, Brown & Weatherstone, 2009).

There was considerable value in linking the outbreak investigation scenario with group work, report writing activities and communicating with the media. It reinforces the value of incorporating and embedding interactive scenarios into the core of the course in an integrated way, rather than using them as simply an add-on where their value may not be fully exploited (Gossman, Stewart, Jaspers & Chapman, 2007)

Integrating the scenario into the face-to-face course following the on-line activities provided a very effective way of concluding the scenario on a dramatic note. Students were intrigued to find out from the documentary if they had correctly identified the cause of the outbreak. Furthermore, the documentary brought the scenario to life, showing the impact that the outbreak had on people's lives and livelihoods and discussing some of the controversial issues associated with the management of the outbreak. This provided an excellent segue to wrapping up the scenario with a general discussion of the key issues relating to 'One Health' investigation and management of diseases affecting animals and people and to early detection of emerging diseases.

Conclusion

We believe the integration of the unfolding disease outbreak scenario into the courses described above reflects "Learning for the Future" and adheres to Meyers and Nulty's five curriculum design principles (Meyers & Nulty, 2009). They argue that in order to maximise the quality of student learning outcomes, courses should provide students with teaching and learning materials, tasks and experiences which:

1. are authentic, real-world and relevant;
2. are constructive, sequential and interlinked;
3. require students to use and engage with progressively higher order cognitive processes;
4. are all aligned with each other and the desired learning outcomes; and
5. provide challenge, interest and motivation to learn.

The combination of an on-line scenario-based approach with group work, report writing activities, face-to-face discussion and role play was effective in presenting an immersive learning experience. While most students were unfamiliar with this teaching model (and some were initially apprehensive), the levels of participation and enthusiasm were high. As with any course, there is room for improvement but the student feedback and positive evaluation reflected a high level of satisfaction. The scenario grounded the learning in context and facilitated group work, embodying what Reeves, Herrington & Oliver (2002) defined as "authentic activities".

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Flex and inflexibility: The impact of real-time collaborative technologies in highly customisable video-linked teaching spaces

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This paper introduces a major investment in 'state of the art' video-linked teaching (VLT) facilities aimed at supporting collaborative teaching and learning across and beyond the campuses of Massey University. It reports how the design and development of the VLT spaces have resulted in unexpected challenges that are occasionally counter to the flexible teaching philosophy that has informed the design of the rooms. Some initial feedback is shared from the early experiences of staff and students, indicating several lessons for other institutions wishing to exploit the potential of VLT and related new 'hybrid' learning spaces. Overall the poster offers a glimpse into an engaging, tactile learning environment which goes beyond traditional video conferencing and highlights some of the pedagogical implications that have arisen through the project pilot phase.

Keywords: Video linked teaching, video conferencing, synchronous, flexible, learning spaces

Background

Massey is New Zealand's largest provider of tertiary level distance education with campuses spread across three North Island locations. The distributed nature of Massey's students and physical infrastructure has provided the impetus behind a rapidly accelerating use of synchronous teaching tools. Until recently, this has mostly taken the form of desktop conferencing applications such as Adobe Connect, Scopia and Skype. Video conference meeting rooms have also been pushed into service as a means of linking simultaneous face-to-face classes on different campuses. Whilst online learning technologies have increasingly blurred the boundaries between modalities, the virtual-physical, distance-internal divides still remain. Video-linked teaching has been envisioned as a means to, as far as is currently possible, remove the barriers of physical teaching space in order to bring together classes of distributed learners.

The VLT project mirrors a sector-wide focus on re-imagining 21st century learning spaces in order to realise "the power of *built pedagogy*" (Oblinger 2006). Traditional teaching facilities continue to be employed across the tertiary sector, many of which encourage transmissional or linear approaches to teaching and learning. It has been suggested that "pedagogical innovation demands a space that enables exploration by both teacher and student" (Neill & Etheridge 2008) and it was with this ethos of innovative teaching and active learning that three hi-tech, flexibly designed VLT spaces were proposed. Envisioned as 'nodes' that would enable distributed learners and teachers to come together in highly interactive, media-rich, real-time collaborative environments, a pilot project was given the go ahead and facilities that support classes of up to 50 students were constructed through the first half of 2012 in Auckland and Palmerston North. Several 'ad hoc' video conferencing rooms have been adapted as linked facilities on the Wellington campus making it possible to link all 3 campuses. 3 classes were taught within the rooms through semester 1 2012.

Spatial design and effect on teaching

VLT spaces have been designed for use with modular, mobile furniture and enable classes to be set up in a wide variety of formats. The amount and flexibility of cameras, displays and inputs, as well as whole-room audio coverage mean that teaching staff have a staggering number of options to consider prior to teaching. This puts a great emphasis not only on technical knowledge of the spaces, but on pedagogical approaches and how these are integrated with the technology to facilitate effective classes. Initial observations indicate that the flexible format of the rooms offers huge scope prior to classes but can be disruptive and disorientating for students if altered mid-class. Prior planning and ‘scripting’, as well as on-demand technical and academic support have proven to help mitigate these issues. Students have also reported that familiarity of room layout plays a major part in their ability to engage successfully in VLT classes; that knowing where information and camera feeds will appear is essential to the navigation of their learning environment and ultimately to their learning experience. Repeated manipulation of a class’s learning environment is not necessarily desirable or effective.

Academic development

Academic support was built in to the project as part of the initial funding application and has proven to be of value through both the design and implementation phases of the pilot. A series of on demand web-based/mobile resources, planning materials and guides have been produced to support academic staff. These resources along with one-to-one consultations, monthly hands-on professional development sessions and heuristic opportunities for academics to review and re-imagine their VLT classes, are enabling teaching staff to more fully exploit the interactive and collaborative potential that the rooms offer (Steel & Andrews 2012).

Teaching consultants worked closely with academic staff to gather lesson plans, layout diagrams and feedback from semester 1 classes. This information informed the design of a series of ‘presets’ that can be used as one-touch starting points for the setup of classes. Room planning documentation, preset guides and ‘visual planners’ have also proved valuable aids in the design of VLT lessons.

Initial observations

The three pilot classes were all team taught, with academic staff facilitating in each location. Students acknowledge the benefit of multiple perspectives and the variety of expertise this has brought to their classes, whilst staff have welcomed the opportunity to ‘team teach’ and co-develop their papers. Students are wary of the potential for ‘remote’ teaching, but enjoyed the increased intimacy that the rooms have brought to their learning experience and have pointed out the contrast to other classes held in more ‘authoritarian’ teaching spaces. Students appreciate the opportunity to develop closer relationships with their teachers, the subject matter and the learning process itself.

Staff and students alike require extended initiation to these new spaces, with students citing familiarity and comfort with the technology as major factors in their ability to successfully learn within the VLT rooms. There appear to be some concerns from staff and students about the potential for sensory overload if too many data sources, cameras and other locations are introduced. Anecdotal evidence suggests that a ‘busy’ environment is more tiring and leads to shorter periods of engagement. The effect of a prolonged and overwhelming sensory barrage on working memory and how this might affect cognitive load is as yet unknown, and this is an area that will require further study if these teaching spaces are to fully benefit, not hinder the learning experience.

What next?

A formal evaluation of the semester 1 classes is in progress. Student focus group interviews, teacher and academic support staff interviews, and a quantitative survey have been conducted. Data analysis is underway and it is expected that a pilot phase evaluation report will be available before the end of the year. Evaluation will be ongoing, with more focused research planned once a broader evaluation has been conducted.

Proposals to extend the pilot and build a third VLT facility on Massey’s Wellington campus are underway. Integration of existing synchronous and asynchronous rich media, collaborative technologies (Adobe Connect, Mediasite) are also being investigated to allow distance students to participate in VLT classes.

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Video-linked teaching: Designing and evaluating technology-rich classrooms for real-time collaboration

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A major 'state-of-the-art' video-linked teaching (VLT) project at Massey University encompasses the development of two purpose-designed rooms to support real-time teaching across two campuses. The intention is for these rooms to be used to establish a strong presence and sense of connection between teachers and students located at each site, offering the ability to teach two (or more) physically distanced classes synchronously with a focus on rich interaction and collaboration. This paper reports on the initial findings of a research project investigating how the VLT rooms have been used during the Semester 1, 2012 experimental pilot phase. It shares some of the experiences of the students and teachers involved and identifies a number of benefits and challenges of using such VLT rooms from pedagogical, physical space and technological perspectives. Finally, the paper reports how the preliminary findings from this research are informing the ongoing use of the facilities as well as the design and implementation of a wider range of teaching and learning spaces.

Keywords: Video linked teaching, video conferencing, synchronous, flexible, learning spaces

Background

Massey University's physical infrastructure is distributed across the North Island of New Zealand with three main locations in Albany (Auckland), Manawatu and Wellington. The distributed nature of Massey's campuses has meant that video conferencing (VC), amongst other methods, has become a key component in communication between departments and colleagues based on different sites. The relative availability of VC facilities for administrative purposes has encouraged staff within several disciplines to experiment with the service for teaching and learning. The College of Sciences, for example, has used VC to link classrooms in New Zealand and Singapore, as well as between campuses, for several years. The College of Business, and College of Humanities and Social Sciences have also used it for small group intercampus teaching, particularly at advanced undergraduate and postgraduate levels. An increased level of interest from all colleges in providing connected classes to larger groups of students across a wider range of courses was the major driver in the development of Massey's video-linked teaching project.

> Our strategy is to facilitate the implementation of [video-linked teaching] to enable collaborative partnerships by removing distance as a consideration from everyday activity (Tate, 2011, p. 4).

Institutional objectives of ongoing sustainability of multi-campus courses and increased intercampus connectivity encouraged the project to really explore "the power of *built pedagogy*" (Oblinger, 2006, p. 1.1) in the design and realisation of these teaching spaces (Hunt, Huijser, & Sankey, 2012; Keppell & Riddle, 2012; Neill & Etheridge, 2008). The project mirrors sector-wide growth in the use of real-time collaborative technologies (Bower, Kennedy, Dalgarno, & Lee, 2011). It has been suggested that "pedagogical innovation demands a space that enables exploration by both teacher and student" (Neill & Etheridge, 2008, p. 47) and this ethos of innovative teaching and active learning has underpinned the entire development process of VLT.

Throughout 2011, rooms were identified on each campus that would be suitable for the intended brief of delivering interactive video-linked classes for up to 50 students. Extended consultation with reference groups consisting of academic end-users, IT technical and support staff, and teaching consultants guided the design of VLT spaces. Three of the most important requirements consistently called for from the academic reference group were: reliability; availability of technical and teaching support; and usability. These became the 'pillars' of the project and to a large extent mediated other factors such as feature set and expense. When it became clear that budget constraints would significantly compromise the design and functionality of a three room build, a decision was made to construct just two spaces on the Albany and Manawatu campuses with an eye to adding a third room in Wellington at a later date. Existing VC infrastructure on the Wellington campus were used as part of the pilot to allow for three-way classes.

The consultation process established technical and pedagogical objectives for VLT classrooms (Tate, 2012). One of the primary technical goals was the creation of as seamless a connection between locations as possible. Clarity of audio and video, large displays to give remote participants more presence and décor intended to give the impression of linked classes being virtual extensions of one another were given high priority (see Figure 1). From a pedagogical perspective, the rooms needed to be flexible enough to accommodate a wide range of active approaches to teaching and learning. Furniture, multiple cameras, a variety of digital input sources and the ability for staff to easily manipulate these components were considered essential for creating an environment suitable for the delivery of rich, interactive classes across a video-link.

Construction began in late 2011 with a budget of almost NZ $1 million and continued following Prince 2 (Projects IN Controlled Environments) process-based project methodology through the experimental pilot phase in Semester 1, 2012.

Figure 1: VLT room, Turitea campus, Manawatu

Experimental pilot phase: Semester 1, 2012

A small group consisting of three undergraduate cohorts of Massey University students along with their lecturers participated in the experimental pilot phase of the VLT project:

- Course A: Taught weekly between the Manawatu VLT room and a standard video conferencing room in Wellington (3 lecturers, approximately 20 students)
- Course B: Taught weekly between the Manawatu and Albany VLT rooms (2 lecturers, approximately 15 students)
- Course C: Taught weekly between the Manawatu and Albany VLT rooms (2 lecturers, approximately 30 students)

Teaching usage for the semester totalled 66 hours across 25 live classes. It should be noted that construction and testing was still happening around scheduled classes, and several components of the final build such as interactive whiteboards, document cameras and room presets were not available. Course A was also constricted by the lack of a VLT facility in Wellington, requiring a simplified connection via a standard VC facility.

The project had technical and teaching support funding built-in and this proved to be invaluable through what had the potential to be a very trying semester of teaching in untested and incomplete facilities. IT technical support was on-hand to assist with set up prior to the start of a class and remained on-site for the duration of classes to ensure a swift response should any technical issues arise. Despite the unfinished nature of the rooms during the pilot semester not one dropout of connection occurred during classes. The conferencing technology that the rooms are based on has continued to be a solid platform and inspires confidence in those that use it.

Academic support has proven to be of value through both the design and implementation phases of the pilot. A teaching consultant assigned to the project has been involved in assisting staff in the design of VLT classes, as well as liaising with technical staff on the implementation of user presets and evaluating the technical build’s application. Presets were based on observations of classes, lecturer feedback and a broader knowledge of the requirements that different teaching styles bring to the layout of a classroom. They enable teachers to tap a single button to call up layouts for specific teaching styles. Presets can be further customised and fine-tuned.

An academic development model proposed by Steel and Andrews (2012) for technology-enriched learning spaces has influenced the ongoing teaching support that is being provided to VLT users. On-demand web-based and mobile resources, planning materials and guides have been produced (see Figure 2). These resources, along with one-to-one consultations, monthly hands-on professional development sessions and heuristic opportunities for academics to review and re-imagine their VLT classes, will enable teaching staff to more fully exploit the interactive and collaborative potential that the rooms offer. Pre-set guides, room planning documentation and ‘visual planners’ have also proved valuable aids in the design of VLT lessons.

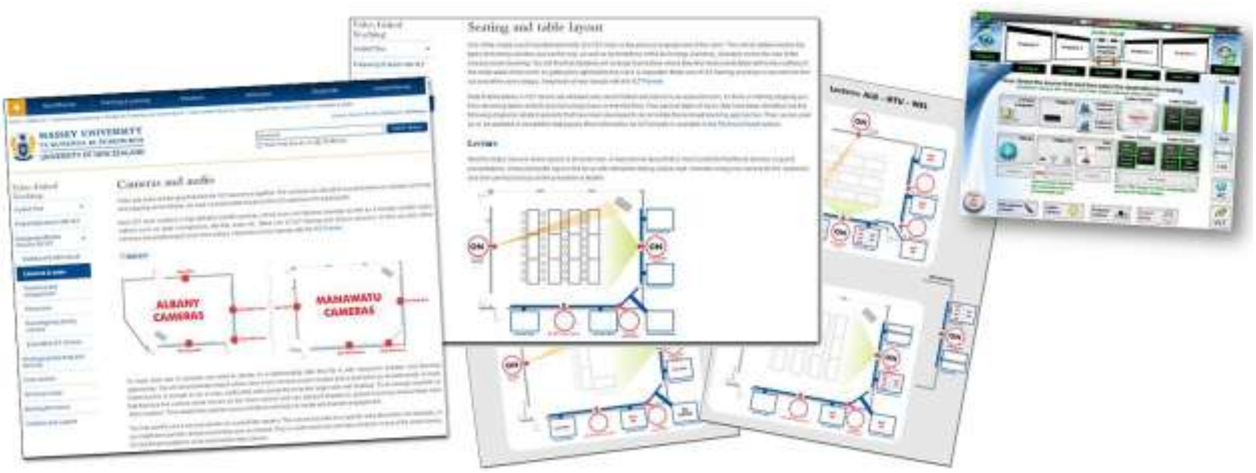

Figure 2: VLT support materials

Initial results

A formal evaluation of the Semester 1 pilot was undertaken, utilising a mixed methods approach. Ethical approval for the evaluation was obtained from the Massey University Human Ethics Committee. Quantitative data from an anonymous student questionnaire were collected alongside in-depth qualitative data gathered through student focus groups and staff interviews, including the lecturers and teaching consultant involved in the experimental pilot phase. Findings presented here draw on student questionnaire data and staff interview data that were collected after the completion of the semester. The questionnaire asked students to rate the importance of multiple factors relating to technical considerations, physical considerations and those related to teaching and learning. While the survey evaluation is based on a relatively small sample of students (n=17) with a response rate close to 30%, the data collected (coupled with insights from staff) provide some useful feedback on the initial implementation and use of VLT at Massey. The results are presented below.

Table 1: Which paper were you studying in semester 1?

Course A	35%
Course B	18%
Course C	47%

Table 1 reports the response rate from each of the three experimental courses. The majority of the respondents (47%) were from Course C, taught between the Manawatu and Albany campuses.

Table 2: How would you rate yourself as a technology user?

Very inexperienced	12%
Inexperienced	0%
Neither experienced nor inexperienced	23%
Experienced	47%
Very experienced	18%

The level of experience as a technology user is reported in Table 2. The majority of students (65%) self-reported that they were experienced or very experienced at using technology.

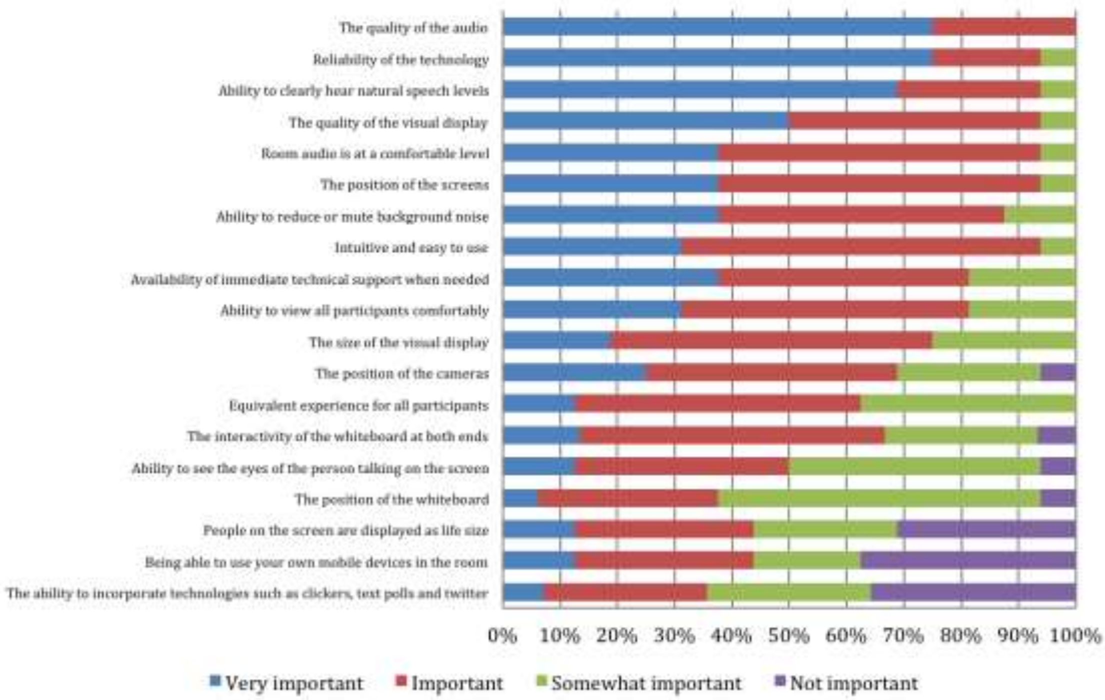

Figure 3: How important do you consider the following technical considerations?

Figure 3 reports a range of technical considerations students perceived as important in the effective use of the rooms. Notably, the most important features were the quality of the audio and reliability of the technology. The importance placed on these technical considerations was echoed in comments made by teaching and support staff as the following comments indicate:

> … you didn't get that delay that you get on the video conference and it's much more real time and you can hear everything well and … I think that worked really well for us. (Course A, Lecturer3)
>
> I mean obviously the goal is to make it as user friendly as possible so that, you know, staff can come in and be able to operate the room without having to have technical support there, but at the moment it's, it's at such a stage, you know, it's at a trial stage and, … it was reassuring just to know that there's that support because you've got students turning up, they're expecting to have a

class and it doesn't look good, it looks pretty unprofessional when there's all of these problems that crop up instead, not that there were any problems particularly. (Course A, Lecturer2)

And make sure you've got the technical sort of support there backing it up to make it successful otherwise there would be lots of wasted time, down time for students, breaks in their learning and you know, I don't think it would work at all. (Teaching Consultant)

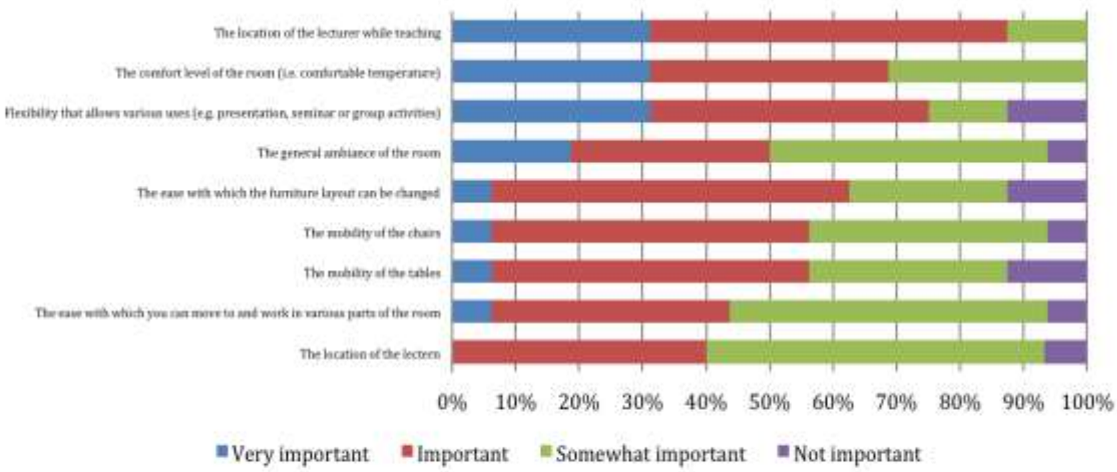

Figure 4: How important do you consider the following physical considerations?

Figure 4 presents the relative perceived importance of different physical considerations. It shows that the locality of the teacher was rated as the most important consideration over and above the comfort level and mobility of the furniture. Staff were also aware of the importance of where they placed themselves when teaching as the following comments demonstrate:

… the teaching spot is quite decentred, it moved elsewhere, and that's what creates a dynamic VLT room … it becomes far more fluid in the VLT space. (Course C, Lecturer1).

You've got to be aware; you have to … you have to keep thinking, oh no I really need to be looking at Albany as well. (Course B, Lecturer)

And where to stand and we'd figured out that we sort of stand on the side and sort of, then we can see both, look at both the screens, it depended on which screen was up too, in the VLT, so if you had to big screen up … on the side wall you tended to look to the side wall because it was a bigger screen, it showed more of the class. But that wasn't where they actually were, you had to turn and face the back wall to speak to the students that were in [the other room]. (Course A, Lecturer2)

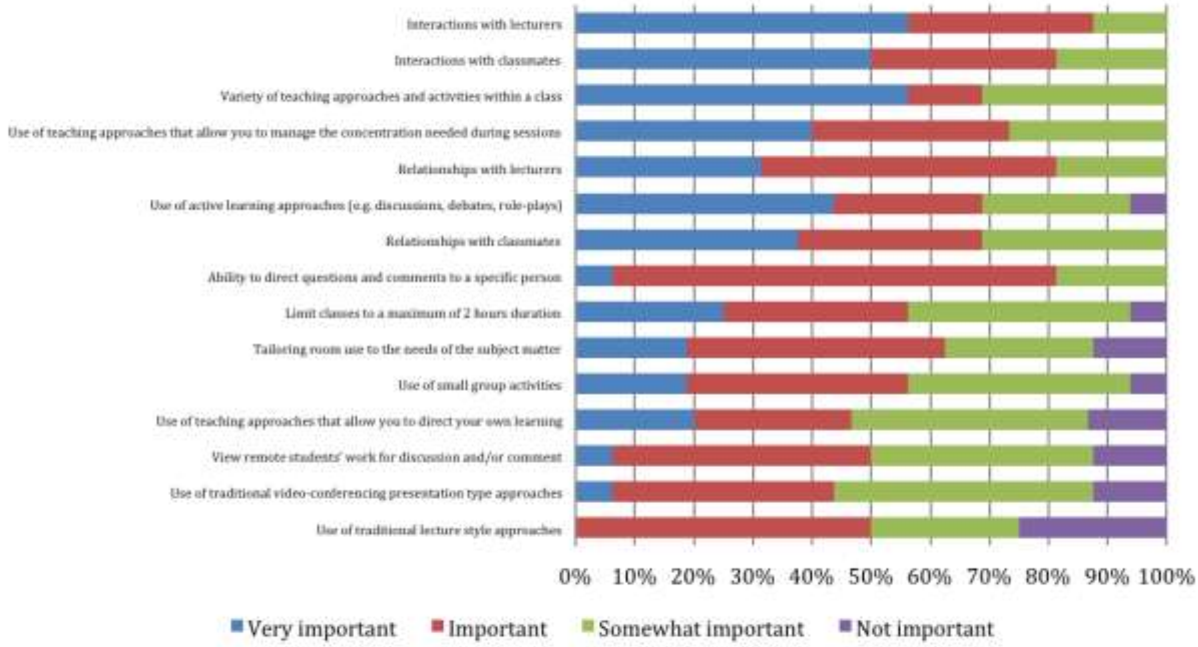

Figure 5: How important do you consider the following teaching and learning considerations?

The relative importance of a number of teaching and learning considerations from students' perspectives are reported in Figure 5. The interactivity of the VLT rooms coupled with the use of a variety of teaching approaches were perceived to be the most important considerations. Staff also spoke of the importance of interaction and teaching approaches that supported this:

> And then the other thing is we were able to use it for group work so one of the speakers we had did the presentation and then in each of the rooms they did group work around what they had done and then the other thing that we have been doing is doing mock presentations because the students have to do their final presentations in a couple of weeks and so they've been able to present to a wider group and that's been good as well. So it's not, it's not a stand and deliver content type lecture. (Course A, Lecturer3)
>
> … it was important to get interaction and discussion going… it was really, really important. (Course B, Lecturer)
>
> [What] Lecturer2 and I realised very early on was that him and me were really important in, in trying to model the interaction in the room … and the more that we could move the kind of locus of activity backwards and forwards between us, the more we could animate the whole room as a single room. (Course C, Lecturer1).

Discussion

It needs to be noted that all three pilot classes were team taught, with academic staff facilitating in each location for the majority of sessions. This approach is not necessarily a model for future use of VLT and some classes may well 'rotate' the physical location of a single teacher through co-taught courses or utilise tutors to facilitate remote locations. Focus group feedback indicates that students are wary of the potential for 'remote' teaching, but enjoy the increased intimacy that the rooms have brought to their learning experience and have pointed out the contrast to other classes held in more 'authoritarian' teaching spaces. Students appreciate the opportunity to develop closer relationships with their teachers, the subject matter and the learning process itself. With these general observations in mind, the following section reflects on the findings in terms of technology, physical space and teaching and learning considerations.

Technology considerations

The overwhelming presence of technology is the first thing that confronts participants in VLT classes. Student survey responses showed a very heavy emphasis on the audio capabilities of the rooms, with four out of the top seven technical considerations being audio-based (quality of audio, ability to hear natural speech levels, room audio at comfortable level, ability to reduce or mute background noise) compared to only two visual concerns (quality of the visual display, position of displays). The importance of high quality audio was also highlighted by staff teaching these courses. These findings were perhaps surprising given the visual nature of the rooms, with each containing five displays and four cameras. One of the major technical goals for the rooms based on user-group consultations was to create as much of a 'physical' presence for virtual/remote participants as possible. This was achieved through creating an 'audience' wall in each room with two large (3m) displays designed to project participants as close to life-size as possible. The student response to this was rather mixed, with over 50% of students responding that displaying life-size participants is only somewhat important or not important. This could signal that the audio qualities of the rooms require more work, but on the basis of these data the visual connection with staff and peers is of much less importance than the ability to hear and speak to them clearly.

Furthermore, students showed a relative lack of interest in using technology such as clickers and mobile devices within VLT classrooms, with over 60% saying this was only somewhat or not important. Along with the emphasis on audio qualities of the rooms, this finding would perhaps suggest that students see these spaces as more suited to conversational and discursive teaching approaches.

Physical considerations

Student responses to the physical aspects of VLT rooms demonstrate the importance they place on their teachers. The overwhelming consideration for students (almost 90% important or very important) was the location of lecturers whilst teaching in the VLT rooms. This point captures the criticality of lecturers staying 'in shot' and in a position where all participants in class feel as though they are being addressed equally. Feedback from staff indicates they, too, were aware of the importance of where they stood and how this could change the learning experience for students, particularly in the other room. Switching position mid-class has proven to fundamentally alter the dynamics of a class, with drops in student engagement in one or several locations noted by teaching staff. It is interesting to note the relative lack of importance ascribed to the visual display mentioned above when compared with this finding, which seems to suggest that certain visual aspects are important (i.e. clear and direct view of the teacher), albeit indirectly.

Flexibility that allows for various teaching activities was also highly rated, but it is notable that students did not really link the mobility of furniture, or indeed themselves, with this statement. Lecturers have reported how the flexible physical nature of the rooms (space, furniture, displays) seems to disappear once a video-link is established and classes begin. Moving students and furniture around rooms during class requires repositioning of cameras, the tweaking of VC data sources (in the case of Course A) and the shifting of content on displays. It is disruptive and potentially counter-productive, increasing the potential for technical problems. Although flexibility of the physical space and furniture was considered a key component in the design and implementation of the rooms, VC technology (on the Wellington campus) has impacted upon this flexibility. Student responses may reflect the way staff have tended to 'set and forget' the physical space to mitigate these issues.

The issue of comfort level can mostly be explained by the lack of air conditioning in the Manawatu VLT room and is something that is currently being addressed. Temperature and lack of airflow was noticeable throughout the semester and significantly impacted student engagement towards the end of classes. Air conditioning is now considered an essential requirement of VLT rooms, which was originally beyond the initial budget.

Teaching and learning considerations

It is perhaps unsurprising that students' most important considerations were about interaction, as this is what the spaces have been designed to facilitate. Interaction with lecturers (almost 90% important or very important) topped the responses to this question, closely followed by interaction with classmates. It clearly demonstrates the need for teaching staff to devote plenty of time to student discussion and questions, and to make the most of the huge potential the rooms offer in this regard. There are important space and timetabling implications in terms of which courses and lecturers are allocated access to the facilities in the future, as the rooms were explicitly designed to avoid the problem of teachers using VC for passive forms of teaching and learning.

Students have also highlighted the importance of a variety of teaching approaches and activities. Consistent with the original goals of the project, they do not want to be talked at: students want interactive, engaging classes. Traditional lecture-style approaches and presentations are of much less importance to participants, and on the basis of these findings they do not rate highly with students. Interviews with staff also support these views highlighting that interaction is very important and that the VLT spaces are not well suited to a stand and deliver lecture-type approach.

Conclusion

In conclusion, the technical and physical flexibility of these spaces offer staff a multitude of parameters that need to be selected prior to teaching. One of the emergent findings is that the technical knowledge required by lecturers to run successful VLT classes is largely overshadowed by the pedagogical skills and lesson planning that staff need to develop. The technical design of the rooms, one-touch user presets and presence of IT technical support has helped to make VLT a relatively user-friendly experience. Initial findings suggest that the onus has now been put on to lecturers to develop suitable teaching methodologies and to employ them effectively in these technology immersive classrooms.

A second emergent point (from the wider study) is that supporting academic staff through this development process will be important to the ongoing success and viability of the technology from a pedagogical perspective. Professional development sessions offering hands-on experience are being offered monthly, and are designed to encourage staff to re-think and adapt their teaching methodologies for truly interactive forms of learning.

Final analysis of qualitative data from the Semester 1 pilot is currently underway, with a full report due before the end of the year. It is anticipated that survey feedback from students will continue to be collected over the coming year in order to form a more complete picture of the student perspective of learning in these spaces and to inform the ongoing technical and teaching development for VLT.

Finally, a positive and consistent theme that runs through the questionnaire data is the value students place on their teachers and their interactions with them. They enjoy being engaged in their learning and having the opportunity to develop closer relationships with academic staff. In this sense, the VLT rooms can be used to ‘flip’ the traditional classroom, although the effectiveness of this depends on a number of factors which include technology, physical space and pedagogical considerations. That said, the VLT project at Massey was designed to bridge the physical space between groups of students across campuses and so far they appear to be successful in breaking down the metaphorical distance between lecturers and students. There is emerging evidence to suggest that when used appropriately, VLT is paving the way for less transmissive teaching approaches and a more interactive and egalitarian classroom.

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Improving learners’ self-efficacy in a learner-controlled online learning environment: a correlational study

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Online learning is gradually being adopted by higher institutes and becoming much more common in higher education worldwide, but some learners still find it challenging. Though they are familiar with computer and technology usage, they are still uncertain of their ability to perform well in online classes. A review of studies focused on how these learners gain more confidence and success shows a link between self-efficacy and learners’ outcomes. Efficacious learners tend to adapt and cope well when faced with obstacles. Moreover, learners who were given control over their learning environment performed better, were more satisfied, and had higher self-efficacy than control groups. It is theorised that embedding learner control into online learning programmes might help inefficacious learners gain more self-efficacy but few studies have investigated this relationship in the real online class setting. Therefore, this study in progress is an attempt to fill in this research gap.

Keywords: Learner control, online learning, self-efficacy, online learner

Research background

Many tertiary institutes now perceive online learning as an educational trend for the future. Online learning is cost effective and can reach more learners. In some sense, it is seen as more creative ways in teaching as well as a sustainable way for learning. Though many studies report success stories of online learning in terms of retention and effectiveness (e.g., Means, Toyama, Murphy, Bakia, & Jones, 2009), findings still show online learners have difficulties in dealing with their learning environment (Cavanaugh, 2005; Cook & Jenkins, 2010; Levy, 2007). Despite using computers and technology in their daily life, they might feel less confident about enrolling in online classes, especially at the tertiary level. They might not have enough of the necessary learning and technology skills for the combination of university and online learning such as skills to compose essays, prepare presentations, analyse data, and do research work (Kennedy, Judd, Churchward, Gray, & Krause, 2008; Mandernach, Donnelli, & Dailey-Hebert, 2006; Ratliff, 2009). Many students still find it hard to adapt and perform well in university online classes because of the demands and stress of the transition from secondary schools to tertiary education. Some students struggle to cope with the complexity of an online environment and often have doubts about their learning performance (Saadé & Kira, 2009). Thus, more technical and psychological support is often needed for online students.

Self-efficacy in online learning environment

In online learning, self-efficacy is considered to be a key psychological contributing factor to students’ success (Pajares, 1996) because it can alter students’ perceptions of their learning environment (Multon, Brown, & Lent, 1991). Consequently, students might perceive their learning environments either positively or negatively. Self-efficacy is not only a good predictor of learners’ academic outcomes but it helps learners well adjust and handle with the unfamiliar learning environment (Alivernini & Lucidi, 2011), even when they have little prior online experience (Swan, 2004).

According to Bandura’s self-efficacy theory, *self-efficacy* is defined as “beliefs in one’s capabilities to organize and execute the courses of action required to produce given attainments” (Bandura, 1997, p. 3). It is a judgment of confidence about the performance of a specific task (Lorsbach & Jinks, 1999). Self-efficacy is not the same as ability or motivation, but they are strongly related (Chowdhury & Shahabuddin, 2007; Vancouver & Kendall, 2006). Indeed, self-efficacy is the personal determination of one's own ability to deal with a certain task. Notably, this determination is not based entirely on actual past experience or existing ability and skills but also on students' perceptions of their own knowledge and ability relative to the task or situation (DeTure, 2004). Self-efficacy is specific to the context of a situation but, once established, is generalized to other situations with the strongest effect taking place in activities that are closest to those in which self-efficacy has been improved. Therefore ensuring that online learners develop self-efficacy within a course means that they should continue to be successful online learners into the future.

Aligned to Bandura's sources of efficacy information (1977), self-efficacy in online contexts is influenced by previous success with online learning systems, online learning technology anxiety, instructor feedback and pre-course training, the factors enactive mastery experience, social persuasion, and affective states (Bates & Khasawheh, 2007). In addition, self-efficacy can be improved by giving learners' control over their learning environment (Lawless & Brown, 1997; Luskin & Hirsen, 2010). Thus, an online course embedded with learner control should help support and enhance learners' efficacy.

The concept of learner control

The concept of *learner control* was firstly introduced by Mager and his colleagues to technology-assisted instruction (1961; 1963; 1962) as a way to improve learning performance. Later on, the concept was applied to distance and online learning by many theorists in this field (Candy, 1991; Dron, 2006; M. Moore, 1997; M. G. Moore, 1973). Learner control can differ depending on the technique used and background theory applied since it is multidimensional (DeRouin, Fritzsche, & Salas, 2005). In general, learner control is the extent to which students can choose what, when, where, and how to learn (Kraiger & Jerden, 2007).

Previous studies have shown that the sense of control students have gained while interacting with instructional media and content can turn into satisfaction, enjoyment, and confidence (Luskin & Hirsen, 2010). Research also found that high levels of learner control can improve students' performance (e.g., Chou & Liu, 2005) because students are engaged in greater levels of interaction. These interactions, especially with their classmates and instructors, can make students feel more efficacious through the activities they and their classmates have accomplished, along with the feedback they receive from peers and instructors and emotional states such as satisfaction and a sense of belonging (Piccoli, Ahmad, & Ives, 2001).

However the effects of learner-controlled online environments on students' self-efficacy are not consistent. On the one hand, findings show no differences in students' self-efficacy between non-interactive multimedia and interactive multimedia classes. For example, Maag (2004) found that students in an interactive multimedia online lesson showed no knowledge and self-efficacy gain compared to the control group but they were more satisfied with the interactive tools.

On the other hand, other research has reported an improvement of students' self-efficacy in learner-controlled online environments. Ebner and Holzinger (2007), for instance, found that games enhanced learning, motivation and self-efficacy with a factor called joy. Likewise, Chang and Ho (2009) found that students with the learner control version had higher test scores and self-efficacy levels than those in the programme-controlled version. In the same way, Jaffe's findings (1997) showed that a greater degree of interaction increased students' self-efficacy. However, these effects were not significantly different. This discrepancy in findings may occur because the online learning environment is complex, and the increase of students' self-efficacy can be caused or influenced by many factors other than levels of learner control. Nevertheless self-efficacy is an important factor that teachers can encourage in sustaining students' participation and effort throughout their study.

This study and its implication

As an attempt to fill this research gap, this study in progress centres the attention on the link between learner control, self-efficacy, and other factors such as previous experience in online learning programme and computer skills. In addition, literature in this area shows a few studies that have investigated experiencing levels of learner control in a real online class setting (Jaffe, 1997). Most learner control research has compared outcomes between learner control embedded in web-based learning and those in traditional learning environments (e.g., Chang & Ho, 2009; Chou & Liu, 2005). Therefore, this study focuses on learners in the formal setting of online learning programmes designed to encourage learner control in higher educational institutions.

Building on previous research this study uses a quantitative approach framed by Bandura's self-efficacy theory (1977). The population frame is online learners in an online programme at a tertiary institution in New Zealand.

The purposive sample group is learners in an online programme where levels of learner control were embedded within the course design which learners are encouraged to do a group project in their own ways or they are allowed to complete different tasks choosing their own order within a flexible time frame. To measure learners' perceived confidence toward their online learning programme, the self-efficacy scales are constructed, piloted and validated. Hypothetically, if the correlation between learner control and learners' self-efficacy does exist, learners who are studying in high learner-controlled online programme should have high self-efficacy toward their learning environment.

The questionnaire was constructed by items generated from the reviewed literature and previous validated tools. After reviewed by scholars and experts in the fields, the initial questionnaire comprised four sections: (1) demographic data, (2) a self-report of learners' computer skills, previous online learning experience, and experience with learner control, (3) an online learning self-efficacy scale (OLSE), and (4) open-ended questions for qualitative data.

Then, a pilot study was conducted to test validity of the research instrument and to establish preliminary findings. Thirty-two students, seven males and 22 females, participated in this online survey. About 75% of participants were 25 to 45 years old. About 80% had some to a lot of online learning experience. Seventy-five percent reported themselves having intermediate computer skills, and the rest were advanced users.

The preliminary findings showed a positive relationship between learner control and online self-efficacy. Pearson's product-moment correlation coefficient was calculated r (32) =0.393 at a significant level of 0.05. This coefficient meant that students' self-efficacy increased along with the level of learner control they had experience. The more in-depth study is planned for a larger and more diverse sample group in term of learner control after the questionnaire was adjusted and validated. Qualitative data, then, is analyses and used to triangulate the quantitative findings.

It is hoped that the results of this study may prove useful for educators and developers in shedding some light on how to make future online students more comfortable and confident in unfamiliar and complex online environments. Novice and inexperienced online students who possess low confidence in their ability might find it easier to interact, collaborate, and thus succeed in online courses when learner control is integrated into the online learning environment from the beginning as part of the course design.

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An exploration in the inclusive teaching practices within a New Zealand university – Part one: Inclusive assessments

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This demonstration is intended to relate some of the initial findings of research into the issues surrounding students with a disability when undertaking assessments.

Keywords: students, assessment, alternative, inclusive, disability, technologies

Introduction

The motivation to engage in this research partially arose due to the experiences of the one the researchers during early 2012 when a student with a disability requested if some of the learning materials could be made available in an alternative format that would be suited to his particular disability. The researcher had not previously thought in terms of how her learning environment catered for students with a disability. Discussion about both researchers practices, and reviews of relevant literature paved the way towards an understanding of the need to think 'inclusive' when designing a teaching programme. To enhance knowledge as to effective inclusive teaching practices, with the object of incorporating these practices in the researcher's university (Massey University or 'MU'), the researchers propose to explore current university policies, teaching practices/attitudes, and the experiences of learners with a disability. This research will begin by looking at assessments then later expand to incorporate other areas of teaching and learning and is a progression from prior research conducted by the researchers (Sayles, F.J. & Te Wiata, I., 2011), as a main focus will be on the use of technology to enhance inclusive learning.

Brief Summary of Literature

The ability to negotiate assessments and learning environments suited to students with a disability may not only be influenced by university policies but also the attitudes of those working within the university system (Bessant, 2012). This can include a reluctance on the part of the learner to request additional assistance, particularly if (s)he perceives it as enhancing difference between the learner and other learners (Seale, 2012). Developing assessment and learning environments that take account of students with a disability *at the start* of the planning stage can assist in overcoming some of these difficulties and may also enhance the learning experience of non-disabled students (Ball 2009). Part of improving this accessibility includes the use of technologies (Ball, 2009) in enhancing the student experience.

A quick overview of the literature on university students and their relationship with technologies shows a mixed picture of success regarding their learning experiences. This is illustrated by many researchers including, Bessant, 2012; Deepwell & Malik, 2008,Garland Thomson, 2012; Goode, 2007, and Kenney, 2012. Despite these mixed experiences, the role of technology in teaching has increased in the design of the learning environment.

Given that the technological abilities of students without disabilities play an increasing role in shaping how universities develop their approaches to teaching and learning support (Seale, 2012), the discourse surrounding students with disabilities also becomes important in understanding how university policies and practices are created. As Seale (2012) highlights, the discourse surrounding the technological abilities of the 'normate' (Garland-Thomson, 2007) student, is largely positive, (focused on what the students can do) whilst for students with disabilities the discourse is negative, focusing more on what they cannot do, and what is required to improve their accessibility to university teaching, learning and assessment practices. It has also been recognised (Ball, 2009) that one of the voices missing in this discourse and in the subsequent development of policies and practices is the voice of the student, as such any further research in this area should seek to provide a vehicle for these voices to be heard.

Methodology

In determining our methodological approach and theoretical framework for this project, we are drawing on the work of Bessant (2012), who, using an auto-ethnographic approach, studied a group of Australian university students with disabilities and their experiences in negotiations for alternative assessment practices. Using case studies and focusing on the perceptions of staff and students, both cultural and practical issues were identified, along with ideas on what needed to be done if a university was serious about addressing equity and inclusive education. The advantages of using the same approach as Bessant (2012) are twofold: the first is that we hope to increase our understanding of how well MU "measures up", and second, we can compare the experiences of various key parties of one NZ university with an Australian counterpart.

An auto-ethnographic approach follows the tradition of ethnographic research. (Denzin, N., & Lincoln, Y. (Eds.), but whereas the researcher is an "outsider", becoming an "insider" only as situation allows, an auto-ethnographic researcher recognises that she or he, is the "insider" (Duncan, 2012) . This then enables her or him, to embrace personal thoughts, feelings and observations as a way of understanding the social context which they are studying (Ellingson &Ellis, 2008). The selected sample of case studies we have chosen for this poster aims to provide insight into the worlds of students with a variety of disabilities using this approach. In following Bessant's framework, we intend to highlight some of the different wisdoms, irrationalities, feelings and biases which inform both judgment and action regarding students with disabilities by also using the personal pronoun model of Elias (1978).

This particular analytic perspective enables us to apply an, 'I', 'we' and 'they' model to our cases. We are however, cognizant that as the experience of students in our study increases and alters over time, the contexts will also inevitably change, thus we will need to be consider how much we are able to apply this model.

We also hope that like Bessant (2012), the use of the personal pronoun perspective with our case studies, will provide insights into what each of the key parties (students, staff and administrators) may be benefit from in working in an inclusive environment. Whether for example, support for staff is required in recognizing and appreciating their legal obligations, or professional development is needed, we hope that the results of this study will offer the university a way forward in improving the opportunities and learning experiences for all of its students.

Conclusion

This research project was initially started due to a personal interest on the part of one of the researchers to develop a more inclusive learning environment for her students. However, initial discussions with some key stakeholders have revealed that the research could have importance for the wider university as it progresses its vision for future, which includes an increasing expansion into attracting overseas students who are used to a different level of inclusive education.

Enabling students with disabilities to better connect with learning through the use of technologies may address some concerns, (it could be argued somewhat simplistically). However, our starting point for understanding what is happening or needs to happen at this university (MU), so as to create an equitable and inclusive environment for students, begins with a study which focuses on the assessment and students with disabilities. We intend to use the perceptions and experiences of students with disabilities, in negotiating alternative assessments (including the use of technologies), as a "vehicle" to inform both our own assessment practices, and the on-going development of university policy and practices. In doing so, we hope to initially help make assessments more student centred and inclusive, than what they are currently.

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Online learning preferences: revealing assumptions and working with difference

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This paper describes a trial of an online survey that was intended to reveal the online learning preferences of students and staff at a Faculty of Education, and our conclusions to date about the usefulness of the tool and the results it revealed. As part of a wider work in progress, the trial arose from our desire to better understand the learning needs of students from diverse cultures and how best to support online and blended students and teachers in increasingly global communities of learning. Our conclusions to date do not enable us to validate the cultural dimensions of learning on which the survey was based, but they do lead us to believe there is value in using the instrument to reveal and explore difference in online learning preferences.

Keywords: Online learning preferences; cultural dimensions

Introduction

Universities are facing a combination of challenges, many of which are likely to grow in the forseeable future. Among these challenges for New Zealand tertiary education, is an increasingly diverse student population, arising from rapidly rising immigration and expanding numbers of international students. Alongside these pressures there is a growing awareness of the needs of indigenous people and a recognition of difference in approaches to learning.

In New Zealand the proportion of Māori and Pasifika people participating in tertiary study is increasing while the numbers of students from other ethnic backgrounds is also growing. Ministry of Education statistics (Wensvoort, 2011) show that a decade ago the number of "European" students in tertiary education was around 70 percent, whereas in 2010 this had dropped to 59 percent, with 18 percent identifying as Māori, 8 percent Pasifika, 18 percent Asian, and 5 percent as from other groups. These figures include a significant number of International students, of whom 72 percent were Asian, together with students from Britain, Europe, Africa, Canada and the USA. Population projects show this trend continuing, particularly in Auckland.
Another major challenge is provided by the growth of online and blended learning which is breaking down barriers to connect communities of learners across social, ethnic and cultural backgrounds. Social software, open educational resources and mobile computing connect individuals with resources and networks which provide opportunities for informal as much as formal learning. An increasing number of online courses is offered at a distance to populations targeted as 'new' markets, with global competition for students. In the New Zealand context, these are mainly from Asian and Middle-Eastern countries.

The study that we report on here arose out of a desire to ensure that courses in the Faculty were designed to meet the needs of this diverse student population, through identifying culturally based factors which might affect student and lecturer engagement in online learning, and developing strategies to mitigate these effects.

Background

A survey of the literature relating to cultural differences and online learning, revealed a growing international concern based on these issues of educational globalisation. Several literature reviews examine culture and ethnicity in online learning environments, for example Rutherford & Kerr, (2008) and McAnany (2009). Some case studies illustrate differences in online learning behaviours that can be linked to cultural differences (e.g. Major, 2005) and provide recommendations for teaching practise. Others attempt to identify conceptual frameworks to account for such differences (Morse, 2003). Much of the literature on culture and learning stems from the model developed by Geert Hofstede (2008) and later colleagues. Hofstede's five-dimensional model was claimed to characterise behaviours (initially in corporate settings) that originate from different societies. The dimensions are: relationship to authority (small vs. large power distance); individualism vs. collectivism; masculinity vs. femininity; tolerance of uncertainty and ambiguity (uncertainty avoidance), and the fifth dimension: long-term versus short-term orientation, was later added as a result of studying Asian societies.

Many later researchers have applied or adapted this model to educational settings, for example to develop guidelines for culturally-inclusive teaching and learning and designing for diversity (McLoughlin, 2007).

The Cultural Dimensions of Learning Framework (CDLF) (Parrish & Linder-VanBerschot, 2010) describes eight key cultural dimensions regarding social relationships, epistemological beliefs, and temporal perceptions. The authors have developed a questionnaire (2009a) and analysis (2009b) based on the CDLF that can illuminate the range of preferences existing among learners.

Some literature focuses on national equity issues related to significant population groups. In New Zealand, for example, a body of research exists that focuses on Māori learning preferences and, to a lesser extent, on Pasifika students. However, as a recent report indicates, the bulk of published research relating to online learning emphasises the differences between 'Asian' and 'Western' learners (Guiney, 2012).

A strong message emerging from this survey of research is that both teachers and students need to be aware of their own cultural values and practices, as well as those of others, when they work together in an educational setting, online or face-to-face.

The current study

To us, the strategy of raising the mutual awareness of participants' learning approaches in online courses offered an appropriate way of meeting our goals within the Faculty. This has particular appeal within teacher education where a major concern is to raise students' awareness of their own role as teachers and develop their capacity for reflective practise (Major, 2005; Alton-Lee, 2003)

The CDLF questionnaire (Parrish & Linder-VanBerschot, 2009a) offered a potential tool for stimulating reflection and discussion in online courses, but there was no evidence of its validity, beyond face validity, or empirical data about its use elsewhere. We have, therefore, established an initial phase of the project to gather data on student and lecturer responses from online teacher education courses, with the intention of carrying out a factor analysis, and comparing responses between students and lecturers, and between students of different ethnicities.

Findings

Quantitative results

In the first semester of 2012 the CDLF questionnaire, with slight modifications to make the terminology relevant to online learning, was administered as an anonymous online survey to participants in 9 courses which make significant use of the Faculty of Education's Moodle online system, following ethics approval from the University of Auckland. Responses have been received from 57 of 122 students (47%) and 2 lecturers. The questionnaire will be administered to a further group in the second semester. The respondents were overwhelmingly female (97%) and covered a wide range of ages from 20 to over 50 years old, reflecting the programmes in which they were enrolled, which included pre-service (B.Ed. and graduate diplomas) and postgraduate, in-service qualifications. In light of our interest in cultural difference it is significant that most respondents (47 or 80%) identified themselves as European or Pakeha (a Maori word describing Europeans). Other respondents identified themselves mixed Maori and European (4), Samoan (3) including one part Chinese, Filipino (2), Indian, Latin American and Middle-Eastern.

The number of responses received so far do not provide enough data to carry out a valid factor analysis, but does give initial indication of some trends in student responses. In addition to completing the 36 items of the questionnaire, participants were given the opportunity to make open-ended comments about the survey and these provide some useful insights into student perceptions of online learning.

The questionnaire data has been initially analysed according to the eight dimensions with which Parrish and Linder-VanBerschott identified the items. Responses for most items show high variability and this is not necessarily a problem where the purpose of the instrument is to stimulate reflection and discussion. There are some identified dimensions within which the correlation between items is moderate to high, but there are also many correlations which are low and occasionally negative. A full analysis with more data will be required to establish how strongly the items are related to the dimensions identified.

It is interesting to note, however, the dimensions where there appears to be a high degree of agreement amongst the respondents to date. A score for each respondent was calculated for each of the proposed dimensions representing the mean ranking of the items associated with that dimension. Items had been ranked between the two poles of the dimension on a scale of 1 to 10. The means of these scores were computed for all respondents and a score between 1 and 3.5, or between 7.5 and 10 were taken as implying strong preferences for the polar positions.

These mean scores indicated that there was a strong preference, on average, for an equality-oriented approach to learning rather than an authority-oriented approach (m=3.06, s.d.=1.19), nurturing compared with challenging (m=2.74, s.d.=1.06), and for uncertainty-accepting compared with stability-seeking(m=7.32, s.d.=1.24). Despite the apparent high degree of agreement between respondents, there were some individuals whose choices were very different; this supports the belief that the questionnaire might enable individual students to develop awareness of how their approaches to learning differ from the approaches of others, and to alert lecturers to these individual differences.

Qualitative results

Included in the amendments we made to the CDLF questionnaire was the addition of a final open question inviting comments on the survey. We felt that our audience, in a Faculty of Education, would be sufficiently aware of educational research to be likely to give valuable feedback on the instrument. In fact, whilst a small minority made some superficial comments on the questionnaire, more interesting were the comments reflecting on online learning.

Less than half of respondents made open comments. However within these there seemed a possible bias towards the ‘authoritarian’ end of the scale, with an apparent student preconception that the responsibility for creating the learning experience rests with the lecturer. One learner expressed a wish for lecturers to close discussions after they (the lecturer) had posted ‘closing’ comments, as this student didn’t want to have to ‘waste time’ going back to view the comments of her peers after that. Another stated that the best lecturers had given her ‘the necessary push’ when needed, and wanted recordings, to listen to lecturers ‘lecturing’ more often. Teacher-led discussions seemed to be in demand by a few respondents, which felt at odds with the espoused socio-cultural approaches of most lecturing staff in the Faculty. Whether these comments reveal a mismatch between online teaching styles and online learning preferences would require more data from lecturers, as well as discussion with the students concerned. Furthermore there seemed little correlation between the individuals’ comments and where they placed themselves on the scales for relevant dimensions. The two respondents who made the comments above, for example, placed themselves clearly in the quality-oriented approach to learning over an authority-oriented approach. One response appeared to arise from an individualistic preference:

> The online forum is very powerful. It gives me ownership over who I choose to 'listen to' and engage with. I used to find it a frustrating waste if my time when lecturers had to repeat themselves for students who did not understand concepts. The online forum is much more efficient for learning in my opinion.

Yet this student placed herself at the collectivist end of the scale. Another respondent mentioned that as a student-practitioner, their answers were given partly as a student and partly as a teacher. We would like to interview students, and to examine whether there is cognitive dissonance in these roles in online learning preferences.

Conclusion

Soon after embarking on our project we became aware of related research. The HEART (Hearing And Realising Teaching voice) tools support teachers and learning designers involved in planning, developing or reviewing course (or learning) designs (Donald et al, 2009). The tools are intended to help make explicit teaching beliefs and educational practice in learning designs. At an early stage the HEART researchers also explored the CDLF questionnaire for their purposes, but have since based their work on Bain and McNaught’s 13 belief/practice dimensions (Bain & McNaught, 2006).

We, however, are primarily interested in revealing learner preferences, and as a result of the additional open ended comments in our survey, we feel more confident that the value of the CDLF is in the wider discussions that it could stimulate, about the nature of good online learning experiences and individual preconceptions of learning**.** Strategies which encourage students to examine their epistemic beliefs and approaches to learning appear to be important, particularly when they are, themselves, teachers.

By the time of the conference we will have more data, and aim to interview students about their responses, after asking them to place themselves on the scale for each question. The next stage of the project will be to explore how this approach can be incorporated into regular teaching of online courses, and whether this is beneficial for student learning.

We understand from the authors of the CDLF questionnaire that data is being gathered from other trials of the instrument with a view to refining the dimensions. Although our questionnaire was modified for online courses, we have agreed to contribute our data to a growing global collection to enable future analysis of a critical mass of findings.

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Mobile learning, exploring the possibilities for rangatahi

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This paper presents the findings of a small exploratory study that evaluated the effectiveness of mobile learning to supplement the face-to-face teaching and learning of a whakairo (Māori carving) three-day course for secondary school age Māori. The study found that in relation to participant learning, the use of mlearning to supplement the learning experience appeared to improve the knowledge transfer or ability to recall key elements relevant to the course for the experimental group. This study forms the basis for further research in the area of mlearning for secondary school age students within tikanga Māori learning environments. It is anticipated that the research will contribute to a tikanga-based framework, shaping the future of learning in Aotearoa.

Keywords: Māori, mobile learning, teaching and learning, secondary schools.

Mobile learning

The uptake of mobile devices, such as mobile phones and MP3 players has, over recent years, overtaken the proliferation of personal computers in both modern professional and social contexts (Herrington, 2009). With the ubiquitous uptake of mobile devices coupled with their ever-broadening technological advances and applications, mobile technologies have set alight the imagination for use within education.

> Mobiles embody the convergence of several technologies that lend themselves to educational use, including electronic book readers, annotation tools, applications for creation and composition, and social networking tools. GPS and compasses allow sophisticated location and positioning… …digital capture and editing bring rich tools for video, audio and imaging – more and more, mobiles encompass it all, and innovation in mobile device development continues at an unprecedented rate. (Johnson, 2011).

Johnson succinctly captures and highlights the current state of mobile technology in its broadest applications. While advances in technology continue to broaden the use of mobile devices for educational purposes, the field of mobile learning is still evolving (Traxler, 2007). It was within this broader context of mobile learning (mlearning) that a small exploratory study was conducted to evaluate the effectiveness of mlearning to supplement the face-to-face teaching and learning of a whakairo short course.

The rationale for evaluating the effectiveness of mlearning

The rationale to explore the use of mobile technologies for teaching and learning within the organization that the study occurred, was to contribute to an informed position on the use and application of mobile technologies for educational purposes.

A whakairo (Māori carving) short course (three days) was identified for the study as the course was already being delivered, it had been developed so successful completion would attain unit standards, and the visual dimensions inherent within the practice of whakairo readily lends itself to the media rich presentation capabilities of mobile devices (accordingly, the iPod touch was selected, in part, for its media capabilities). The purpose of the course was for students to be able to describe aspects of their lineage, heritage and cultural identity. A whakairo instructor delivered the course and the learning was then conveyed and captured through workbook completion and the medium of student designed whakairo pattern.

The exploratory study

The course was delivered one day a week over three weeks. The first aspects covered by the course include whakapapa (genealogy) and its importance to Te Ao Māori (Maori world view), whakawhanuangatanga (process of establishing relationships) and mihimihi (speech of greeting). The course then covers the key whakairo concept of whakarei (surface patterns) and provides visual examples in the learning journal of the many different styles used, their basic meaning and tribal origin. The course provides the opportunity for students to practice drawing each type of whakarei (surface patterns) before they are required to design their own pattern that captures and symbolically depicts their individual cultural identity. At about the halfway point of the course, the steps involved in carving-out whakarei are presented so students can carve-out their design. This course was delivered to two cohorts at two separate locations. There were 11 participants in Cohort A (control group) and 19 in Cohort B (experimental group). All participants self identified as being Māori. In addition to the face-to-face classroom instruction of the course, Cohort B received a mobile device to supplement the learning experience. The experimental materials for each condition are described below.

For the Cohort A classroom instruction condition the Whakairo Short Introductory Course was delivered (face-to-face) within the school marae on the first day, a school classroom on the second day and a technical facility for the final carving day. The technical facility was equipped with workbenches and vices for the purpose of whakairo. Haehae (chisels) and pao (mallets) were provided and the whakairo learning journal was provided to students for completion.

For the Cohort B classroom instruction condition, the STAR Whakairo Short Introductory Course was delivered (face-to-face) within a whakairo room. The technical facility was equipped with workbenches and vices for the purpose of whakairo. Chisels and mallets were provided and Whakairo learning journal were given to students to complete. In addition, students in Cohort B were loaned an iPod for the final week of the course. On the iPod was loaded several videos, including the CEO welcoming students through mihimihi (welcome, included lineage) and overviews of the concepts of kaupapa and whakapapa, presented by members of the Cultural Office. Video recorded sessions of the different whakarei (surface patterns) being carved into particleboard, including the name of each pattern and the carving stages were also displayed on the iPod video (refer Figure 1).

Figure 1: iPod video of whakairo pattern being carved into particleboard (example only)

For each cohort, pre-course questionnaires were administered to form a baseline of student's existing experience and understanding of whakapapa, mihimihi, whakarei, kowhaiwhai, pao and haehae. A post-course questionnaire was also administered to cohorts to gain their reactions through self-ratings. The questionnaire also provided space in which students could comment on aspects they liked least, and liked most about the course. As per the pre-course questionnaire, the post-course questionnaire again prompted students understanding of the courses key concepts (whakapapa, mihimihi, whakarei, kowhaiwhai, pao and haehae).

The study findings

The study found that overall satisfaction of the course was high, with slightly higher levels of satisfaction reported by Cohort A (control group), than Cohort B (experimental group). Of interest to the study objective, Cohort B indicated that they enjoyed getting an iPod touch to use but equally did not enjoy giving the iPod back. In relation to understanding the course key concepts, each cohort improved after completing the course. However, results indicated that Cohort B displayed an improvement in knowledge or ability to recall the meaning of the above elements than the Cohort A participants. In summary, the use of mlearning to supplement the learning experience may improve the knowledge transfer or ability to recall key elements relevant to the course.

Moving the exploratory study forward

After completing the study, questions arose about how mlearning might best be applied for Māori students. These questions were influenced by the observation that the study simply loading edited video information to a mobile device for students to view presented limitations. Alternative approaches for using mobile devices could yield substantially greater gains for participants through podcast productions and authentic e-learning.

Podcasting

Progressing from mere information consumption is the use of mobile devices for capturing and compiling information that can be delivered or presented to others through, for example, podcasts. The term podcast refers to the development and subsequent distribution of digital audio / video files manually from the Internet or automatically through subscriptions (Buffington, 2010; M. Lee & Chan, 2007; McGarr, 2009; Shumack & Gilcrest, 2009). At the risk of not fully exploiting the possibilities offered by mobile technology as highlighted by Herrington (2009), podcasting as a means of content delivery also offers relatively low barriers of access to produce knowledge and learning resources (M. Lee & Chan, 2007). These resources can augment the learning experiences of students by preparing them for an upcoming learning topic or session, or potentially be submitted for (formal) assessment. This is highlighted by the audio or video recording functions of mobile devices, the ease of access and increasingly intuitive nature of editing software, and the availability of subject matter expertise, providing the foundation for near instant development and distribution. Listening or viewing these files can be done directly from the PC desktop or via a mobile device such as an MP3 player (Buffington, 2010; M. Lee & Chan, 2007; McGarr, 2009; Shumack & Gilcrest, 2009).

Three broad categories presented by McGarr (2009) relating to the purpose of using podcasting, these are: substitutional, supplementary and creative use. At the basic level, podcasting substitutes the traditional lecture and are best suited to revision and review of passive information. The use of podcasts to provide supplementary material is of significantly more educational value, especially if the material is in addition to that provided from the lecture. Creative use refers to the construction of knowledge by students through a deep understanding of the subject matter to construct a podcast. McGarr explains that this type of use of podcasting occurs least in the literature. Similarly, Lee, McLoughlin & Chan (2008) hold strongly to the belief that knowledge creation and its ability to disseminate learner-generated content is the true potential of podcast technology.

Authentic e-learning

The concept of authentic e-learning, as described by Herrington, Reeves & Oliver (2010) occurs when learners are engaged in “an inventive and realistic task that provides for complex collaborative activities” (p.1.). Herrington et al., (2010) identify nine key elements of authentic e-learning which form a framework for the design and production of authentic e-learning courses, these elements relate to; an authentic context, authentic tasks, access to expert performances and modeling of processes, multiple roles and perspectives, collaborative construction of knowledge, reflection, articulation, coaching and scaffolding, and authentic assessment.

Herrington et al., (2010) explain that the purpose of authentic learning is to ensure that the knowledge obtained from the learning experience will be more likely to be used for problem solving situations. This claim is contrasted against the concept of inert knowledge, whereby principles, facts and concepts are taught in abstract and decontextualised form. The problem with the latter approach means that the knowledge cannot be readily retrieved and applied to a given situation, as information has been stored as facts and not as tools. As an example, viewing information simply provides a ‘window’, whereas authentic learning provides students with a ‘door’ through which they can engage with the information on a practical level.

Relevance to Aotearoa New Zealand

The convergence of several complimentary factors within the Aotearoa context also necessitated further review of mlearning, including the increasing uptake of smartphones, schools (soon to be) connecting to ultra fast broadband, a growing emphasis on NCEA attainment for target groups, and the need for increased ICT skills for students to be successful 21st century citizens.

Seemingly, most young people have at least a mobile phone in their possession and, if their mobile phone does not offer the capability, they may have a digital music player as well. Price, both in terms of the devices and the related network charges (for mobile phones), were significant barriers to access. However, advances in technology have made these devices widely and progressively more available (Hung & Zhang, 2012). As such, the use of mobile phones and increasingly smartphones are an ubiquitous feature of today’s society.

In a recent press release (National Government, 2012), the Minister of Social Development, the Honorable Paula Bennett, signaled that the Ministry has placed a priority on supporting young people (16 to 17) who have been disengaged from education and re-engaging them under its Youth Services initiative. This initiative stems from the looming issues currently prevalent among young people, a problem faced disproportionately by Māori (and Pasifika) (Ministry of Education, 2011a). Although overall improvements in performance have lifted in the education system over the last ten years, the Ministry of Education acknowledges that although the education system works for some learners it is not suitable for others (Ministry of Education, 2011a).

The Ministry of Education, in its statement of intent 2011/ - 2015/16 (Ministry of Education, 2011b), places greater emphasis on using technology in learning and improving outcomes for Māori students. Accordingly, the Ministry expects the following; use of modern technologies that supports and increases student achievement as well as effective and efficient teaching and learning; more Māori gaining NCEA level 2 qualifications and above; culturally responsive teaching that is high quality and effective; relevant skill and qualification attainment; and approaches that ensure Māori are achieving education success as Māori. Each of the above contributes to the Ministry's vision to be a "world-leading education system that equips all New Zealanders with the knowledge, skills and values to be successful citizens in the 21st-century" (Ministry of Education, 2011b).

A research proposal

It is from the potential of integrating these broad and loosely defined areas that research is being proposed to further explore mlearning for Māori. More precisely, it will seek to find an effective way to use mobile technology to engage young people in formal learning to produce positive learning experiences. Positive experiences could include something as simple as having fun or learning something new from the internet, through to something more complex like the construction of a video presentation as a piece of assessment towards specified learning criteria. As mlearning is relatively new, there does not appear to be any research relating to tikanga Māori based mlearning activities and accordingly there is no literature available on effective practices or experiences associated with such activity. While these practices undoubtedly are occurring, they do not appear to be published within the research literature. It is anticipated that the proposed research will contribute to a tikanga-based mobile learning framework to shape the future of learning in Aotearoa.

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A 2010 Snapshot of Educational Technology use by CSU students

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Ensuring an excellent learning experience is critical for the modern Australasian university. This is particularly important for an institution like CSU, which has the majority of its students studying at a distance. This paper presents a snapshot of student usage and attitudes towards technologies for learning and teaching, drawing on an institution wide online questionnaire in 2010 completed by 3952 students. One of the most interesting findings from this study is that students' use of educational technologies may be driven primarily by the need for their studies to be flexible and manageable around work and family demands. Students appear to be 'digital followers' rather than early adopters but are nevertheless very regular users of technologies in their own lives, and appear very receptive to the frequent use of technologies in their studies.

Keywords: Technology adoption, eLearning, Educational Technology use, students, Charles Sturt University

Introduction

Charles Sturt University has a very large and diverse cohort of students studying both undergraduate and postgraduate degrees, with many studying by distance or online. CSU has been one of the largest providers of distance education in Australia and consequently has maintained a keen interest in the use of educational technology to enhance delivery of this mode. As a university that engaged early with the development of learning management systems and other technologies that support the online delivery of higher education courses, CSU are in a good position to reflect upon the use and developments of our educational technology over time. With this in mind, it is important to ensure we build and promote sustainable systems of educational technologies that address the needs and uses of all stakeholders. Consequently, this study was initiated to explore the nature of students' use, preferences and familiarity with the use of educational technology while studying at CSU, either via distance or as an internal student.

Background

In the early part of this decade, much of the academic debate about attitudes towards and use of technology by university students was framed by Prensky's (2001) conjecture that today's students are 'Digital Natives', while their teachers are 'Digital Immigrants', and similar conceptualisations of students as being part of a 'Net Generation' who had grown up surrounded by technology use and therefore had much greater expectations of a technology enriched learning experience than previous generations (Oblinger and Oblinger, 2005). This led to a number of large empirical studies which tended to find, firstly, that age differences were not the primary factor distinguishing between student attitudes towards and use of technologies in their private lives and studies, and secondly that many students fitting the age criteria for being a 'Digital Native' or part of the 'Net Generation' were not in fact frequent or highly competent users of a wide range of technologies, and were not calling for a technology driven transformation of their university learning experiences. For example, in the largest Australian study in this area, Kennedy, Krause, Gray, Judd, Bennett, Maton, Dalgarno, and Bishop (2006) surveyed 2588 students at three universities in 2006, and found substantial diversity in technology usage and found that this diversity was largely not attributable to student age (see Kennedy, Judd, Dalgarno, & Waycott, 2010). Studies overseas undertaken during the same time period found similar results and in general tended to present a more complex picture than that proposed by commentators such as Prensky (see, for example, Salaway et al., 2007 in the US, and Jones, Ramanau, Cross & Healing, 2010 in the UK).

Alongside this empirical work, a number of scholars have also criticised Prensky's methods (see, for example, Sheely, 2008) while others, such as Bennett, Maton and Kervin (2008) have commented on the fervour with which his ideas were taken up, suggested that educators need to take a more measured stance and called for "considered and rigorous investigation that includes the perspectives of young people and their teachers, and genuinely seeks to understand the situation before proclaiming the need for widespread change" (p. 784). Senn (2008) also noted that early ICT implementation neglected consideration of student preferences and that staff willingness and/or institutional capacity to provide the level of online interaction promoted by some educators and theorists were often limited.

Communication and interaction between students and students, and students and their lecturers remain key elements of learning in higher education and many educational technologies have had a significant impact on the ways in which this communication is facilitated. The universal use of the internet in higher education has brought with it new social norms in terms of social interactions (Dykman & Davis, 2007), however, less universal has been the development of educators' communication skills to incorporate these changes into their teaching (Moller, Foshay & Huett, 2008). For an institution to begin to appropriately address these issues they must first understand how their students and staff are using ICT and what tools they prefer.

Recent studies have begun to present a picture of noticeably greater usage of technology by university students. For example the latest in a series of annual studies of undergraduate students' use of technology undertaken by the EDUCAUSE Centre for Applied Research in the US, which involved a sample of 3,000 students in 1,179 colleges and universities, found: very high levels of ownership of technologies such as laptops (87%), iPods (62%) and smartphones (55%); very high proportions of students using Facebook (90%), reading Wikis (85%) and blogs (72%) and sizable minorities also using other tools such as Twitter (37%) and contributing to blogs (43%); and very high proportions of students agreeing with a series of statements about the benefits of technology for learning (Dahlstrom, de Boor, Grunwald & Vockley, 2011).

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 2008, 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. As well as the questionnaire completed by students, which is discussed in this paper, a similar questionnaire was designed and administered to CSU staff.

Administration and Sample Demographics

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 had just under 500 members). Ethics approval for this survey was obtained from the CSU Learning & Teaching Services Ethics Committee.

The survey was conducted anonymously and it was made clear that even though Survey Monkey used the IP address of the computer to enable students 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.

Students 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 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 3952 students, including 1314 males, 2625 females, and 13 not stating their gender. There were 753 respondents from the Faculty of Arts, 882 from Business, 1000 from Education and 1221 from Science, with 96 not responding to the question. 1278 respondents indicated that they were aged 40 or over, 1419 were 26-39, 1250 were 18-25 and 5 indicated that they were less than 18. Of the respondents, 403 were international students and 3453 were domestic students. In terms of study mode, 2673 were distance students, 814 on-campus and 369 were mixed mode. 998 respondents identified as Undergraduate (Year 1), 541 as Undergraduate (Year 2), 838 as Undergraduate (Year 3 or more), 1081 as Post-graduate (Course work), 202 as Post-graduate research or higher degrees and 196 as other.

Findings

Attitude towards technology

Students were asked to choose which of a series of descriptors relating to their attitudes towards new technologies best described themselves. The descriptors ranged from "I love new technologies and am among the first to experiment and use them" to "I am sceptical of new technologies and use them only when I have to". The results (see Figure 1) show a reasonably even distribution of responses. At one end of the scale, 8.7% of students indicated that they loved technologies and were among the first to use them, and 23.5% of students indicated that they liked technologies and used them before most people they knew. At the other end of the scale 3.8% of students indicated that they were sceptical of new technologies and 8.9% indicated that they were one of the last to use new technologies. The largest group of respondents (31.6%) were in the middle, indicating that they use technologies when other people start to use them.

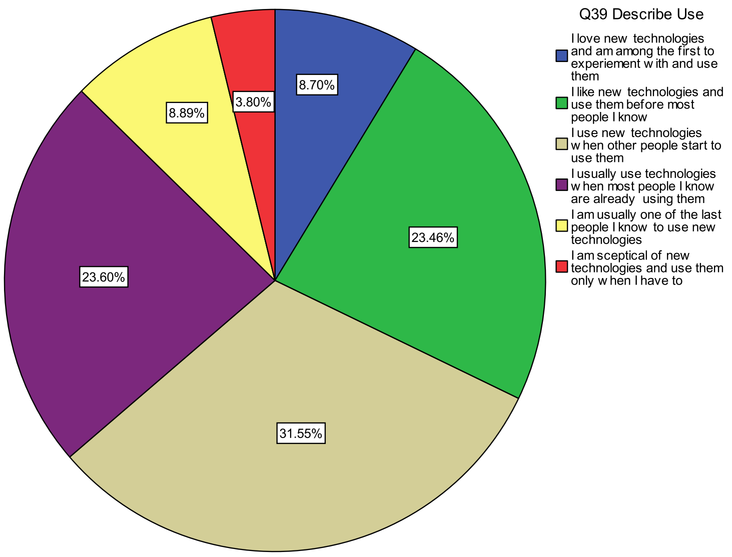

Figure 1: Attitudes towards new technologies

Usage of technology in general

Students were provided with a list of 60 technologies, tools and online information sources and asked to indicate in each case whether they had never heard of the technology, 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 a selection of 16 of these 60 technologies. Tools used regularly by the majority of students included email (94%), spreadsheets (58%) and CSU Interact, the university's Sakai based Learning Management System (79%). Tools used either regularly or occasionally by the majority of students included presentation software (49% regularly and 36% occasionally), social networking (46% regularly and 27% occasionally), electronic library resources (46% regularly and 31% occasionally), and discussion forums (36% regularly and 36% occasionally). At the other end of the spectrum, the majority of students had either not heard of or were unsure what the following technologies actually were: ePortfolios (41% not heard of, 26% unsure of), web conferencing (34% not heard of, 23% unsure of), and electronic simulations and virtual worlds (34% not heard of, 20% unsure of). Technologies for which there was divergent levels of awareness and use, included Google Scholar (18% never heard of, 21% using regularly) and wikis (12% never heard of, 16% using regularly).

Table 1: Technology Use and Awareness

	Never heard of it (1)	I've heard the name but not really sure what it is (2)	I know what it is but have never used it regularly (3)	I use this occasionally (4)	I use this regularly (5)	*Mean*
Social Networking	.5%	2.7%	23.1%	27.3%	46.4%	4.16
Google Scholar	18.1%	13.3%	19.4%	28.0%	21.2%	3.21
Electronic Library Resources (e-journals/electronic databases)	2.1%	4.9%	16.9%	30.5%	45.6%	4.12
ePortfolios	41.2%	25.6%	21.9%	8.3%	3.0%	2.06
Webconferencing (e.g. Elluminate, Wimba, Dim Dim)	33.7%	23.4%	31.6%	8.2%	3.2%	2.24
CSU Interact	1.6%	2.4%	4.8%	11.8%	79.4%	4.65
Email	.2%	.1%	1.6%	3.7%	94.4%	4.92
Discussions Forums	.9%	3.0%	23.4%	36.6%	36.1%	4.04
Wikis	12.2%	11.7%	30.5%	29.9%	15.6%	3.25
Electronic Simulations and Virtual Worlds (e.g. Second Life)	33.8%	20.3%	40.2%	4.0%	1.8%	2.20
Social Bookmarking (e.g. Delicious, StumbleUpon)	50.6%	16.7%	24.7%	5.5%	2.6%	1.93
Microblogging Services (e.g. Twitter, Tumblr, Yammer)	10.2%	20.0%	57.3%	8.3%	4.1%	2.76
eBooks	4.2%	10.3%	44.5%	27.4%	13.6%	3.36
Podcasts	4.8%	13.5%	42.5%	28.3%	10.8%	3.27
Spreadsheets (e.g. MS-Excel)	.4%	1.5%	10.6%	29.2%	58.4%	4.44
Presentation software (e.g. PowerPoint, Keynote)	.5%	1.8%	12.7%	36.2%	48.8%	4.31

Attitude towards educational technologies

In order to gauge students attitudes towards the use of technology for learning, students were asked to nominate the “single most important benefit for me of using educational technology in my subjects”, choosing from six options. As shown in Table 2, the most frequently chosen benefit was “access (would have been unable to attend some or all of the required on-campus classes e.g. due to distance, family commitment)” (38%), while 27% chose the somewhat related reason “personal management (able to study at times and in places convenient for me”. Only 24% chose “improving my learning”, while only 8% chose “communication with teachers and classmates”. These results would suggest that access to information in a convenient way is still the most important application of technology. The low proportion of students (1%) indicating that they could see no benefits in the use of technology is encouraging.

Table 2: Most important benefit of using educational technology

The single most important benefit for me of using educational technology in my subject	
Improving my learning (1)	24.4%
Access (2)	37.7%
Personal management (3)	27.2%
Communication with teachers and classmates (4)	7.8%
No benefits (5)	1.3%
Other (6)	1.6%
Mean	2.29

Use of the Learning Management System

Students were asked to respond to three statements about their overall experience of the university Learning Management System (LMS), which goes by the tag "CSU Interact", rating the statements on a scale from "very strongly agree" to "very strongly disagree" and including an option for "not applicable". The first statement was "My overall experience of the functionality of CSU Interact has been positive" with 81% of students agreeing and 10% of students disagreeing. The second statement was "My overall experience of the availability of CSU Interact has been positive" with 80% of students agreeing and 11% of students disagreeing. The final statement was "My overall experience of the use of CSU Interact has been positive" with 81% of students agreeing and 9% of students disagreeing. Table 3 shows all responses to the three statements.

Table 3: Overall experience of using CSU Interact

	Very strongly agree (1)	Strongly agree (2)	Agree (3)	Uncertain (4)	Disagree (5)	Strongly disagree (6)	Very strongly disagree (7)	Not applicable (8)	*Mean*
My overall experience of the functionality of CSU Interact has been positive	14.1%	26.7%	40.1%	7.7%	6.4%	1.6%	2.1%	1.2%	2.85
My overall experience of the availability of CSU Interact has been positive	14.6%	26.9%	38.7%	8.0%	6.9%	1.9%	1.8%	1.3%	2.85
My overall experience of the use of CSU Interact has been positive	14.2%	27.1%	39.7%	8.5%	5.8%	1.6%	1.8%	1.3%	2.83

Current and desired usage of selected technologies in learning

Students were asked to indicate the frequency with which their lecturers use each of 34 technologies in their subjects and the frequency with which they "would like" their lecturers to use each of these technologies, on a scale where 1 = "more than once per week" and 5 = "never". These results were then collapsed to a 3 point scale, from "weekly or more" to "never". Table 4 shows the percentage of responses in each category for 10 of these technologies. By far the most frequently used technologies were the discussion forum and the online announcements tool in the LMS. Such tools have been in use at CSU for a number of years and have been very widely used in both on campus and distance mode teaching. Other tools being used at least sometimes in some subjects taken by the majority of respondents but generally less than weekly, included the chat room, online assignment marking, and online quizzes. It is interesting to note that a sizable minority of students have experienced the use of wikis, blogs and lecture recordings in their studies.

By comparison, students' desired frequency of use of technology in their studies is noticeably higher than the actual frequency. Technologies with particularly high desired use but only moderate actual use include lecture recording (58% desiring weekly use, while only 18% reporting actual weekly use), the chat room (52% desiring weekly use, while only 27% reporting actual weekly use) and online quizzes (40% requesting weekly use, while only 14% reporting actual weekly use). Other technologies for which a large proportion of students desire at least occasional use include the provision of subject information on handheld devices (50% desiring use, while 15% reporting actual use), online assignment marking (94% desiring use, while 61% reporting actual use), and Blogs (64% desiring use, while 32% reporting actual use).

Table 4: Frequency of use and desired use for selected educational technologies by lecturers

	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	54.5%	40.9%	4.7%	74.3%	24.3%	1.4%
Lecture recordings	18.1%	25.5%	56.5%	58.4%	27.7%	13.9%
Discussion forums	63.6%	26.8%	9.6%	72.2%	21.7%	6.0%
Chat room	27.0%	30.2%	42.8%	52.3%	28.1%	19.6%
Wikis	12.7%	29.7%	57.5%	33.2%	36.0%	30.8%
Blogs	11.1%	21.3%	67.6%	31.7%	32.3%	36.0%
ePortfolios (PebblePad)	6.6%	17.5%	75.9%	22.0%	33.4%	44.60%
Assignments - getting marked work back online	7.8%	53.1%	39.0%	30.1%	63.4%	6.50%
Quizzes for learning/self review/assessment	13.8%	41.4%	44.8%	40.4%	48.8%	10.80%
Subject information on my mobile device (handheld)	6.7%	8.8%	84.4%	28.5%	21.0%	50.50%

Comparison by Study Mode

A Multivariate Analysis of Variance (MANOVA) was also used to compare the mean frequency of use of a range of technological tools within subjects undertaken by respondents enrolled on campus and in distance mode (see Table 5). Students were asked to indicate the frequency with which their lecturers used specific technologies in their teaching on a scale where 1 = "more than once per week" and 5 = "never". The results show small but statistically significant differences for most of the selected technological tools. Particularly noticeable differences include announcements, ePortfolios and tracking progress and grades e.g. Gradebook (all of which were used more in on-campus or mixed mode subjects than distance subjects).

Table 5: Frequency of use of specific technologies lecturers currently use

	Study mode Mean response on frequency of use of specific technologies lecturers currently use					
	Distance (n = 2673)	On-campus (n = 814)	Mixed (n = 369)	All students (n = 3952)	F	p
	Mean	Mean	Mean	Mean		
Announcements	2.56	2.08	2.08	2.42	83.518	<.001
Online readings	2.93	2.73	2.59	2.86	15.678	<.001
Interactive video teaching	4.40	3.99	4.23	4.30	39.145	<.001
Animation	4.60	4.08	4.27	4.47	78.950	<.001
Lecture recordings	4.18	3.55	3.92	4.03	67.051	<.001
Discussion forums	2.16	2.81	2.51	2.32	78.143	<.001
Chat room	3.55	3.73	3.75	3.60	4.460	.012
Wikis	4.17	4.11	3.94	4.14	6.146	.002
Blogs	4.35	4.16	4.31	4.31	6.625	.001
ePortfolios (e.g. PebblePad)	4.60	4.32	4.38	4.53	26.988	<.001
Assignment – submitting work online	3.16	3.46	3.30	3.23	34.503	<.001
Assignment – getting marked work back online	3.93	3.76	3.90	3.90	6.541	.001
Quizzes for learning/self review/assessment	4.11	3.46	3.70	3.94	86.122	<.001
Tracking progress and grades (e.g. Gradebook)	4.58	4.28	4.37	4.50	27.776	<.001
Subject information on my mobile device (handheld)	4.71	4.38	4.60	4.63	28.760	<.001
Notifications sent to my mobile device (handheld)	4.71	4.52	4.71	4.67	11.652	<.001

Discussion and conclusion

The respondents to the question about students' attitudes towards technology suggest that only a small proportion of respondents (8.7%) "love technologies and are among the first to experiment with and use them " and a minority (23%) "like new technologies and use them before most people" (see Figure 1). The average CSU student who responded to the survey in 2010 was clearly a digital follower, rather than an early adopter of new technologies. However, it is interesting to compare the frequency of usage of technologies such as Social Networking by the students responding to this 2010 questionnaire with the frequency reported by the students responding to the 2006 questionnaire reported in Kennedy et al. (2007). As shown in Table 1, 73% of students responding to this questionnaire used Social Networking regularly or occasionally, compared to only 44% of students responding to the 2006 questionnaire. On the other hand, the percentage of these students using presentation software such as PowerPoint regularly or occasionally (84%) was very similar to 89% reported by Kennedy et al. (2006). This suggests that even though the self reported orientation to technology does not imply that these students are necessarily 'Digital Natives', their regular use of both productivity technologies and social technologies does suggest that they are now well prepared for the use of technologies for learning.

Students' responses to the question about the most important benefit of using educational technology suggested that students' current use of educational technologies appeared to be driven by a desire for flexibility in their non-virtual world, with 38% specifying "Access" and 27% choosing "Personal management" as the most important benefit and only 24% choosing "Improving my learning" (see Table 2). Broadly speaking, the technologies most frequently used by students tended to be those that facilitated asynchronous communication, including email (see Table 1), and online forums and announcements (see Table 4) as well as technologies used for assignment production such as spreadsheets and presentation software (see Table 1). The desired shift in educational technology use as expressed by students (see Table 4) tended to focus on those that support 'time-shifting' or increased flexibility, such as increased use of online announcements, recorded lectures and asynchronous discussion forums. Also noteworthy was a desire for an increase in the use of synchronous interaction through chat rooms.

Student responses to the questions asking them about their desired frequency of use of a range of technologies suggest that in general they have a very strong preference for the use of technology in their learning, with the majority of students wanting to see technologies such as online announcements, recorded lectures and discussion forums used at least weekly. Looking at this in conjunction with their responses to the questions about the experience with CSU's online learning platform, Interact (for example 82% agreeing that their overall experience of the functionality of CSU Interact has been positive), provides an overall impression of a student body very enthusiastic about the ways in which technologies are being used and very keen for increased usage. This is consistent with the results of the most recent EDUCAUSE study in the US (see Dahlstrom, de Boor, Grunwald & Vockley, 2011).

The comparison of the use of technologies by distance and on campus students provides some interesting findings, which may reflect the differing learning needs of these cohorts as well as the opportunities provided by their lecturers (see Table 5). For example, the greater use of forums and chat rooms in distance mode subjects probably reflects the fact that for these students such technologies provide the main avenues of communication with their peers and lecturers. Similarly, the higher use of electronic assignment submission in distance subjects reflects the fact that for these students the only other alternative is to mail their assignments, and because they have to arrive at the university before the due date, this results in lost time to work on the assignment. By comparison, on campus students can hand deliver their assignments and so electronic submission is not as important. The greater use of electronic announcements in on campus subjects may reflect the fact that these announcements often relate to late breaking information about the subject delivery. The higher use of quizzes for on campus students is somewhat surprising, although the usage appears to generally quite low. The higher use of electronic return of assignments in on campus subjects is also surprising, although the difference between distance and on campus respondents is relatively small in this case.

A recent study at CSU of distance student use of technology including virtual lectures and asynchronous forums and grades found that the more the students engage with these online resources the greater their academic achievement (Crampton, Ragusa & Cavanagh, 2012). The authors noted that it was perhaps the students who realised the value of the resources, students perhaps with higher self regulation skills, who were more likely to engage with the resources and that development of student led regulation/ self directed leaning skills should be included early in a students' academic career (Crampton, Ragusa & Cavanagh, 2012).

The desire for an increase in the use of online marking and quizzes (see Table 4) was consistent with internal subject evaluations in which students continued to request improved mechanisms of feedback. Quizzes and online marking promote self directed study as well as facilitating the return of feedback during the session, at a time that is maybe most productive for improving learning. CSU's large contingent of distance students for whom the practical realities of their sometimes very remote locations can prevent the timely return of some assessment items. Therefore it could be argued that just as educators are starting to see technology as a means of addressing existing barriers rather than just a call by some to totally change how they teach, so too students are beginning to understand the role technology can play in improving experiences they currently value such as feedback in a more appropriate and useful manner.

It is important to note that apart from the use of the subject outline tool and the discussion forum, there are no mandatory requirements for any particular educational technology to be used in any class at CSU. For some aspects of this survey (such as Table 4 which displays results of students' actual-versus-desired use of particular technologies) results may be skewed due to the possible lack of student experience of a particular tool. For example, it may be difficult for a student to determine that they would like to use more blogs or wikis in their class interactions if they have little or irregular experience of these tools, especially in this context. As most students indicated they wait for others to take the lead in terms of new technologies (see Figure 1), it is difficult to know to what extent we need to further adopt such technologies on this basis alone. Apart from communication and administrative functions (email, chat, resources, etc), and tools that enable students to study in ways that enable them to work their study commitments around work and family obligations, it may be assumed that technologies should still be chosen for their pedagogical benefits, rather than student desire alone.

Looking forward, we see the emergence of more mobile learning initiatives and strategies and would suggest that institutions learn from past blind forays into LMS. Important questions that need to be asked are "what gap/s will be addressed by such technologies?", "what are student needs?" and "what pedagogical affordances will mobile learning address?". Our results would suggest that space and opportunity to explore need to be provided to staff and students as a first step down any new paths so that increasingly limited resources can be channelled in the most effective ways rather than be driven by the technically savvy early adopters.

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A matrix for sustainable online community development

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In supporting the development of an online community of practice, the uniqueness of a community and its situation need to be recognised in both its design and growth. The matrix outlined in this paper and poster draws from both guidelines and frameworks in the literature, and the study of one developing online community of practice. The perspective it provides will be of particular value to those seeking to grow and sustain an online community of practice, for a relatively small community of educators.

Online community, Matrix, Framework, Design, Community of practice, Adult education

Designing for an online community

An online community of practice (OCoP) for professional development has much to offer. In designing and creating such an environment Stuckey and Barab (2007) note that a "community-based approach holds great promise for learning, as it does not simply support content acquisition but is focussed on transforming practices ... by putting the power of this transformation in the actions of its members" (p.443). Developing an OCoP, however, requires careful consideration and planning, and takes time and attention to implement and grow (Stuckey & Barab, 2007). As stated often in the literature, a community of practice cannot be designed, but it can be designed for.

In creating an environment for an online community, the community itself needs to be considered. While focussing on design for online learning communities Riel and Polin (2004)explain that, "a community differs from a mere collection of people by the strength and depth of the culture it is able to establish and which in turn supports group activity and cohesion" (p.18). It is a combination of the environment, community members, and the activities which they undertake within it, which help to create a community. The activities in which a community involves its members need to be meaningful and linked to their practice. As Schlager and Fusco (2003) found, "simply having the ability to interact more frequently and for longer durations online than face-to-face does not translate directly into high-quality learning experiences or sustainable communities" (p.127). Not all efforts to create an online of community of practice for teachers have been successful. Schlager and Fusco (2003) also observed that "few professional development projects … resulted in online communities … sustainable enough to support teachers as they engage in the extended process of classroom reform" (p.127). Schwen and Hara's (2003) research observations and review of CoP literature reported that none of the fully functioning CoPs in their study had been designed. All had evolved naturally over several years.

The apt analogy of plant growth has been used for community development. Designing for an OCoP for one organisation's distributed community of adult educators was akin to preparing the soil and planting the seeds. From its beginnings, this OCoP, like a living entity, continued to change. Stuckey and Barab (2007) explain that a community is "continually evolving according to the relationships between members and the maturing practices of the community" (p.441). There are many conditions which need to be considered in designing for a community, and these must be kept in balance for healthy growth to take place. The matrix in this poster paper outlines the different elements needed by this community as it grew through the phases in its development.

A matrix of elements for developing online communities

As Stuckey and Barab (2007) point out, "No one who has tried to develop a Web-supported community in the service of learning could deny the challenges in doing so" (p.456). However, there are some helpful examples, frameworks and guidelines available in the literature. Riel and Polin (2004) structure their view of the community through the four dimensions of; membership, task features and learning goals, participation structures, and mechanisms for further growth and reproduction. In her meta-analysis of guidelines Stuckey (2004) uses Hillery's (1955) four common components of community; common ties, people, social interaction and place. Preece (2001) offers purpose, people and policy as the three design criteria for sociability and dialogue and social support, information design, navigation, and access as the four design criteria for usability. In developing the matrix from this study, all these dimensions/components/criteria have been combined to form three components of the online community, namely Environment, Engagement and Stakeholders.

Each of these components is considered in terms of the elements which have encouraged the development of the online community within the three phases of this study. These phases loosely align with what Stuckey (2004) calls "areas of influence and action", where the developers seek to design, implement and sustain the community. Elements within the full matrix are drawn both from the literature and from the study of the design, implementation and growth of the online community designed for the organisation of adult educators. Following an initial coding of the data using constant comparison to distil grounded theory on the elements of the community's development, the data was re-coded using the elements of Stuckey's (2004) meta-analysis. This re-coding highlighted existing elements of Stuckey's framework which were relevant, and some which were not appropriate for this community, as well as new elements distinct to this community's development. From this a matrix of elements for developing an online community relevant to a distributed single organisation's OCoP was created. The community specific elements contributed to the framework by this research are displayed in Table 1 and the full matrix can be viewed in the poster.

Table 1: Summary of additional community specific elements

	Environment	Engagement	Stakeholders
Sustain	*Maintain flexibility of design	*Maintain the value added	*Encourage more community members to provide leadership, impetus, and inspiration *Encourage members to run subgroups
implement	*Be open to community input *Develop both whole community and small group spaces	*Highlight the value added *Keep it relevant to the professional practice *Encourage a critical mass of engagement *Provide the means for collaboration to take place *Encourage member connections through communication and community awareness *Create new rituals	*Find well respected community members to provide coordination, leadership, impetus, and inspiration
Design	*Situate the community in the practice *Fulfil existing community needs *Design with simplicity *Ensure appropriate IT infrastructure is in place	*Keep it relevant to the professional practice *Develop connections	

While all components; environment, engagement and stakeholders, needed to be considered throughout the community's development, the emphasis of the developer activity fell on different components as the community developed through the phases. The environment was most important during the design phase. In the implementation phase, engagement was most important and in the sustain phase, the emphasis moved to the stakeholders. Because the community in this study is comparatively young and still very much under development, some of the elements in the sustain phase are still to be verified. These elements are based on data of what has sustained the community so far, and the missing elements which may be holding it back from further growth. The matrix as a whole should provide focussed support for community development in a similar context, throughout the design and implementation phases and on towards sustainability.

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Understanding novice programmers: their perceptions and motivations

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This paper presents the initial findings of an ongoing research program eliciting a basic understanding of students undertaking a first year programming course at the University of Ballarat, with a particular focus on their motivations and aspirations. This paper also provides a brief history of the course within its institutional setting including the different strategies that have been implemented over the last decade, an overview of the overarching study that is currently being undertaken, a discussion of some of the initial results, as well as a short discussion further research that is currently being undertaken. Results from the initial study indicate that students are positive coming into our courses but can become disillusioned as the course progresses. The research path forward will also be presented along with the discussion of these initial findings.

Keywords: Novice programming, motivation, perceptions

Introduction

Programming is a proven difficult topic to learn and teach and there is a great wealth of research attesting to this (Bergin, Reilly, & Traynor, 2005; Bonar & Soloway, 1983; Lewandowski, Gutschow, McCartney, Sanders, & Shinners-Kennedy, 2005; Lister et al., 2004). In spite of the effort dedicated to understanding and resolving this problem, IT programs and courses, including our own, are still suffering high attrition, failure and dropout rates (Ramalingam, LaBelle, & Wiedenbeck, 2004; Roberts, McGill, & Hyland, 2012). This situation is made even more perplexing by the perceived shortage of IT professionals in the work force (Barnes, Powell, Chaffin, & Lipford, 2008).

Like many others educational institutions, we have been experiencing on going challenges delivering introductory programming courses to commencing first year students (Bonar & Soloway, 1983; Lewandowski et al., 2005; Lister et al., 2004; Nagappan et al., 2003). In order to better understand the perceptions, motivations, aspirations and concerns the students have when they undertake our degree we planned and deployed a series of surveys throughout the first 2012 semester of a first year programming course. We endeavoured to discover if the students have any pre-existing programming knowledge, what motivates the students to undertake the course, and whether their motivations fluctuate during the lifespan of the course.

This paper provides a brief overview of the history of our programs and the first programming course that most of our students are required to undertake, and discusses some findings of interest from the first exploratory survey that was conducted prior to the students' first programming class. The students' responses to the various questions were in general very positive indicating that, at this initial stage, many of them perceived programming to be both achievable and relevant to their career goals.

Background

The University of Ballarat (UB) is a small, regional university located approximately 100 km northwest of Melbourne, Australia. UB draws a range of domestic students mainly from Western Victoria, and they tend to have a wide variety of backgrounds and abilities. Many of our students come from circumstances that fit them into one of our so-called "equity groups" which indicate disadvantage – for example, many come from sparsely populated areas that have limited access to certain resources such as broadband Internet, or at times may be the first on their families to attempt tertiary education. Some have not had great success in their secondary studies, may come from low socio-economic backgrounds and in turn face many challenges in undertaking tertiary study (Devlin, 2010; University of Ballarat, 2011). A further complication that we are currently facing is the emergence of a demand driven intake which has resulted in a far wider range of students that has been encountered by UB to instruct, support and assess.

ITECH1000 Programming 1, SITEs CS1 course, is a core course within many UB degrees including the Associate Degree, all the undergraduate IT degrees delivered by SITE, the Bachelor of Mathematical Sciences, in most of our conversion Masters degrees and the course is also offered by most of our partners. Students enter our degrees through a variety of means including students with ATAR scores, direct entry, students articulating from TAFE, students who have completed our Foundation Access Studies Program (FAST), mature aged students, along with international students from a variety of countries and educational backgrounds. This diverse, mix of students has made the shaping and delivery of courses to be a continually challenging and evolving process within SITE.

Since 2001 ITECH1000 has undergone a significant number of structural and pedagogical changes following the trends of many other universities and lines of research (Barnes et al., 2008; Koffman & Wolz, 1999; Smith & Boyd, 2001). During this time the school also developed a number of partnerships with private providers; as a consequence, the programming course underwent further changes to internationalise the content of the courses and to accommodate a wider variety of commencing student types. The course also had to be developed in such a way that it could be delivered as a standalone package to enable partner lecturers to deliver the material successfully and without further development. Adding to this momentum of change was the school adopted policy of providing students with early feedback within all first year courses. This process of early intervention enabled students who were struggling with the course to be given an opportunity to seek personalised assistance early and in turn raise their chances of successful course completion.

Like many other universities we also utilised a number of other evolving and differing approaches to aid student learning. These approaches have included, but are not limited to, the use pair-programming within the laboratories (Nagappan et al., 2003), using exercises to challenge high-achieving students who were becoming disengaged, using robots to enable program visualization (Wu, Tseng, & Huang, 2008), and implementing a Peer Assisted Study Scheme (PASS) to provide further assistance to students (Devey & Carbone, 2011). Nonetheless students continue to have difficulties.

It has become apparent that we now need to focus on the demographics, needs, motivations and expectations of the students involved. The first step towards this new approach was to develop an understanding of the backgrounds, motivations and perceptions of the new students entering the course. We also intend to study how these factors change for the student during the lifespan of the course.

The Study

The purpose of the main study was to develop an understanding of the students undertaking the first programming course in our IT degrees, focusing on the motivations and perceptions of these students. A series of exploratory surveys were planned over the semester including prior to the students first lecture, the mid-point of the semester (week 6 of 12), and in the final week of learning (week 12).

This paper focuses on the data collected prior to the first lecture in week 1 of the first 2012 semester and contained a series of questions covering demographic data, perceptions of programming, issues regarding the commencement of programming, prior programming experience, students' thoughts regarding how they would approach the course, and the final result the student expects to obtain for the course.

Further data was collected throughout the semester to provide a comparison with the students' initial responses, focusing on their perceptions of success or failure within the course, how their view of what programming is changes and where they will seek assistance. This data is continuing to be gathered and analysed for future publications and presentations. In the following section we provide a description of the participants of the survey, an overview of the initial data that has been collected and how the data has been analysed.

Results

Participants and Data Collection

The participants are fifty eight (N=58) students who were enrolled in ITECH1000 Programming 1 which, as outlined earlier, is the first programming course taught within a number of degree programs at the University of Ballarat and is generally a core, unavoidable course for most enrolled students. The course may also be taken as an elective by other students at the University but in general this is a rare occurrence. The data collected was analysed using Minitab. Descriptive analysis was conducted using Pearson Chi-squared tests and basic thematic analysis was used to model trends.

Participants – Demographics

The majority of the students who participated in the study were under twenty (20) years of age (72.4%). The cohort was predominantly male (82.8%) and there were only small number of international students who took part in the initial survey (13.8%). Over half of the students entering the course have had some form of prior programming experience (58.6%). The languages previously used by the students varied. Most of the previous experience was completed within a formal school setting, however, a small percentage (8.3%) were self-taught.

We also asked the students why they were undertaking the degree. Most of the students indicated that they were enrolled as they wanted to become an IT professional, with second most common response was that they enjoy working with computers. Surprisingly and encouragingly there were indications that the surveyed cohort had entered our degree and introductory courses with a very solid pre-understanding of the concept and meaning of programming. The students generally expressed a detailed view of what programming meant in terms of: different languages that could be used; automation of processes; the building of applications to solve problems and a multi-industry view point of use. Although interestingly a small number of students who answered this question seemed to confuse scripting with programming. Even more surprising was the consistently solid understanding of what programming entailed. These themes include the likes of: having to apply different languages; continual learning; testing and debugging; and the use of multiple platforms.

None of the students who completed the survey expected to fail the course, with the majority of the students expecting to receive a final grade of HD (33.3%) or D (42.11%). Only four of the respondents expected to receive a final grade of P (7.0%). Due to the low numbers of respondents who indicated that they would receive a C or P grading (N<9), the data for these two categories was combined for the purposes of the analysis.

Expected Results

A Pearson Chi-square test was run to investigate whether there is a relationship between gender and expected final grade. The results indicate that there was not a significant relationship between the gender and expected final grade (see Table1: Gender and Expected Result).

Table 1: Gender and Expected Result

	M	F	All
HD	15	5	20
	70.00	55.56	34.48
D	22	2	24
	44.90	22.22	41.38
C/P	12	2	14
	24.49	22.22	24.14
All	49	9	58
	100.00	100.00	100.00

A Pearson Chi-square test was also run to investigate whether there was a relationship between prior programming experience and expected final grade. The results indicate that there was a significant relationship between the prior programming experience and expected final grade. By examining the table below overall students with prior experience expect to get a higher grade and those without experience lower, this is evidenced by 71.43% of the students with no prior experience expecting to get a C/P grade (Chi-square = 6.920, DF = 2, p-value = 0.031; see Table2: Prior Programming Experience and Expected Grade).

Table 2: Prior Programming Experience and Expected Grade

	Yes	No	All
HD	14	6	20
	70.00	30.00	100.00
D	16	9	24
	66.67	33.33	100
C/P	4	10	14
	28.57	71.43	100.00

All	34	24	58
	58.62	41.38	100.00

Future Directions and Conclusion

We wish to draw what conclusions we can about first year student motivations and pre-existing programming knowledge in order to better prepare materials and shape pedagogical practise. Our ultimate aim is to improve student performance (i.e. grades) without adversely affecting learning outcomes or diluting course content. We especially want to reduce the number of failures and dropouts which are so problematic to a small teaching institution in a competitive environment. We have anecdotal evidence that some students in the past have changed degrees or have dropped out of tertiary study based upon not being able to successfully pass the introductory programming course on their first attempt.

Once we have completed the whole series surveys we will match it up with other sources of data such as attendance records (at labs and lectures), and final grades. We will examine the access of Moodle (our electronic repository for materials) to see whether students are finding more flexible ways to learn the material. We will also examine any exit interviews provided by students who do drop out although these are not always available.

We then expect to expand our studies to our partner institutions who are also concerned about failure and dropout rates. These students differ in demographics from those at our Mt Helen campus in that they are mainly international students. We would expect these students to have a different set if backgrounds, concerns and motivations from those of our domestic students. We will also conduct surveys with our Programming 2 (CS2) students and students in more advanced courses to how motivations have changed during the course of their degrees.

This initial survey into various perceptions, motivations and concerns of students commencing our CS1 course (Programming 1) was an exploratory survey conducted in response to concerns of high failure and dropout rates of students in these early core courses. We found students, in general, have very positive attitudes towards their new course, expect to do very well and have a firm entering understanding about what programming means and entails. Many of them had very explicit ideas of what careers they wished to pursue once they finish their degree which indicates an intrinsic motivation towards their studies. Follow up studies will attempt to elicit if and when these motivations change and will be used to find possible remedies for this problem.

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ANU Campus Quest: A Mobile App For Transition

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This paper outlines a new mobile application designed to assist student transition at the Australian National University (ANU). It briefly outlines the importance of addressing student transition in the current higher education climate, and explains why the ANU has decided to move into the mobile space in order to assist student transition to the geographical, social and institutional context of the university. The app is designed as an information-based scavenger hunt, informed by research into the social and learning utility of games. Students need to work in teams to devise strategies to approach the game, assisting them to make social connections, while the game itself takes students across campus to discover spaces and university cultures.

Keywords: transition, gamification, mobile apps

Introduction

Transition to university is a significant issue for higher education institutions, emphasised by the increasing social, cultural and academic diversity present in the incoming student cohorts. This diversity is likely to increase following the release of the Bradley report which recommended widening participation to increasingly include non-traditional students from low socio-economic backgrounds, equity groups and mature age students (Bradley, Noonan, Nugent & Scales, 2008). Not surprisingly, these students exhibit diversity in terms of existing academic knowledge and are managing a variety of work/life balances. To accommodate these differences, universities have responded by offering more flexible study patterns such as different times of entry (mid year etc), different modes of study (distance, face to face, online etc) and part time study. All this increases the challenges in managing successful student transition to university (Johnston, 2010; Kift, 2009).

This paper outlines the rationale for and design aspects of a new mobile application (app) designed to assist student transition at the ANU. It focuses on the decision to utilise the mobile space, explains why the app is designed as a game, and outlines the key features of the app including the need for students to work in teams, form strategies and physically engage with the campus itself.

The need to address student transition

Holistic approaches to transition are needed that recognise a wide range of transition issues including cultural and community, academic, social and personal elements (Johnston, 2010). These approaches, dubbed as third generational approaches (Kift, 2009), are essential as the more socially and academically engaged the students the greater their persistence (Tinto, 2009). Establishing firm social networks is a crucial aspect in student retention (Christensen & Evamy, 2011) with Willcox, Winn and Fyvie-Gauld (2005) finding in their small study that the lack of friends was a significant factor in student withdrawals. One focus of transition is the first few weeks of a new student's university life as it can involve great emotional and social upheaval. Students "have an urgent need to belong, to identify with others, to find a safe place and to negotiate their new identities as university students" (Willcox *et al.,* 2005). Making initial contacts with others is important in helping students adapt to university life. Transition activities need to provide opportunities for students to do this as well as orienting them to campus and academic life.

ANU is developing a more holistic approach to transition. One of the initiatives that forms part of this wider program is a mobile application for Orientation week that aims to start students on their journey to engage with the university. Specifically the app aims to:

- geographically orient students to the campus
- encourage students to socially connect with their peers
- introduce students to the institutional structure.

Why a mobile app for transition?

Smartphones are becoming ubiquitous. Already, Johnson, Smith, Willis, Levine, & Haywood. (2011 p.13) estimates that “virtually 100% of university students worldwide have mobiles”. Increasingly these phones are smart devices capable of connecting to the Internet, and 62% of smartphone users downloaded an app in the last 30 days (Neilsen, 2011). This uptake of smart mobile devices is predicted to continue with 80% of access to the Internet by 2015 to be via mobile devices (Ericsson as cited in Johnson *et al.*, 2011). This strongly suggests that smartphones are a medium that will become increasingly important in the tertiary education environment.

However, despite these figures, the impact of mobile devices and other Web 2.0 tools on university learning is open to question. Some such as Prensky (2001) and Brown (2002) coined the term digital natives to describe the generation brought up with the Internet, and contend that this group learns in fundamentally different ways to older generations. To engage this cohort, they argued new approaches to learning were essential. Increasingly this is being challenged as the wide diversity in IT skills and associated learning approaches among university students is recognised (Kennedy, Judd, Churchward, Gray & Krause, 2008; Lorenzo, Oblinger & Dziuban. 2006). Notwithstanding these differences, technology use is escalating and students increasingly have expectations of “access, convenience and connectedness” (Kennedy et al. 2008, p.118). In this increasingly connected world, both the university and students need to become competent and engaged users of the technology.

In this context, creating a mobile app for transition was a logical choice. Mobile apps are popular and this was one way of seeking student involvement at a time when a lot of things are competing for their attention. It was also an authentic use of the technology that fitted well with encouraging greater use of appropriate technology in the university context. Smartphones offer portability, location detection (knowing where they are) and image capture (Johnson *et al.,* 2011), all necessary features for the orientation app. Finally, while not all students would have smartphones, the use of teams in the orientation activity would ensure all students could participate.

Why make the app a game?

Our orientation activity needed to encourage social interaction and engagement with the university; it needed to do more than provide information. To this end, the app incorporates a game-based approach as this is capable of both encouraging social interaction and facilitating engagement.

Social interaction and cooperation with other players are powerful attractions of a game. This is reflected in social games such as *Farmville* or *World of Warcraft* where competition is still often an important element of a game but not the overriding reason to participate. In team games, more players are motivated to participate than if they are only competing for themselves (Zicherman & Cunningham, 2011). If students are motivated to work together to achieve team goals they are conceivably more likely to engage interpersonally with their team members and to begin the process of social transition to the university.

Similarly, games can be a powerful tool to increase a person’s engagement in tasks that might not have interested them. Kapp (2012) gives the example of a subway station where the exit stairway was changed so each step played a musical note when stepped on by a commuter. As a result, the use of stairways over the escalator increased by 66%. Fun, an essential element of games, not health concerns made commuters engage and change their behaviour. In the transition context, many students attend the campus during orientation week but anecdotal evidence suggests they often do not wander far from the commercial hub of the campus, or get a feel for the campus as a whole. Reasons for this include the lack of motivation to do so, or the fact that such exploration may not be as exciting as other socially-based orientation activities. On a campus such as the ANU which is geographically large, it is important that students begin to find ways of coming to terms with and navigating this vast physical space. This is encouraged by giving students a fun and social reason to start exploring the campus.

The ANU Campus Quest app

The Campus Quest app is designed as an information-based scavenger hunt to be undertaken during Orientation Week. Students will be organised into teams to complete a number of activities. Activities fall into 3 broad categories: multiple-choice questions, alphanumeric questions requiring the entry of a correct response, and image questions that require students to use their phones to take a photo of a particular thing, the GPS coordinates of the image then being verified with the coordinate range of the correct location (see Figure 1). The points awarded for an activity depend on its difficulty. At the start of the hunt, teams will be given some time and campus maps (print or electronic) to plan and strategise. Through the app, activities can be assigned to members. Teams then break up and spread across campus to answer activities. Team progress can be seen throughout the hunt. Activities are not marked until the end, to give students an opportunity to discuss and alter their responses throughout the challenge. To avoid last minute guessing of multiple choice questions, points will be deducted for incorrect answers. At the completion of the quest, the team with the most points will be announced the winners and awarded a real-world prize.

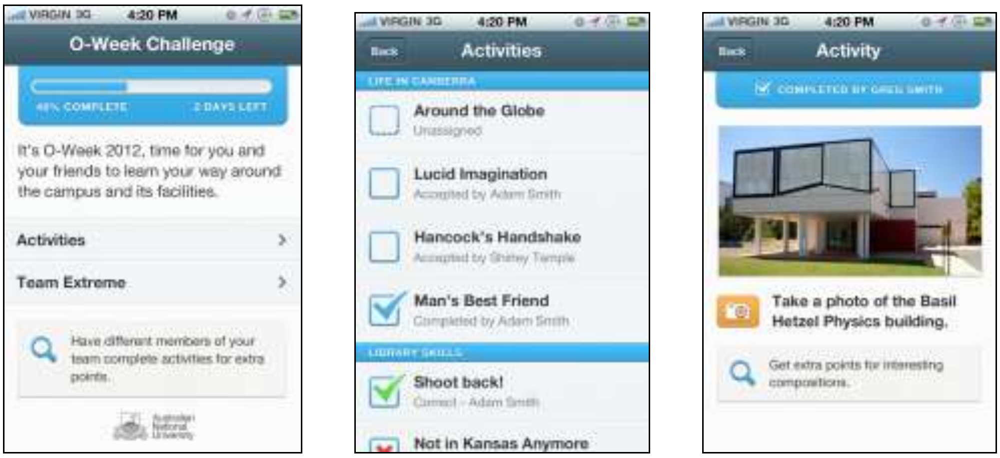

Figure 1: Three screen shots showing the screen for Team Extreme, the list of activities, and an activity. The list of activities shows who has been assigned an activity and if it has been answered.

The app has been designed to meet three aims: to encourage students to socially connect with their peers, geographically orient students to the campus and introduce students to the institutional structure. To encourage social interaction, the game requires significant collaboration between team members. Students register as individuals and then will be broken into teams so they will have the opportunity to meet new people. The app allows for the number of people per team to be greater than the number of phones; for example a team of 10 students will only be allowed a maximum of 5 phones. Thus, students will have to work in small groups to go around campus to complete the activities and will also have to coordinate and form strategies with other team members to allocate tasks. Extra points will be awarded to the teams that spread the tasks most evenly amongst themselves. This will be measured by how many activities each 'phone' completes and the spread of completion across the team.

Each activity is designed to help students orient themselves to the physical environment or institutional context of the university. For example, students may be given a photo of a small part of a building and asked to identify it, or be asked to obtain a key piece of information from the plaque of one of the many statues around campus. Other activities focus on places to eat and exercise, and may ask students to obtain prices of coffee or gym membership. Still other activities focus on how the university works, and ask questions about, for example, the college structure or university motto which can be obtained by navigating the university's website - familiarising students with this important resource.

To succeed in its aims, the scavenger hunt must be fun. Game designers aim to get players into a state of flow or 'in the zone' (Zicherman & Cunningham, 2011). Flow is a state between anxiety, where the task is too difficult and stressful, and boredom where the task is repetitive and unengaging. When designing activities for the game it was therefore important for us to consider the fact that activities that could conceivably meet the transition goals (for example asking questions about course rules and university regulations) may not necessarily enhance student engagement with the game. Additionally, the activities need to be challenging but doable and not repetitive if we want to maintain engagement, hence we needed a range of challenges from easy to difficult. Rewards help to keep players in a state of flow. Surprisingly, rewards that are not predictable in their occurrence or size are often the most effective (Zicherman & Cunningham, 2011). We have tried to build in some unpredictability of rewards with hard challenges where there is no certainty of success.

Similarly, a recognition that not all students are sophisticated users of technology means that the app only requires them to employ the basic functions of their phones. Thus tools such as Foursquare (https://foursquare.com/), that require downloads or even tools such as QR codes (http://www.denso-wave.com/qrcode/index-e.html) that require a more sophisticated use of technology were avoided. However, this may change in later iterations. The app is capable of working on both Apple iPhones and Android phones.

Finally, the app was designed for both large numbers and flexibility. To facilitate large numbers, all activities are machine verifiable. Thus winners are available as soon as the quest is over. Later iterations may include new types of activities that may require human verification, such as the taking of photos of 'favourite' or 'quirky' locations on campus. Flexibility is incorporated by not limiting the number of activities, size of teams, length of quests, or content of activities. It is hoped that this will eventually allow the app to be used for a wide range of situations and groups.

The app will be piloted during July 2012 before being rolled out for O week 2013. Pilots are planned both with a group of postgraduate students involved in a mid-year intensive program and with new undergraduate students as part of the orientation activities for Semester Two. The pilot sessions will give teams twenty minutes to work out their strategies before having a two hour quest window. Feedback on aspects of useability and experience will be gathered from the pilots.

For orientation 2013, the quest will be open to all new students. We plan to run quests tailored to individual academic areas. This will not only allow students to meet new people studying similar courses but allow us to tailor activities more appropriately (e.g. send law students to law locations etc). Depending on the feedback from the pilot, we may also look at running different length quests or themed quests, e.g. history of the campus.

Conclusion

Though this app is still in the pilot stage it is envisaged that a game-based design that encourages social interaction and campus exploration while assisting students to learn more about the university itself and its culture will assist students to begin their transition process at the ANU. It may not suit all students, nor is it by itself the solution to transition issues. Rather it needs to be one part of an integrated package.

While this app has been designed with O week in mind, it has the potential to be used much more widely. It is suitable for many groups new to the university, e.g. school groups, short courses etc. Similarly the generic nature of the activities may allow the quests to be expanded beyond orientation to more academic content.

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Breaking the Rules: Supporting Learning and Teaching Technology Innovations

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The learning and teaching landscape in higher education fails to actively support innovators to experiment with new technologies and educational methods. It is also a poor provider of ongoing support for innovations after start up funding runs out. There are tensions between enterprise systems and 'grass roots' initiatives in a context where technology is changing rapidly and institutions are slow to respond. Innovators in learning and teaching using emergent technologies are often treated as suspects in an undefined crime. They are pushing boundaries... and bureaucratic institutional buttons! Charles Sturt University (CSU) took an unprecedented step to break these punitive rules of engagement with an institutional Learning and Teaching through Technology Innovation Support Service (LATISS). The LATISS is described within the framework of a four phase learning and teaching with technology innovation (FPLTI) management model, and offered to other institutions of higher education as a means to foster innovation.

Keywords: innovation; educational technology; learning; teaching; rules; sustain; institutional impact

Introduction

Innovators in learning and teaching using educational technologies are often treated as suspects of an undefined crime (Discussions at ACODE 57, 2011). They are pushing boundaries... and therefore also bureaucratic institutional buttons. Charles Sturt University took the unprecedented step to break the rules of engagement to actively support innovators using educational technology through the Learning and Teaching Innovation Support Service (LATISS). The institution takes a positive stance on academics using external technologies, and the first author is currently leading a group to develop guidelines for their use within the institutional environment.

An innovation management model with distinct but overlapping phases of support has emerged from practice at Charles Sturt University and from the literature. The result is a four-phase learning and teaching with technology innovation (FPLTI) management model. Phase one encourages and supports innovation and experimentation, through strategies like LATISS. Staff are encouraged to try new learning design approaches and technologies within a scaffolded framework, and without too much concern for the risk of making mistakes. Phase One is the focus of this paper in which LATISS play a key role. Phase Two involves analysing the educational potential of the innovation for niche or wider applicability at the university, while Phase Three leads to University support for dissemination and adaptation of the innovation for use in different contexts. Phase Four deals with the critical activity of sustaining the innovation through a projected lifecycle that makes optimum use of the available potential.

LATISS has been conceptualised and implemented within the broader framework of learning and teaching innovations in higher education. Experience at Charles Sturt University and research conducted in the wider context of the international higher education sector provides the theoretical basis for design of this support model.

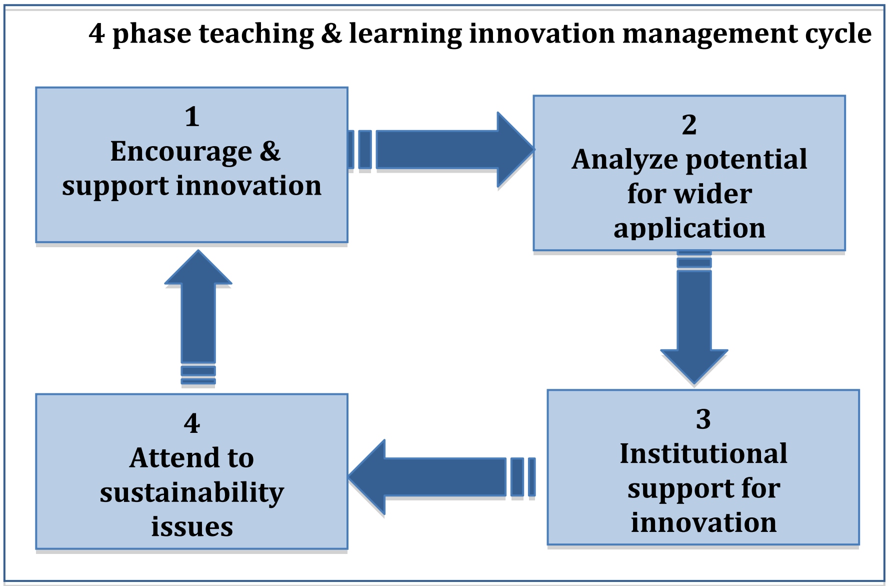

Figure 1: The FPLTI management model.

The challenges of supporting learning and teaching innovation

The challenges associated with learning and teaching innovation in higher education are not new. Earlier research explored the motives and drivers behind innovations involving new technology, and identified different sets of challenges and opportunities associated with top down versus individually driven initiatives. Hannan, English & Silver (1999) drew on interviews with 221 staff from 15 UK universities to acknowledge a range of punitive effects on lone innovators, despite the existence of institutional strategies that espoused their support. As noted above, these innovators are often treated as suspects in an unspecified crime as they challenge tradition in disciplines and institutions, and thus put personal career progression prospects at risk. This is hardly a just 'sentence' for creative attempts to leverage new technology to enhance student learning, accommodate larger and more diverse groups of learners, and meet demand from the professions for actively engaged and broadly educated graduates. Indeed, it is a testament to the commitment of the individuals concerned that innovation happens at all.

The tendency of top down initiatives to seek a 'one size fits all' solution has been found equally detrimental to the instantiation and spread of innovations. Gibbs & Gosper (2006) criticized the 'narrow view of education and pedagogically weak designs' reflected by the capabilities of the current generation of institutional elearning systems. They found the common practice of developing strategy at the centre, without broad consultation, resulted in low practitioner involvement. Hannan, English & Silver (1999) had already found teaching and learning support units struggling to implement centrally driven strategies that defined the direction, if not the actual form, that innovation should take.

A more recent study of 22 high profile elearning innovations from the Australasian higher education sector identified similar barriers in the structures and processes of the institutions that espouse their support (Gunn & Herrick 2012). On the technical side, centralized IT Services models are not set up to promote experimentation with emergent elearning tools, and pedagogical strategies are often (though not always) perceived to be constrained by the capabilities of the LMS. Common administrative tools provided by the LMS meet most faculty needs, but the 'art' of learning design demands greater flexibility and user choice. It is not, of course, reasonable to expect a central service department to be equipped to support every choice a creative teacher or adventurous learner might make.

The root of the problem can be traced to tensions arising from the interaction of new technologies with new sets of circumstances against a backdrop of institutional traditions (e.g. established ways of teaching and leading from the top) and constraints (e.g. resource limitations and enacted priorities). Various authors have defined the conditions required to support elearning innovations, (e.g. Alexander 2001; Southwell et al 2005; Stansfield et al 2009: Gunn 2011). These differ considerably from the conditions found in many contemporary universities, and are summarized as follows:

- A vision for elearning at the institution
- A culture that supports teaching and learning innovation, collaboration and risk taking
- Faculty development opportunities in learning design, project management, teamwork and evaluation
- Faculty workload policies that accommodate elearning, e.g. with time release for development
- A comprehensive technology plan, maintenance of reliable technology networks, and facilities to provide technical support to staff and students

These high level statements translate into different realties in particular institutional contexts. However, a recent study involving a group of individual elearning innovators found very few situations where all these conditions were present in their professional practice context (Gunn 2010b). Another issue here are the 'significant shortcomings in the capability of senior management teams in HEIs to identify and exploit the full strategic potential of technology' reported by Duke, Jordan & Powell (2008). Unfounded speculation and failed expectations of the impact of new technologies on higher education (e.g. Zemsky & Massy 2004) make it a hard task to gain high level commitment and to encourage other faculty to follow the road marked out by pioneers (Hannan, English & Silver 1999). So scenarios where individual innovators struggle for recognition and strategic initiatives fail to gain traction remain all too common in the university sector. A workable solution is required so the espoused institutional intention to support teaching and learning innovation can be realized. Better business intelligence to inform management decisions would be an integral part of that solution, and wider consultation is one sure way this could be achieved.

From an institutional perspective, some degree of standardization and constraint must be applied for budgets and support service provision to remain feasible. However, the trick is finding a balance that will support rather than stifle innovation, and allow the experience of exploratory work at grass roots level to inform later developments and influence strategic initiatives. This implies a staged approach to support for different types of innovations. Kelly (2006) provides an example where exploratory, developmental and validation phases take place within an educational design research cycle. Nieveen, McKenney & van den Akker (2006) note the predominant focus of published literature on validation studies. This could be explained as a result of the types of research that are acceptable for publication. Whatever the cause, it creates a communication gap that is unhelpful for individuals or institutions seeking to learn through shared experience and discussion of ideas at the exploratory or developmental stages. The most accessible place to begin to address this gap may be at institutional level, where attempts can be made to define the kind of support that innovators need and that central services can reasonably provide.

While innovation and user choice need to be encouraged, at least in the early stages, there are clear benefits from situating these opportunities within an institutional framework that shifts the perception of innovators as outlaws, and provides a reasonable level of support for exploratory work. Ideally, this would make the best expertise from across the institution accessible to innovators, foster broad collaboration, and keep central services such as Teaching and Learning Development and IT departments engaged with emergent trends (Gunn 2010b). Diffusion of leadership roles and responsibilities around elearning innovation could also be facilitated through a networked approach. As far as the literature is concerned, the challenge of defining such a framework has yet to be resolved, and the need for discussion and dissemination of ideas among innovators, teaching staff and managers remains largely neglected. The affordances of social networking technology offer the means to address these issues in a practical, inclusive and affordable way. The challenge lies in shifting institutional culture and practice to actively support what the technology affords, and in the process, turn innovators from suspects to star witnesses and key informants.

From suspect to star witness

The problems facing teaching and learning innovators and institutions are well documented, and provide a sound basis on which to build a supportive institutional framework (Stansfield et al 2009; Gunn 2010a&b). In general the learning and teaching innovation landscape in higher education can be characterized as:

- Lacking active support for innovation and experimentation
- Failing to provide ongoing support for innovators after initial funding rounds
- Lacking transparency and consultation around decisions on technology for teaching and learning
- Responding slowly to rapid advances in technology
- Espousing rather than enacting values around elearning innovation

- Creating tensions between enterprise systems and ‘grass roots’ initiatives
- Failing to acknowledge the different phases of innovation, i.e. exploratory, validation, dissemination

While broader action is needed to address many of these deficiencies, the LATISS was conceived to address the first two issues listed above.

Advancing innovation at Charles Sturt University

In the past, the Charles Sturt University innovation landscape included a number of institutional players, but support mostly occurred in formal and selective ways. A Flexible Learning Institute supported small-scale innovations, and developed ‘self help’ resources relevant to the institutional community for both small and large-scale initiatives. Further support was available through colleagues in faculties or schools, such as a fellow champion, Sub-Dean Learning and Teaching, Head of School or Learning and Teaching committee members.

LATISS was conceived by the Strategic Learning and Teaching Innovation section in the Division of Learning and Teaching Services so innovators could share what they are doing, and if required, be supported by the Information and Communication Enables Learning community of practice that has just over 650 members. This community uses Yammer, a microblogging tool, to share information and request support. The rationale for LATISS includes the beliefs that: a) to remain competitive in an open Educational Market, Charles Sturt University must create an environment supportive of learning and teaching innovation using technology; b) without this kind of innovation the University will be a perpetual follower - not an innovator; c) smaller learning and teaching innovations and experiments with new technology that happen outside the scope of projects are often valuable but not supported; and d) support should be provided for distinctive applications of educational technology in specific areas and possibly with small groups of students.

Larger scale innovation is supported at Charles Sturt University in a number of ways. Plans for new or updated educational technologies for a significant segment of Charles Sturt University can be discussed with the Executive team, Strategic Learning and Teaching Innovation or Educational Design and Media sections of the Division of Learning and Teaching Services . Proposals ultimately go to the Curriculum, Learning & Teaching Committee and the Information and Learning Systems Committee for consideration. The Flexible Learning Institute’s Teaching Fellowships provide for significant release from regular duties, and Course Team Symposium Grants offer annual funding for successful applicants to develop a course level blended and flexible learning strategy. This Institute further fosters innovation through evidence-based practice, applied research and scholarship. The university also has an Initiatives Handling Process for major strategic initiatives, and Faculty and School based schemes that deal with larger innovations.

LATISS, however, addresses informal and small-scale innovations, as outlined in this description of Phase One.

Phase One: encouraging and supporting innovation

While some of the institutional issues outlined above may be harder or take longer to address, creating an environment for mutual exploration and discussion of the affordances of new technologies can be immediate and effective. Anecdotal evidence shows that institutional social networks facilitate conversations that previously did not take place, at least in such transparent and inclusive format. Criticism of institutional systems can be aired in open channels, and so can discussion of elearning innovations and pedagogical strategies that are being tried out in different parts of the institution. This is a positive move towards a culture of collaboration, where risk taking is encouraged by the knowledge that others may be exploring similar opportunities. It is also an unprecedented way to take the pulse of the institution on matters related to any topic that may be raised for discussion by participants. While representation of staff in these networks is not uniform, it is growing rapidly in many contexts.

Innovators are in the minority among academic staff at Charles Sturt University, a situation that is typical for Australian universities, and that might be another reason why so little attention and support are provided to innovators. However, champions can have a powerful multiplication effect in their faculties and schools on integrating educational technologies within learning and teaching.

The LATISS was launched on 1 May 2012 by the Information and Communication Enables Learning community of practice, which is facilitated by the Strategic Learning and Teaching Innovation section of the Division of Learning and Teaching Services under the direction the first author. Leading up to the launch, feedback on the concept was sought from key units across the University, in particular, from academics involved in innovation with technology.

LATISS has the following key objectives:

- To communicate to innovators that the University is positive about innovations and innovators
- For champions and early adopters to innovate i.e. support personal innovation so that staff tap into their creative talents to make performance improvements in their own work
- To improve learning and teaching at Charles Sturt University by feeding back the results to appropriate groups and committees
- For innovators to share their innovations with the rest of the ICT-enabled learning community of practice
- To provide support via the Information and Communication Enables Learning community of practice to the innovators - and thus create a "lattice" of support!
- To link up innovation activities.

The public interface to LATISS is a set of Yammer pages that is only accessible to Charles Sturt University staff members. While this limits the extent of sharing to the institutional community rather than opening innovations up to the world, it is an increasingly popular set up in universities and for academics where no commitment to an open access philosophy has been made.

The LATISS concept was formulated by the Strategic Learning and Teaching Innovation section, then discussed by various interested parties, including the Division of Learning and Teaching Services Executive, the Educational Technology Reference Group that represents the four faculties, the Library, Division of Information Technology, Flexible Learning Institute, Education for Practice Institute and the Division of Learning and Teaching Services staff. It was also shared with relevant university committees, so wide consultation has helped to shape its implementation.

The opening page of LATISS links to the following pages: Charles Sturt University innovation landscape; the Division of Learning and Teaching Services support for LATISS; Library support for LATISS; Division of Information Technology support for LATISS.

On the opening page staff are asked to describe their innovation by providing as much as possible of the following seven points:

1. Aim: what learning/teaching aim are you trying to achieve through the innovation?
2. Technology: what technology/technologies will you be using?
3. Objectives: what faculty/school objective(s) are you trying to address?
4. Who: who is involved?
5. When: when do you plan to run this experiment?
6. Support: do you need support? If so, what support do you need?
7. Students: How will the students be supported?

The service was launched with an invitation to a number of academics to put up innovations that they are busy with or planning on the opening Yammer page. Eight academics responded within the first two weeks following the launch. Two further innovations were added soon after the initial eight.

The innovations posted are quite diverse, and some examples are outlined below:

> For a subject with a workplace learning component, the lecturer wants students to be able to add info into cells in a table against workplace capacities and skills that are listed in a column. The idea is for students to be able to add to this over time, as they progress through 3 subjects in a series of workplace learning subjects.

> I am taking the TESOL students from a print-based DE mode of delivery through to a blended mode of delivery and want to demonstrate what blended learning might achieve when they are considering ways to teach their own learners.
>
> We are demonstrating how to create a visual presentation that supports key thinking, and also allows students to learn about creative commons images, copyright, attribution etc. This innovation is a real-world experience, as students are already translating the new practice into their own classroom teaching.
>
> Over the last few years I have experienced a sense of disconnectedness with DE students. The forums are losing their value, as students want an answer NOW, resulting in less communication through this channel and therefore less connection within the cohort. This group of students also lacks the ability to compare assessments in the way internal students do after class and during all night library sessions. I think this communication is important in driving student achievement – most people are after all a little competitive.
>
> I am planning to refine and refocus my "Introduction to Educational Computing" subject. It works very well at the moment, and even though I usually support the idea that if something's not broken it doesn't need fixing, it is a subject that has grown and developed quite organically and needs regular updating as technologies and educational policies change. Newer technologies need to be incorporated - particularly apps and mobile devices. Two of the creative and engaging assessment tasks need to be constrained - students tend to get carried away and make HUGE assignments. Great learning, but difficult to mark and students spend too much study time on them.

The types of support that may be provided by the Information and Communication Enables Learning community of practice through LATISS include advice; brokering support within and external to units such as the Strategic Learning and Teaching Innovation section and doing this within the Division of Learning and Teaching Services; collaboration in activities; linking activities; assistance in software development; providing access to a technical innovation systems environment through the Division of Information Technology; and actual implementation.

The Strategic Learning and Teaching Innovation section has appointed a staff member who does follow-up on the innovation as one of his duties. This staff member reviews the opening page for new innovations, discusses possible support with the Strategic Learning and Teaching Innovation section colleagues, and posts a response to each innovation. The staff member will also follow up with the innovator at the end of the experiment to encourage them to post their findings on the opening page with the original information on their innovation.

It is still very close to the launch and there is currently a long teaching break, so we look forward to seeing more innovations being listed, but at least some innovators have shared their work and it is now known that Charles Sturt University is proactive in supporting its learning and teaching with technology innovators.

Phase Two: analysing the innovation for niche/wider applicability

Phase two of the process is where innovations that have passed an initial proof of concept phase can be assessed for feasibility, and potential for application beyond the original development context. This presents challenges around the sharing of information at an individual level, and knowledge management by the institution, so that even if a development will proceed no further, the experience gained through exploratory phase is not lost. The ability to pursue this form of evidence based practice is important to produce efficiencies, and to guide teaching and learning development at both individual and strategic levels. This has been problematic in the past, however, as innovators tended to stay off the radar so the 'suspect' nature of their activities did not attract attention. A more transparent process and enacted support for innovators will hopefully help to address the challenge.

From an institutional perspective, it is necessary to determine if the innovation addresses wider needs: either for a particular niche or for use across the University. Either case would be fine, but there is currently no specific process in place in most institutions to either gauge or encourage wider interest, or to determine what level of investment might be justified given the prospects. Central service units often showcase and highlight support available for innovations. However, it is not uncommon to find an original developer trying to take responsibility for all user support and professional development in order to disseminate their work. Different sets of skills are involved in development, dissemination and support; so different people should be allocated to these processes, including professional development, customization of learning designs, end user support and technical maintenance.

A challenging question in this context is, what kinds of evidence need to be gathered and presented to convince other faculty and institutional leaders that support or further investment in justified? Few innovators in learning and teaching with technology would aim to present a business case to the institution to secure the future of their creations. It is more likely that they would evaluate its impact on student learning in different educational contexts and publish the results in conference proceedings and scholarly journals. These two forms of reporting are equally valid, but serve very different purposes, so the question needs to be addressed from the perspective of the different interests and priorities of those involved.

A further challenge relates to the emergent nature of learning innovations, and the fact that it may be impossible to predict or fully appreciate potential in the early dissemination stage. The only reliable prediction about the use of new technology in education is that forecasts are usually wrong. It is often not possible to predict how people will use a new system or tool until they actually get involved and try it. The eventual uses often come as a surprise to the developers. It is therefore asking the institution to take a risk in backing emergent innovations, the prospects of which cannot easily be framed in ‘business language’. As Lorraine Stefani (ACODE 58 Presentation) said ‘we must be more business like, but not more like business’ as the impact of promising innovations cannot be costed, yet investment decisions demand an evidence-base of a ‘business like’ nature. Broad consultation is also required to determine processes and structures for Phase 2 of the Innovation support initiative. However, this remains a work in progress for most institutions.

Phase Three: University support for innovation

Once an innovation has been reviewed and scope for wider application identified, the following issues need to be addressed:

- Identify affordances and strategies to promote integration into pedagogical practice
- Licensing arrangements (if appropriate)
- Professional development requirements and strategies
- Change management plans
- Implications for guidelines/policies;
- Staff and student support requirements
- Ongoing financial commitment

These are all significant issues in the university context, which given the pace of change, will take some time to work through and involve a degree of uncertainty around eventual outcomes. Again, broad consultation is required, and possibly also the establishment of new working relationships. For example, some of the innovations examined by Gunn & Herrick (2012) involved collaboration across teaching departments, libraries, central teaching and learning and IT support centres. Establishment of these cross-functional relationships for a particular project was usually not an easy task, so it may be reasonable to expect that doing so on a longer-term basis would be equally challenging, at least in the establishment phase. Shifting the culture and practice of learning and teaching within an institution is no simple task either. A suitable approach is identified in the ‘ecologies of learning’ concept defined in a report from the UK Association of Learning Technology (ALT 2010). The multi-faceted support strategies provided through flexible and responsive systems that are required to articulate such ecologies present multiple challenges to established institutional culture and practice.

Phase Four: Sustain the innovation

As well as supporting early stage exploration and broad collaboration, institutional social networks provide a way to gauge popular interest in particular innovations, which in turn can be used to guide decisions about what to support and where to invest resources. Gunn & Herrick (2012) recommended ways to support innovations after an educational concept has been proved either with or without the start up funding that most institutions already provide. Proposed actions include the use of initial scoping information gathered through systematic process as an input to design and decision-making; and use of more formal project management techniques by multi-skilled teams for the development and dissemination phases. Two critical success factors, however, are choosing the right innovation to back, and getting the right team together to promote it. The common situations where innovators and initial developers are also expected to take responsibility for dissemination and provide all forms of support have proved to be unrealistic. This is not surprising given the wide range of skills and the time commitment involved in these different activities. Evidence from their investigation of 22 case studies (Gunn & Herrick 2012) showed that the number of years in development and levels of investment were not reliable predictors of dissemination or sustainability prospects. Since management backing does not appear to be the most reliable predictor of popular interest, it may be posited that a more democratic method for choosing what to support could lead to better results.

It is critical to employ appropriate change management strategies to sustain innovations in learning and teaching with technology. Managing change for enterprise-wide impact in higher education is particularly problematic since people are central to the process, and it is therefore necessary, as Fullan (1991, p350) suggests, "…that we explicitly think and worry about the change process" in educational reform. The LASO (Leadership, Academic & Student Ownership and Readiness) Model for Technological Transformation in Tertiary Education attempts to address the wider context in which the infusion of educational technologies takes place, and acknowledges that the process of enterprise-wide technological transformation is complex with many dislocations, dilemmas and uncertainties (Uys, 2007). The LASO model proposes that top-down, bottom up and middle out strategies operate in unison to achieve sustainable change (Uys, 2010; 2009a,b &c).

Summary

A service like LATISS is designed to fill a very specific void in the typical innovation landscape at universities. It is very early in the use of LATISS, but it is promising that 10 innovations were listed in the first few weeks after the launch of this service. Although it limits the spread of innovation to staff in a single institution through a social networking extension to the intranet, this is a sufficiently major change for many, and will inevitably lead to wider sharing as individuals engage in various external networks. It also provides an important preliminary step into the social networking world for novices.

A local version of the LATISS and the four phase learning and teaching with technology innovation management model could be of value to higher and tertiary education providers who wish to ensure successful innovation. A service like LATISS could play a significant support role in Phase One, and the strategies for action recommended by Gunn & Herrick (2012) could usefully address later stages of the process. An ecological approach is essential to the innovation process, which has neither a fixed start nor end point, and where the outcomes of dissemination strategies often cannot be predicted before they materialize. The unpredictable nature of innovation presents many challenges to planning and budget cycles and the forecast based futures of higher educational institutions. However, failure to respond to these challenges with flexible and supportive strategies for innovation creates the unacceptable risk of failing to move with the times in an environment where no university can afford to be left behind.

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Faculty experiencing first-line implementation of Technology Enhanced Learning

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Higher education is entering an interesting period of change. Faculty and students will have to adapt to a more technologically enhanced environment for teaching and learning. Adopting new pedagogy can place a critical responsibility on faculty. This article evaluates members of a small faculty's experience of the implementation of laptops as part of Technology Enhanced Learning (TEL) at a residential higher education institute (HEI) in South Africa. The study population comprised 36 first year Humanities students, the Faculty Dean, and seven lecturers of the first year modules. Data collected through semi-structured interviews, focus group discussions and an open ended questionnaire were captured in an integrated dataset using Atlas.ti^{TM}. Coding and categorization focused on the requirements of TEL in the faculty and the researcher derived at two themes: (i) Demands of TEL and (ii) initiation characteristics.

Keywords: Faculty; Technology Enhanced Learning; Information and Communication Technology

Introduction

With traditional pedagogical methods in higher education (HE), changing at an accelerating speed to online or blended learning, change is expected (Tang & Austin, 2009). Adopting the use of new (and some not so new) Information and Communication Technology (ICT) devices, e.g. laptop computers, iPads, smartphones, tablets, and android devices as learning technologies have implications for HE teaching pedagogies. This implies change beyond verbal and visual learning to a virtual way of teaching and learning. Traditional learning principles should be revisited and adapted accordingly (Njenga & Fourie, 2010; Proserpio & Gioia, 2007) to develop teaching and learning strategies to incorporate the strengths and opportunities of online learning with those of traditional modes of learning (Emerson & MacKay, 2010). Moving towards a more technologically enhanced learning approach seems revolutionary yet necessary.

Technology enhanced learning

Technology enhanced learning (TEL) is "characterized as maximizing the best advantages of face-to-face learning and multiple technologies to deliver learning" (So & Brush, 2008, p. 321). Salinas (2008) suggests that this new environment relates to enhanced motivation, new roles for students and faculty, and improved learning outcomes. For a transition like this to take place, a paradigm shift is predictable. Teaching and learning have to move away from a teacher-centered approach to a cooperative and student-centered model (Salinas, 2008; Weaver & Nilson, 2005).

Adapting to this environment poses new responsibilities for the faculty. Faculty have to become creative in the redesigning of their courses in order to actively integrate technology for learning (Emerson & MacKay, 2010; Proserpio & Gioia, 2007; Tang & Austin, 2009; Wurst, Smarkola, & Gaffney, 2008) and create innovative learning opportunities for their students (Proserpio & Gioia, 2007). Technology integration in HE demands major changes in the way faculty views technology, as well as in teaching and learning (Salinas, 2008). Faculty has to combine technology, assignments and learning material in such a matter that it leads to optimal learning. This may ultimately lead to better student learning and satisfaction, and the best combination may enhance faculty members teaching abilities and lead to better teaching evaluation (Tang & Austin, 2009). Faculty are compelled to consider students' "learning styles, perceptual modality preferences and computer or Internet proficiency when introducing technology into their teaching" (Tang & Austin, 2009, p. 1252). These changes lead to additional challenges for teaching and learning (Tang & Austin, 2009) as the roles of students and faculty during course communication change (Proserpio & Gioia, 2007; Salinas, 2008; Wurst, et al., 2008). These changes result in instructional implementation of the technology; it is not technology itself that effects the learning that takes place (Tang & Austin, 2009).

The Internet with its quick access to a wealth of information does not necessarily lead to meaningful knowledge creation and demands much more from faculty to ensure the transformation of information into knowledge (Guri-Rosenblit, 2005). The availability of modern technologies does not imply educational usage thereof

(Proserpio & Gioia, 2007). This statement highlights the importance of the compatibility of ICT with the users, their preferences, and the way technology is implemented.

Faculty members often remain sceptical about the value of these new technologies to improve teaching and learning and research on the topic is still inclusive (Salinas, 2008). Sufficient knowledge and skills are needed to ensure that the use of technology is beneficial in teaching and learning (Kay, 2008). Research should focus on developing a better understanding of ICTs used at HEIs and the effect thereof on the different role-players. Therefore, this paper aims to contribute towards the understanding of a HE faculty experiencing first-line implementation of Technology Enhanced Learning to foster sustained research, support, and training for high quality teaching and learning.

Research design and methodology

Context of the study

The Teaching and Learning Committee of the North-West University (NWU) launched a pilot study to determine the feasibility of issuing laptops to all students on the Potchefstroom Campus. They targeted the smallest faculty on the Potchefstroom Campus and at the onset of the 2011 academic year each first year student received a custom loaded laptop computer. The cast contained *inter alia* anti-virus software, MS Office™, OneNote™, and several e-books. The computers linked to the NWU wireless Internet network that gave the students access to e-Fundi—the university's learning management system (LMS) which provided links to an email account, the library's resource database, electronic study guides, communication to faculty, discussion forums, technical assistance, posting of assignments, and online assessment. In spite of contradictory indications from the literature, the Committee aimed to determine if the Virtual Generation students perceived their teaching and learning experience to be positive (Fried, 2008; Kirkwood & Price, 2005; Mottarella, Fritzshe, & Parrish, 2004; Njenga & Fourie, 2010; Tang & Austin, 2009; Wurst, et al., 2008). The Committee also aspired for improved student achievement as a positive spin-off of the "Laptop Project."

The Dean of the involved Faculty's strategic plan aligned with the HEI's change towards technologically driven teaching and learning and its perceived competitive advantages for the global market (Rice & Aydin, 1991). The Dean's vision was to gradually evolve ICT into teaching and learning, shifting the current instructivist teaching paradigm towards a learner-centred approach (Salinas, 2008), changing the perceptions of faculty members and students about dealing with information and content. This change encompassed establishing new partnerships between teaching and learning responsibilities at his Faculty.

Participants

The participants comprised the total intake of 36 first year on-campus students, registered for a qualification in the Humanities, seven Theology faculty members responsible for the first year modules and the Dean of the Faculty of Theology.

Methods

The study followed a qualitative case study design to capture insight, discovery, holistic descriptions, and a better understanding of the experiences of lecturers during TEL (Leech & Onwuegbuzie, 2007; S. B. Merriam, 1998; 2009). The researchers collected data at several occasions over a period of one year, according to five strategies:

(i) An interview with the dean of the faculty which focussed on his strategic views on the establishing and implementation of a TEL environment.
(ii) Semi-structured individual interviews with six purposively selected students. The questions focused on students' expectations, their experiences and their use of the technology for academic or other purposes.
(iii) A semi-structured focus group discussion with faculty members focussing on the integration of technology into teaching and learning.
(iv) A semi-structured focus group discussion with seven first-year students that focussed on how technology supported their learning.
(v) An open-ended questionnaire posted to the learning-management system for all 36 participants, although only fourteen students responded to the questionnaire.

The use of the different strategies aimed to triangulate the data of the semi-structured focus group discussions with faculty's experiences that added value to the results.

Data analysis

Data were analysed with the focus on the requirements of TEL on the faculty. Atlas.ti™, a qualitative data analysis and research software programme, combined the textual data from the five data collection strategies as an integrated dataset. The author coded and categorized the participants' responses into 68 codes, seven categories, and two themes according to the use of the constant comparative analysis method (Leech & Onwuegbuzie, 2007, 2008). This method identified underlying themes from the data. The researcher grouped phrases together as meaningful parts and linked them with a code. Subsequent chunks of text were pared with existing codes. Codes were grouped together due to their similarity as categories, and then as themes (Figure 1).

Findings and Discussion

The findings are presented according to the two themes identified from the data: (i) Demands of TEL and (ii) initiation characteristics (Figure 1).

Demands of TEL

The theme demands of TEL originated from four categories: (i) Mind shift for teaching and learning with technology, (ii) concern about students, (iii) barriers caused by the laptops, and (iv) added responsibility.

Mind shift for teaching and learning with technology
Some faculty members had little confidence in the changes stowed upon them regarding their new roles and pedagogical practices of integrating technology into their established learning environments. Although there was conscientiousness amongst faculty members about their new role and responsibilities (seeGuri-Rosenblit, 2005), the new technologies required that faculty had to make a mind shift and develop new teaching and technology skills. Nevertheless, faculty still felt responsible to attain the previously defined pedagogical outcomes that did not take into account a different teaching environment (Mottarella, et al., 2004). They took the responsibility to adhere to and reach these outcomes during a contact session seriously, in spite of a dramatically changed learning environment. This stance compromises the ideals of TEL and illustrates resistance to change:

> I did not make any mind shift. My preparations remained the same. I teach or lecture the same way while I will communicate with them through e-Fundi and all that...

Due to their insufficient knowledge on TEL, faculty members reduced ICT's potential to the use of e-Fundi, a dependable Sakai™-based e-learning platform (Abbad, Morris, & de Nahlik, 2009; Fichter, 2005); some computer applications; and PowerPoint™ presentations. These previously used ways of teaching let faculty to believe that traditional learning can continue as usual and that the students needed to adapt:

> I did not need to make a paradigm shift but my concern is not about myself but about the students (Faculty, focus group discussion).

Faculty members were no longer considered as the *sage on the stage* (Palloff & Pratt, 2003), with students perched at their feet, ready to absorb any knowledge. Faculty should evolve to *guides on the side* (Palloff & Pratt, 2003) who holistically share in the teaching learning experiences of their students. This will involve role adjustment and a pedagogical shift to learner-centred learning. However, not all of faculty shared this progression and they strongly voiced their traditionalist defiance:

> I must reach my outcomes...There are outcomes to be achieved and someone says make it work and I say it's not working and we are wasting time by this argument its working, make it work, it's not working, make it work and so forth and where is the process of teaching and learning it's being hurt (Faculty, focus group discussion).

Faculty members agreed that the success of the pilot project depended on their positive attitude and change of teaching philosophy according to the demands of TEL. Change did not happen easily. Resistance, being one of the most important stumbling blocks in implementing e-learning (Njenga & Fourie, 2010), was strongly experienced by some faculty members:

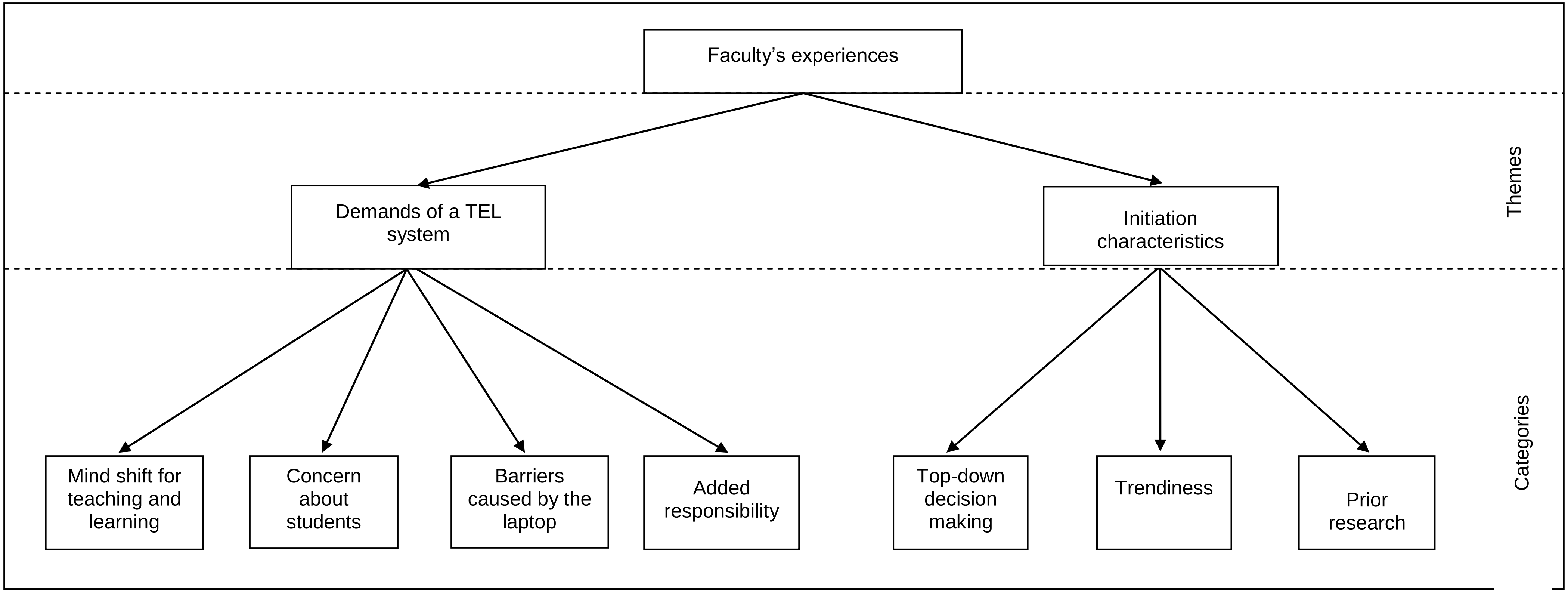

Figure 1: Categories and their distinguished themes relating to the Faculty's experience of the implementation of Technology Enhanced Learning at a residential Higher Education Institution

> I think when we closed last year I was halfway with my preparation for Greek for this semester and then only to come back in January and hear that there is this thing. Can you imagine now I'm halfway with my work. Some of my tests are already set. I know I am going to do this work at this time and so forth. You had your schedules and know you have to adapt to the new system. It's a traumatic situation that we've started this academic year (Faculty, focus group discussion).

Concern about students

Management initiated the laptop initiative, but during the first year of the rollout, faculty did not fully buy into the change. They were uncertain about the advantages of the endeavour for the students, and felt that more research should have been done. Guri-Rosenblit (2005) warns against these substantive issues of ICT implementation in HE. Faculty members were concerned how the shift towards TEL would affect the students. Faculty members not from the Virtual Generation voiced their concerns that the pilot project was too much, and too fast. They maintained that the approach did not take into account the technology preferences of the Virtual Generation. The students voiced their concerns:

> I was affected in a huge way, when I was used to taking note on paper and now it is done on the laptops it's a big change which on the other hand it slows you down, because I'm still getting used to the typing (Student, open-ended questionnaire).

> The change, previously just listening to the professor and taking notes (it's easier this way) now it's different. Somehow it can be in the negative, it can even effect your concentration or the effectiveness to think... This can influence your learning experience. At first you don't feel all together in class with all these things in the class. I felt like, am I really going to manage this (Student, individual interview).

Uncertainty about the advantages associated with TEL and the unforeseen mistakes and gaps that accompany such change predominated faculty members' concern for their students' learning process:

> Has it been resolved by whoever that the future is an e-learning environment as they describe it, and why, and what are the advantages and why is it better than the previous? (Faculty, focus group discussion).

> I'm very worried about is actually the gap which is created especially in the contact session. The focus and participation is actually reduced. The attention is now given to the computer (Faculty, focus group discussion).

Barriers caused by the laptop

In their minds, incorporating ICTs in-class proved to be more of a hindrance and faculty preferred the traditional teaching environment. Obtaining and maintaining students' attention while they were interacting with their laptops irritated the lecturers and disrupted their classes. Faculty asserted that the laptops distracted students' attention in classes and that students required maturity and discipline to focus their attention on the facilitation at hand:

> I think what needs to be done is a way of… if using a computer in a contact session, to prepare the students, they need that preparation. Yes, they need that shift for them to be able to use the computer and concentrate at the same time (Faculty, focus group discussion).

The in-class use of the laptops diminished the interactivity with course content during contact sessions and estranged social interaction in real time and space:

> I feel that a contact session, in the deepest sense of the word, it must be a face to face talk and then questioning and answering, discussing, rather than a communication by passing through the computer... (Faculty, focus group discussion).

However, they acknowledged that out of class use of the laptops was convenient. Communication and studying could now take place in the students' own time and space; and that this boundless environment had a positive effect on TEL (Guri-Rosenblit, 2005; Mottarella, et al., 2004; Proserpio & Gioia, 2007; Tang & Austin, 2009).

Besides the insufficient attention and focus in-class, faculty were concerned about possible loss of traditional skills by students in the TEL environment:

> The other problem I said to the class is that yes you can use this tool but the problem is when you go to the exam I'm not going to allow you to use the computer. I need to be able to write the Hebrew characters with your own hand so in a way computer is not helping in this situation (Faculty, focus group discussion).

In spite of the challenges, some students, faculty and management believed that TEL could contribute towards an improved teaching and learning experience:

> Improvement of teaching and learning is like that, it can lie within effective access to information that one has as result of this teaching aid (Management, individual interview).

> The level of teaching that can be supported by technology is much better if everybody involved adapts to it and takes part (Student, open-ended questionnaire).

Faculty made an effort to incorporate the laptops in class and use other available technology; everything to the students benefit:

> They make quite an effort to get us involved with the laptops (Student, individual interview).

> A few of the older lecturers or Prof. seem to have problems with the e-Fundi. They say they don't quite know what to do yet. And one of the other lecturers uses e-Fundi but loads the material wrong. He puts the dates wrong, but he is working on it, so he is managing. They are all definitely making an effort to learn (Student, individual interview).

> They undoubtedly do everything to be to my advantage. I will not be disadvantaged because of e-Fundi or the computers (Student, individual interview).

Added responsibility
Faculty feared for the quality of their teaching. Previously insurmountable information at students' fingertips could enrich their learning experiences, yet did not replace the distinction between information and knowledge (Guri-Rosenblit, 2005). The responsibility fell on faculty to devise learning strategies to ensure that students benefited from instant access to data (Wurst, et al., 2008). Faculty members pronounced that it was not their responsibility to teach computer literacy to students and viewed TEL as an additional burden that will delay students' academic development:

> The students needed the proper preparation to use this tool, because I think instead of helping, it's not… it can't progress to their full potential at the moment it's not going to work well especially with the languages (Faculty, focus group discussion).

Initiation characteristics

Three categories relate to the theme initiation characteristics: Top-down decision making, trendiness and prior research.

Top-down decision making
Changing a pedagogical system requires careful planning and inter-systemic collaboration. Several factors should be taken into consideration like, potential users, the effects on these users, management and existing research. Faculty had to make a systemic change. Adapting to TEL meant working through much uncertainty, concern and reluctance. In this kind of development all role-players should be involved (Davis, Bagozzi, & Warshaw, 1989). Adoption of TEL takes effort and careful consideration. A partnership between all role-players is vital before changing from traditional classroom-based teaching and learning to TEL. This may be the most important aspect in successfully integrating TEL at traditional HEIs. The Dean of the faculty conceded irrevocable changes in HE, but faculty members experienced being excluded from this process:

> We don't know why it has been implemented, we were simply confronted with it and it happened like that (Faculty, focus group discussion).

> We were not part of the process; we were just informed that from now on it will be like this (Faculty, focus group discussion).

Faculty members felt that although change was mandatory, their opinions were not heard and that the responsibility of reaching traditional teaching and learning outcomes was still their responsibility:

> What I'm trying to say here is having introduced to the whole system and it's like we (personnel) are not listening to each other. When I stand up and say in Greek it won't work in our environment someone will stand up and say make it work and you see now there is a struggle I must make something to work while time is passing by (Faculty, focus group discussion).

> I must reach my outcomes, there are outcomes to be achieved and someone says make it work and I say it's not working and we are wasting time by this argument its working, make it work, it's not working, make it work and so forth and where is the process of teaching and learning it's being hurt (Faculty, focus group discussion).

Besides being pushed far beyond their comfort zone, faculty members remained true to their perceived responsibility towards their students:

> I will do anything to improve things for my students. Really, I think it is every lecturer's responsibility (Faculty, focus group discussion).

Trendiness

Faculty members experienced this change to be beyond feasible, especially for languages. Being pioneers in the use of TEL did not only place much pressure on them, but they felt concerned about possible errors during decision making:

> We pay a price for being trendy and being first and other people might learn from our mistakes, but we learn from our own mistakes and worst of all the students learn from our mistakes and I don't know if it can be corrected (Faculty, focus group discussion).

> I don't know if they (lecturers) had any...A course or something to teach them how to use the technology better. It seems to me that some of them (lecturers) are forced to use it. So they are doing it to meet the minimum requirements, but it is of little use, giving us computers to enhance the learning experience without equipping them with the abilities to meet the possibilities that has been created (Student, individual interview).

Prior research

The success of the pilot project depended on the initial project preparation, which included thorough research of the system requirements to adopt TEL. Thorough research is vital when changing a pedagogical paradigm. Insufficient knowledge of this system aroused questions, like "Was significant research done before the initiation of the change?"; "What was the rationale for the project?" and "Do we know enough about the generation students we teach?":

> Much more research should have been done beforehand on all possible aspects, advantages and disadvantages, and experience from other people should have been interpreted (Faculty, focus group discussion).

> I feel that it is my responsibility as a faculty member if it is a new system at the university let it be well researched let us be well trained as faculty and professors and let the student be well oriented to the system (Faculty, focus group discussion).

> I think we fooled ourselves. We said children were computer literate from the age of four years and that is why it will be wonderful for them to continue with the computer here. We were wrong, it isn't like that (Faculty, focus group discussion).

Faculty had to plan ahead, consider controlling measures, as well as augment stereotypical classroom teaching. Both ease of use and usefulness depend on how faculty design the classroom experience and not on the technology itself (Proserpio & Gioia, 2007). Having faculty members trained to effectively integrate ICTs with their teaching will be a vital factor to promote learning (Fried, 2008; Proserpio & Gioia, 2007; Wurst, et al., 2008).

Conclusion

All motives, rewards and promises of TEL have not yet been explored. However if technology is incorporated to suit both the user and the pedagogy the result can be surprising. The researcher is suggesting the following technology implementation aspects that might be helpful during this adaptation (suggestions is applicable for this context):

1. Top-down decision making creates resistance and negative attitudes in faculty. Faculty members need to be involved from the initiation phase of TEL to become a motivated and transformed teaching corps.
2. A partnership between all system role-players must be formed.
3. There is a need for sustained overt communication between management and faculty members.
4. Current research in the field needs to be studied and the value of TEL needs to be communicated to faculty members.
5. For a TEL system to function sufficiently all learning material and the method of teaching will have to change.
6. To move away from the traditional teaching culture faculty members can start exploring a more constructive, learner-centred approach to teaching.
7. Training members of faculty for their new role and the pedagogical transformation is very important. Training can focus on new innovative and creative ways to effectively integrate technology with teaching and learning and the appropriate learning strategies effective in TEL.

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Assisting student learning through professional development: The affect of website materials and real world science on teacher development

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To improve student learning and success in a science field while at university, it is important that students begin their studies with good basic science knowledge. Thus, it is important for high school science teachers to be teaching current scientific methods. To update their skills high school teachers need to participate in professional development programs to update their own knowledge of current science research and techniques used in labs. Towards this goal, the John A. Burns School of Medicine at the University of Hawaii developed a professional development program for high school science teachers. In 2012, eight high school science teachers attended the program for eight week days over a two week period. This study is a report of the teachers' experiences within the program. Specifically, this paper reports on the results of the teachers' evaluation of the online materials and their perspectives of real world application of the learned material are investigated. The data set in this study includes all eight teachers' pre-survey responses and final survey data.

Keywords: professional development, online learning, blended learning, educational technology.

Introduction

High school teachers are persistently looking for ways in which to inspire youths to commit to the science field. The competitive nature of the science field encourages a thorough understanding of current scientific techniques and knowledge to become successful in science. It is essential for teachers to be up to date with current skills and knowledge of science to effectively educate students. As The Committee on Science Engineering and Public Policy suggest (2007), professional teacher development is necessary to evolve and boost the current state of science education. Studies investigating the effects of professional development on science teachers have been positive. For example, Radford (1998) reports that teacher development training improved teachers' confidence to teach and content knowledge within science. Moreover, teachers who engage in hands-on science benefit in their teaching practices as there is a clear indication of improvement in creating a culture of science within their classrooms (Cuevas, Lee, Hart, & Deaktor, 2005).

Unfortunately, it is evident from previous research that it is scarce for high school science teachers' to attend professional development programs frequently and engage in hands-on lab work (Parisky & Boulay, 2010; Boulay, Parisky & Campbell, 2010). In efforts to help facilitate student learning and keeping teachers up to date with current research, online materials are fast becoming a popular method to augment offline learning (Parisky & Boulay, 2010). This type of learning is termed blended learning and is an important tool in the current professional development program. Past studies have found great success in implementing online learning materials. For example, one study found that introducing a simulation program prior to engagement in labs increased comprehension of techniques and concepts in comparison to those who did not have access to the simulations (Martinez-Jimenez, Pontes-Pedrajas, Polo, & Climent-Bellido, 2003). Utilizing a blended learning approach, The John A. Burns School of Medicine (JABSOM) developed a professional development program for high school science teachers with additional online materials to augment face-to-face learning.

To evaluate the usefulness of the program and the online materials, this study seeks to investigate how eight teachers' evaluated the online materials after engaging in a professional development program. Additionally, teachers' comments on how the learned material in the program relates to real world situations are examined.

Method

Program Development

Preparation for the professional development began in 2009 with the formation of the online materials (see Boulay, Anderson, Parisky, & Campbell, 2009). The first time the professional development program initiative was conducted occurred in 2010 at JABSOM (see Boulay, Parisky, & Fulford, 2010). The program was run three years in a row, each time taking place over the summer period. Each year, the program undergoes an evaluative procedure by which the head researchers and leaders consolidate the effectiveness of the program and make any changes necessary to update the program for the benefit of the participants. Additionally, online materials were developed to augment the learning of the high school science teacher's participation in the program (see Boulay, Anderson, & Parisky, 2009; Boulay, Parisky, & Campbell, 2010).

Data Sources

The data sources for this study include all of the teachers' pre-survey responses and all of the teachers' final survey responses. The pre-survey gathered additional information about the teachers' experience and background in education. The final survey included five major sections asking about the teachers' personal molecular biology definition, their experiences in the program itself, the molecular biology techniques they learned, their evaluations of the scientists' presentations, and their evaluation of the website. Teachers also completed final written reflective statements. The final written reflective statements included prompts on their experiences in five general areas. These areas asked teachers about their initial goals before entering the program, knowledge/skills acquired during the program, how participating in the program impacted their teaching, how participating in the program influenced their attitude towards teaching, and how the program impacted on their goals.

Participants

Eight high school science teachers were invited to participate in the 2012 professional development program. Teachers ranged in total teaching experience from 2-15 years (M = 8.5, SD = 4.14). Teachers taught at their current school for an average of 6.75years (SD = 2.49). The teachers' latest academic degrees varied. For example, the latest academic degrees awarded to the teachers were MEd in Secondary Education, M.S. in Biological Oceanography, B.S. in Biology, and Post-Bachelors in Science. The year the last degree awarded to the teachers ranged from 1994 to 2010. Teachers were selected for their multiple assumed roles in their high schools. For example, some of the extra roles teachers assumed were Assistant to the Director of Curriculum, Department Chair, Science Olympiad Coach, Advisor, Instructional Leadership Team Leader, and Science Fair Assistant Coordinator. Of the 16 techniques teachers reported to have used before, the most common techniques were pipetting, centrifugation, DNA electrophoresis, and microscopy. In the professional development program various techniques were practiced in the lab including multiple techniques new to teachers. Some of the main techniques practiced in the program were centrifugation, DNA electrophoresis, DNA plasmid purification, DNA ligation, restriction enzyme digestion, western blotting, polymerase chain reaction, use of a spectrometer, immunostaining, cell culture, tissue sectioning, microscopy, and pipetting.

Analysis

Investigator triangulation (Keyton, 2006) was used in thematic analysis of the current data (Braun & Clarke, 2006; Glaser & Strauss, 1967). In the original data from 2010, multiple researchers agreed upon a set of 24 codes without any *a priori* hypotheses or themes. In 2011, researchers coded with the original set of codes in mind but several extra codes arose. In the 2012 dataset, 27 agreed upon codes were used to manually code post-surveys and final written reflective statements. In this study, only the codes labeled *website* (W) and *real world application* (RW) are investigated. In the thematic analysis nature, codes were designated as important if they were recurring (same thread of meaning), repeated (repetition of key words or phrases), and forceful (stressed phrases or words) (Owen, 1984).

Results

The results are separated into three sections. Firstly, teacher's responses to one core question in the pre-survey are reviewed. Secondly, teachers' website experiences and evaluations are reviewed. Thirdly, teachers' perspective of real world application of the content learned in the program is reviewed.

Pre-survey

Program expectations
The last question in the pre-survey asked teachers what their expectations were for the professional development program prior to participating. The most frequent theme in this question was teachers' goal of improving their abilities to help educate their students. For example, some of the teacher responses to the question were:

> To gain knowledge and experience to take back into the classroom. Also, to stir up more of an excitement first within myself, then transfer it unto the students.
>
> Learn, Learn, Learn... Advance my lab skills to be able to teach my students.
>
> Learn real-world applications of biological science principles to share with my students and to promote some career choices.
>
> I would expect to have a much deeper understanding of molecular biology concepts, learn new techniques and increase my skill level to make me a more effective instructor for students and teachers.

Undoubtedly, teachers show a concern for the welfare and future of their students. As noted above, teachers aim to inspire students into the science field, once they complete high school, and to help them succeed in their future. The following excerpts from teachers after participating in the program shows that their expectations for the program succeeded.

Website

Any reference made to the online materials was coded as *website* (W). The online materials received very positive reviews from the teachers. A theme within the W code is the teachers' perspective of using the website in their own classrooms. For example:

Classroom application using online materials

> … I will use it more as I improve my current curriculum of my molecular biology course at my school.
>
> The content on tissue culture (the video) was useful and I will use this in my class with plant tissue culture.
>
> This is a great resource for teachers to use in the classroom.
>
> I plan on using it (the website) more in the future as I expand the curriculum in my courses.
>
> I will definitely be sharing this (Information of Safety and Laboratory Equipment and Protocols) with my students.
>
> I plan to use the website materials (particularly Module 1) to help my students learn more about the laboratory procedures and techniques that I hope to cover in class.
>
> I will use the website material for before I start the lab activity with my students. I will use it as homework for them.

Real-world application

Any reference made to the application of current research was coded as *real-world application* (RW). Especially from the evaluations of watching professional scientist presentations, teachers' commented on the importance of real-world examples to take back to their students. For example:

Classroom application of real world research

> I loved learning about what the researchers are currently doing. I will be using examples from their lectures in my classes. I now have many more answers to the dreaded question "why do we need to know/learn this?" Just being able to give specific examples of how the lab techniques are used today to find new breakthroughs will be extremely valuable to me and my students.
>
> I would also love to have any of the scientists come to my class to present what they do to my students. Nothing beats real-life experience and they can provide more for my students when it comes to true application in research.
>
> Just learning about what is going on right here in Hawaii. I would never have known about the great things happening right now if I did not get to hear their presentations. I would love to have them speak to my students and get the younger generations excited about science and research that they can do here at home.
>
> By looking at the facility and learning from the people who actually works in it, I could definitely give "real-life" example of why we're learning molecular biology, as it is often the questions of students.

Conclusion

In conclusion, the results of the present study describe the usefulness of the professional development program and the online materials. The eight high school science teachers reported positive experiences after participating in the program. Before participating in the program, it was clear that teachers wanted to learn new material or update their skills to help their teaching abilities. After participating in the program, teachers found the online materials to be very helpful to them but also to their students and future curriculums. Incorporating online materials into an educational setting is also being introduced and tested at the tertiary level. For example, Andrewartha and Wilmot (2001) describe how students learning style is altered when utilizing computer based program to replace existing face-to-face teaching. By integrating virtual learning during high school, students transitioning college may benefit immensely. The evaluation of the online materials in this program clearly indicates the usefulness and attainable application of extending online learning into college curricula.

Meeting the scientists in particular gave teachers some real world examples to bring back into their classrooms to help show students why a career in science is important. Making clear the usefulness of scientific research to high school students, it is more likely their dedication to the field will extend into college. Keeping this in mind, future professional development programs should seek to update both teachers' knowledge and abilities in a scientific lab and teaching skills to bring back into their classrooms to benefit students success at the tertiary level.

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A blended approach to Canadian First Nations education: The Sunchild e-learning community

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The purpose of this research study was to investigate if and how a blended approach to Canadian First Nations education could be used to foster student engagement and success. The study examined the Sunchild E-Learning Community program through the lens of the *Seven Principles of Effective Teaching* (Chickering & Gamson, 1999). Data was collected via an online survey, interviews, and site visits. The study participants indicated that the deliberate and intentional integration of mentors at local learning centers with online teachers, who provide synchronous tutorials through the use of a web-based learning management system and conferencing tool, was the key to academic success.

Keywords: blended learning, First Nations education

Introduction

The Sunchild First Nation Reserve (40) is located in the western central part of Alberta, Canada. The reserve has an area of 52.18 square km. As of 2008, the First Nation had a registered population of 1209 people, of whom 732 live on their reserve (Government of Canada, 2008).

In 1999, members of the Sunchild First Nation considered the lack of education in their community and decided alternative methods were needed to reach First Nations students. They discovered that:

- First Nations students faced unique challenges including family and legal situations, time away from class and relocating to new homes.
- Many First Nations students were adults. These students wanted to upgrade and build a better future while meeting their current schedules and responsibilities (Sunchild E-Learning Community, 2012).

In order to address these challenges the Sunchild E-Learning Community Program was established. This program adopted a blended learning approach for high school courses by combining the use of mentors at local learning centers with online teachers who provide synchronous tutorials through the use of a web-based learning management system and conferencing tool.

The purpose of this research study was to investigate if and how this blended approach to Canadian First Nations education could be used to foster student engagement and success. All students enrolled in the Sunchild E-Learning Community were invited to complete an anonymous online survey in the fall 2011 semester. Online follow-up interviews were conducted with students in the winter 2012 semester as well as online interviews with learning centre mentors, online teachers, and administrators involved in the program. In addition, site visits to learning centers were undertaken. The following three questions were used to guide this study:

1. What are the advantages of a blended approach to Canadian First Nations education?
2. What are the challenges?
3. Recommendations for improving this approach to Canadian First Nations education?

Blended learning

The idea of blending different learning experiences has been in existence ever since humans started thinking about teaching (Williams, 2003). What has recently brought this term into the limelight is the infusion of web-based technologies into the learning and teaching process (Allen & Seaman, 2010; Clark, 2003). These technologies have created new opportunities for students to interact with their peers, teachers, and content.

Blended learning is often defined as the combination of face-to-face and online learning (Sharpe et al., 2006; Williams, 2002). Ron Bleed, the former Vice Chancellor of Information Technologies at Maricopa College, argues that this is not a sufficient definition for blended learning as it simply implies "bolting" technology onto a traditional course, using technology as an add-on to teach a difficult concept or adding supplemental information. He suggests that instead, blended learning should be viewed as an opportunity to redesign the way that courses are developed, scheduled, and delivered through a combination of physical and virtual instruction, "bricks and clicks" (Bleed, 2001). The goal of this redesigned approach to education should be to join the best features of in-class teaching with the best features of online learning to promote active, self-directed learning opportunities for students with added flexibility (Garnham & Kaleta, 2002; Littlejohn & Pegler, 2007; Norberg, Dziuban, Moskol, 2011). This sentiment is echoed by Garrison and Vaughan (2008) who state that "blended learning is the organic integration of thoughtfully selected and complementary face-to-face and online approaches and technologies" (p.148). A survey of e-learning activity by Arabasz, Boggs & Baker (2003) found that 80 percent of all higher education institutions and 93 percent of doctoral institutions offer hybrid or blended learning courses (Figure 1).

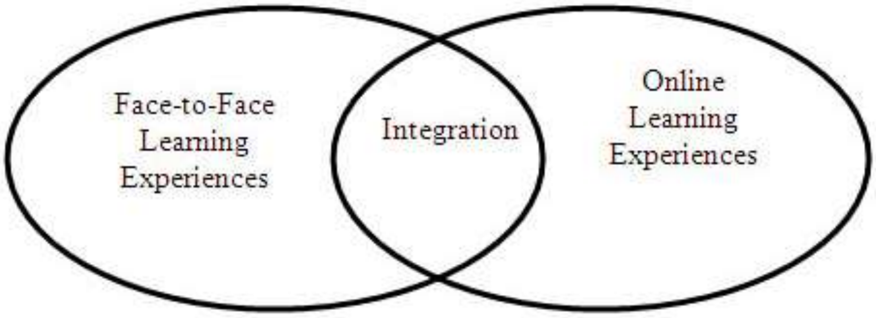

Figure 1: Campus-based blended learning approach

Campus-based environments have their roots in educational systems where classes have been delivered by teachers in synchronous class lecture settings. Initially, blended learning has been used to complement these synchronous lectures through the use of asynchronous discussion forums and learning management systems such as *Blackboard* and *Moodle*. With the advent of synchronous tools, such as *Blackboard Collaborate* and *Adobe Connect*, opportunities have been created to provide students with both synchronous and asynchronous communication possibilities.

Power (2008) has coined the term Online Blended Learning to describe the simultaneous and complimentary integration and implementation of an asynchronous-mode learning environment (i.e. a course management system, or CMS) and a synchronous desktop conferencing environment (i.e. virtual classroom). The Sunchild E-Learning Community framework has further expanded this conception of blended learning by fully integrating face-to-face and online synchronous and asynchronous learning opportunities for their students through the use of mentors at local learning centres and highly qualified online teachers (Figure 2).

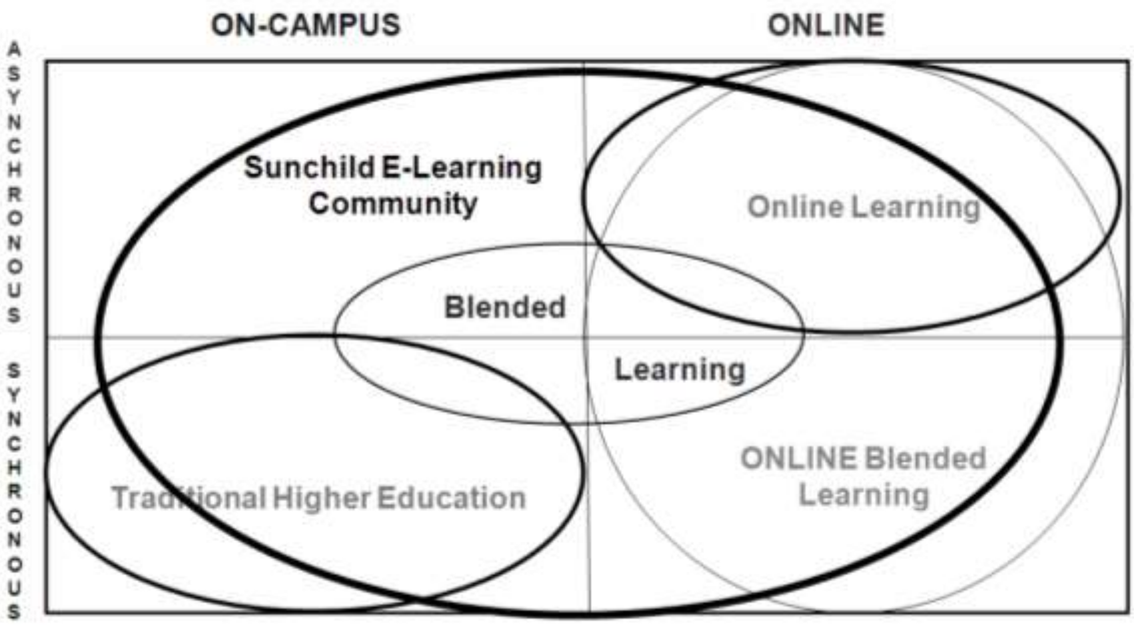

Figure 2: Sunchild e-learning community program framework

Methods of investigation

An action research (Stringer, 1999) and case-based method (Creswell, 1997) were utilized for this study. Gilmore, Krantz and Ramirez (1986) define such a framework as:

> Action research . . . aims to contribute both to the practical concerns of people in an immediate problematic situation and to further the goals of social science simultaneously. Thus, there is a dual commitment in action research to study a system and concurrently to collaborate with members of the system in changing it in what is together regarded as a desirable direction. Accomplishing this twin goal requires the active collaboration of researcher and client, and thus it stresses the importance of co-learning as a primary aspect of the research process. (p.161)

This approach consisted of a mixture of quantitative and qualitative data collection methods. All students enrolled in the Sunchild E-Learning Community program were invited to complete an online survey in the fall 2011 semester and then follow-up online interviews were conducted in December 2011 with four of the students who completed this survey. In the winter 2012 semester, these online interviews were expanded to include seven mentors, two online teachers, and the principal of the program. Two site visits were also conducted (Chinki Adult Education Center and the Calgary Aboriginal Futures Center).

The educational research literature strongly suggests that student engagement is the key to academic success and retention (Astin, 1999; Kuh, 2008; Pace, 1980; Pascarella & Terenzini, 2005). The National Survey of Student Engagement (NSSE) defines student engagement as the amount of time and effort that students put into their academic studies that lead to experiences and outcomes that constitute student success, and the ways that programs allocate resources and organize learning opportunities and services to induce students to participate in and benefit from such activities (NSSE, 2011). The NSSE is constructed on the Seven Principles of Effective Teaching (Chickering & Gamson, 1999):

1. encourages contact between students and teachers,
2. develops reciprocity and cooperation among students,
3. encourages active learning,
4. gives prompt feedback,
5. emphasizes time on task,
6. communicates high expectations, and
7. respects diverse talents and ways of learning

These seven principles are based on over fifty years of educational research (Graham et al., 2001) and they were used to guide the data collection and analysis for this study.

Findings

This section begins with a demographic profile of the student participants followed by a summary of the results for each of the three research questions based on the seven principles of effective teaching framework:

1. What are the advantages of a blended approach to Canadian First Nations education?
2. What are the challenges?
3. Recommendations for improving this approach to Canadian First Nations education?

Demographic and technology profile of student participants

There were three hundred and eight students enrolled in the Sunchild E-Learning Community in the fall 2011 semester. In order to establish a context for the study findings, the initial online survey asked a series of demographic questions (n=24, 8% response rate). Table 1 compares the demographics of students in the Sunchild E-Learning Community to students at a university in Calgary, Alberta who had recently completed a similar survey (Vaughan et al., 2011). The purpose of this comparison is to demonstrate the demographic similarities and differences of students enrolled in the rural Sunchild E-Learning Community program to those attending an urban university.

Table 1: Student comparison of Sunchild e-learning community and Mount Royal University

Student Item	Sunchild E-Learning Community	Mount Royal University
Gender		
Female	68%	55%
Male	32%	45%
Age		
Under age of 24	54%	89%
Over age of 24	46%	11%
Place of Residence		
Living with parents	46%	62%
Living with own family with children	42%	0%
Living alone	0%	10%
Living with roommates or partner with no children	13%	23%
University residence	0%	5%
Employment Status		
Currently not working	83%	23%
Currently working part-time	16%	65%
Currently working full-time	0%	23%

Two-thirds of Sunchild E-Learning Community students were female and one-third were male. The students surveyed ranged in age from 18 to over 41. There appeared to be a bi-modal age distribution with two-thirds of the students between the ages of 15 to 27 and one-third between the ages of 31 to 41 plus. In terms of place of residence, 46% of the students lived with their parents, 42% lived with their own family with children, and 12% lived with roommates or partner with no children. With regards to employment status, 83% of the students were currently not working compared to only 23% of the Mount Royal students (the remainder had either a part or full-time job).

A similar comparison was made between Sunchild E-Learning Community and Mount Royal University students with regards to access to technology and self-reported skills (Table 2).

Table 2: Comparison of technology access and skills between Sunchild e-learning community and Mount Royal University students

Technology Item	Sunchild E-Learning Community	Mount Royal University
Home access to the Internet	37%	100%
Access to high-speed home Internet connection	33%	98%
Have your own a mobile communication device (e.g., cell phone)	62%	90%
Have your own laptop computer	38%	89%
Have your own a mobile communication device with Internet access (e.g., Smart Phone)	29%	82%
Personal Rating of Computer Skills		
Novice (not really comfortable using computers)	0%	5%
Intermediate (comfortable using computers)	70%	59%
Advanced (have developed some expertise and enjoy using a computer)	30%	36%

In terms of technology access, only 37% of the Sunchild E-Learning Community students surveyed had home internet access. Two-thirds of the students had a mobile communication device (e.g., cell phone, Blackberry, iPhone), 38% had their own laptop, and 33% had access to a desktop or laptop computer at home that they share with others. Despite this lack of home and personal access to computer technologies, through participation in the Sunchild program, 70% percent of the students rated themselves as intermediate with regards to their computer skills while 30% rated themselves as experts.

Seven principles of effective teaching practice framework

Principle 1: Good Practice Encourages Student-Teacher Interaction

Frequent student-teacher contact in and out of class is one of the most important factors in student motivation and involvement (Light, 2001). Teacher concern helps students get through rough times and keep on working. Knowing a few teachers well enhances students' intellectual commitment and encourages them to think about their own values and plans (Chickering & Gamson, 1999). The Sunchild E-Learning Community is designed so that students have optimal contact with mentors at the learning centers and the online teachers through synchronous and asynchronous communication systems (Figure 3).

Figure 3: Student and mentor at the Chiniki adult learning center

Mentors

Students interviewed indicated that there is an opportunity to interact with the mentors on a daily basis that helps form a relationship and a bond over time. The mentors commented on how they know what is happening in the student's school and family life and how they gently nudge students forward through encouragement and help. The online teachers stressed that an active mentor is the key to the success of the program. The more active the mentor, the more students they draw to the site and the more they retain their students – the key to academic success.

Online Teachers

The students indicated that the one-to-one interaction in the online tutorials and personal emails from the online teachers really helped them succeed. One student also commented that "I get along with my online teachers because they don't know me, my reputation, and how I've been in the past, how I acted out in high school that gave me a really bad reputations" (Student 2). The mentors stated that Sunchild has "amazing online teachers – they really know their stuff and they are very encouraging with the students" (Mentor 5). The online teachers stressed that "we are here for the students – we are a face on the screen, a voice in the headset – more than just an email message" (Online Teacher 1). And, that "synchronous online communication is the key to establishing relationships with students – without this component it would just be a glorified correspondence program" (Online Teacher 2).

Integration

The students emphasized how important it was for them to integrate both the mentor and online teacher support. For example, "I learn new ideas and concepts in the online tutorials and then I practice them with the mentors help in the classroom" (Student 4). It's "almost like having two teachers for all of my courses" (Student 2). "Pretty well like having a teacher right beside you all the time" (Student 3).

Several of the mentors also commented on the integration of teaching support, "I can listen to the online teacher and then explain the concepts to the students" (Mentor 7). "Having both a face-to-face mentor and online teachers is important to balance student support and perspectives about learning" (Mentor 4). "Students are motivated and encouraged by both the online teachers and mentor to succeed" (Mentor 2).

Mentor - Challenges and Recommendations

The students identified mentors potential lack of educational experience and sometimes not a positive relationship with all students as a couple of challenges. The online teachers also indicated that some mentors are quite hands-off with their students and quite hands-off with the online teachers, which can lead to communication and student progress challenges.

Several students recommended having more than one mentor at each centre so that you can find someone whose personality you can relate to. The online teachers suggested that the mentors receive training and become more active in counselling students about appropriate courses. For example, having students complete basic literacy and numeracy pre-requisite modules before attempting high school level courses.

Online teacher – Challenges and Recommendations

The only challenge identified by students is that sometimes they feel like they have to wait a long time to have their questions to the online teachers answered by email despite the fact that there is a 24 hour response policy in place (except for weekends).

Both online teachers interviewed emphasized that workload was a serious issue. They indicated that to do a good job teaching online you cannot do it full time. "What has happened to some people is that they have actually burned out" (Online Teacher 2).

One of the mentors suggested having online teachers come to each of the sites to meet their students a couple of times each year, "putting an actual face to a name" (Mentor 6). And, the recommendation was made to hire more online teachers and lighten their teaching load.

Principle 2: Good Practice Develops Reciprocity and Cooperation among Students

Learning is enhanced when it is more like a team effort than a solo race (Chickering & Ehrmann, 1996). Good learning, like good work, is collaborative and social, not competitive and isolated. Working with others often increases involvement in learning. Sharing one's ideas and responding to others' improves thinking and deepens understanding. This Sunchild E-Learning Community intentionally emphasizes cooperation and community for everyone involved in the program – students, parents, mentors, online teachers, principal, and administrative staff.

Students

The program and the learning centers are designed to create a cooperative environment for the students. For example, students are able to interact and work with other students while they are at the center. In addition, "they get to participate in real online sessions with other students their age from other reserves. Not with younger students so they feel more comfortable with their learning" (Mentor 1).

The mentors also work hard to provide a sense of community and belonging at the learning centers. "I do lunches with my students so that it becomes more of a community. We do it for special holidays and at the end of each semester. This keeps the students engaged and makes them feel like they are part of something" (Mentor 2). At another center, "we've got a lunch area and a pool table in the basement of our center where students can relax and socialize" (Mentor 3). And, "we're not in the main school so the students feel like they are not going to the regular high school. The students are older and this building feels more like their place – not a traditional school with younger children" (Mentor 5). At the Chiniki Center, "they actually have their own Students Council – so there is some form of community and opportunity to socialize" (Mentor 3).

Mentors and Online Teachers

Both the mentors and online teachers interviewed commented on how they work hard to cooperate and create a community amongst themselves. One online teacher indicated that "the proactive mentors are constantly emailing me with questions – they are really involved with their students – you get to know these mentors and you have a great relationship with them (Online Teacher 2). In addition, "all the mentors and online teachers have Skype so that we can have instant conversations rather than waiting for email" (Mentor 6). One mentor has constructed" a bulletin board at our site that introduces the online teachers and the subjects they teach" (Mentor 4).

Principal

All of the mentors and online teachers were unanimous in their praise for the tremendous support and mentoring provided by the Principal of the Sunchild E-Learning Community. She works very hard to establish a sense of community for the program by always being available for help and coordinating monthly online team meetings with all the mentors and online teachers. Currently, the team is reading and discussing the *Blended Learning in Higher Education* book (Garrison & Vaughan, 2008) during their monthly meetings (Online Teacher 2). Each August, the Principal also organizes and facilitates an annual face-to-face meeting of all the online teachers and mentors in Red Deer before the start of the school year (Mentor 5).

Student - Recommendations
One student interviewed suggested that there should be more face-to-face group work. She commented that "there are lots of students in my online class but for me it seems easier to work in a face-to-face group" (Student 4).

Mentor - Recommendations
Since the mentors work with the students on a daily basis one mentor recommended that "a mechanism should be developed where mentors could have some input about common student learning issues or problems. I think this would help improve parts of some of the online courses" (Mentor 3). Support is already provided to help new mentors establish their learning centers but one mentor also commented on how important it is to include a social context to these centers so that students immediately have a sense of belonging and community (e.g., displaying their work on the walls, creating a student council, creating a lunch and leisure space).

Principle 3: Good Practice Uses Active Learning Techniques
Learning is not a spectator sport (Chickering & Ehrmann, 1996). Students do not learn much just sitting in classes listening to teachers, memorizing pre-packaged assignments, and spitting out answers. They must talk about what they are learning, write reflectively about it, relate it to past experiences, and apply it to their daily lives. They must make what they learn part of themselves. In order to achieve this ideal, Littky and Grabelle (2004) advocate for a learning environment that stresses relevance, rigor, and relationships (3R's of engagement).

Life Skills
In the interviews, all the mentors and online teachers stressed how relevant the Sunchild E-Learning Community learning experience was for the students. For example, "the students are learning so many key life skills through this program such as time management, money management, public relations skills, online and face-to-face communication skills" (Mentor 7). And, "they are learning important technology life skills through their studies – searching, word processing, spreadsheets. They receive one Career & Technology Studies (CTS) credit for doing the online orientation to the program, which is an introductory computer skills module (Online Teacher 1). In addition, "the program teaches students to be more accountable for their own learning. They become independent, mature, and self-directed learners" (Mentor 2).

Technology
The students indicated that they found learning with technology to be very motivational. They also commented on how "the computers at the center work – very few technical or Internet connectivity problems" (Student 3). One of the mentors also stressed how he had "great local IT support from the Band" (Mentor 3).

Online Learning
Several of the mentors described how the online learning component of the program was interactive and visually stimulating for the students. "Students are able to see everything on the whiteboard, write on the whiteboard, speak, or text. It's much more interactive than a conversation" (Mentor 2). "The audio and visual recorded tutorials enable students to pick up where they left off. I have seen first-hand, how this is a very valuable aspect of the program" (Mentor 6)

Technology - Challenges and Recommendation
While the students seemed relatively content with the technology and Internet connectivity at the learning centers the mentors and online teachers identified several challenges and recommendations. The Calgary Urban Center has experienced rapid growth and they identified lack of computers and printers as an issue. "It's sometimes hard to get students to come into our centre when they have to wait for a computer or printer to use" (Mentor 2). At some of the more remote sites Internet connectivity was raised as an issue. "Slow Internet connection – really impacts students' ability to view the recorded tutorial sessions" (Mentor 4).

Several student issues with technology were also raised. For example, "some of the older students initially find the technology to be a barrier – they lack the previous experience and they panic when they encounter logon or tool problems – they sometimes wish they could just use pen and paper and fax in their work" (Online Teacher 2). Or, "sometimes students forget where they saved their work – on the network or on the computer. After students make a few mistakes, they don't make them again" (Mentor 3). And, "wide open access to the Internet. I have found that some students become sidetracked very easily – such as going on YouTube" (Mentor 5).

Numerous recommendations were provided by students, mentors, and online teachers about improving the use of technology to support an active learning environment. One online teacher emphasized that is should be "mandatory that all students complete the online orientation module BEFORE they begin their academic studies – reduce anxiety and frustration and level the playing field" (Online Teacher 1). It was also suggested that "all the sites should have the same level of technology – older sites have older computers while newer sites have newer computers" and that there should be "more on-ground technical assistance – some sites are very isolated while others are right in the middle of Calgary" (Online Teacher 1). Several of the mentors echoed these comments and one indicated that he's been working hard to obtain newer technology "but it's the Band's decision and budget" (Mentor 6).

Two mentors stressed the need for "more printers, we always get students to print out their work just in case something gets lost on the computer. Also, students can take their work home with them as many of them do not have computers in their homes" (Mentor 1). And, another mentor commented that she would like to see the "SCCyber website more user friendly – navigation around the site isn't that easy" (Mentor 6).

Finally, one of the students would like to "find a way to use the online whiteboard without using the computer mouse or keyboard – I find it difficult to show the teacher how I can solve a problem by just using my mouse to write out the answer on a whiteboard" (Student 4). A potential solution maybe the purchase of a *Wacom Drawing Tablet* (http://www.wacom.com/en/Products.aspx) or even an *iPad* (http://www.apple.com/ipad/) for each of the learning centers.

Other – Challenges and Recommendations
The students and mentors both indicated that the Science and Math courses were very demanding. One of the mentors suggested that there should be "extra tutorial time for courses like Science and Math 10. These are heavy courses and there is a lot covered. I think students need some extra time and assistance with these courses" (Mentor 2).

Principle 4: Good Practice Gives Prompt Feedback
Knowing what you know and don't know focuses your learning. In getting started, students need help in assessing their existing knowledge and competence. Then, in classes, students need frequent opportunities to perform and receive feedback on their performance. At various points during courses, and at their end, students need chances to reflect on what they have learned, what they still need to know, and how they might assess themselves. The Sunchild E-Learning Community program places a huge emphasis on frequent and weekly assessment feedback (Figure 4).

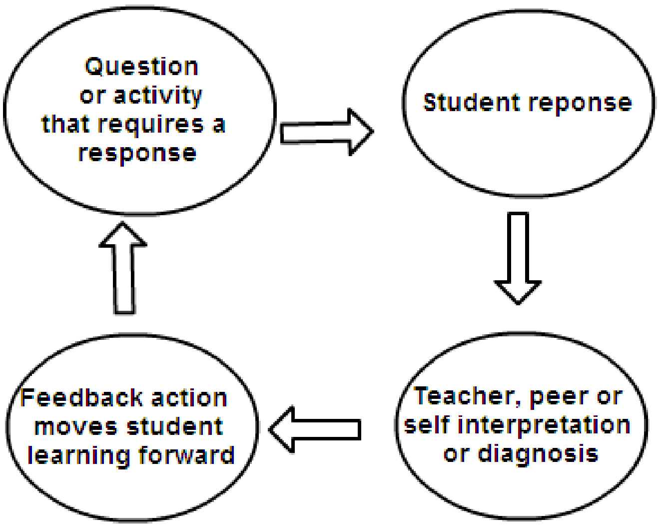

Figure 4: Student assessment feedback loop

Students
Through the use of the online grade book in the *Moodle Learning Management System* the students "have access to their grades online, which is updated every Monday morning. So the students know from Monday to Monday if they are passing or failing a course" (Mentor 1).

Mentors
The mentors are constantly providing students with feedback and checking in on assignment completion. "A week does not go by without me personally checking in on student progress" (Mentor 7). "Any time a student emails a completed assignment to an online teacher it gets copied to the mentor. The mentor also gets a copy of the marked one as well" (Mentor 3). The students commented that this immediate assistance and feedback with questions and any problems with the computers really helped with their academic progress (Student 1).

Online teachers
Students indicated that they can always get an email reply or one-to-one tutorial assistance for difficult questions from their online teachers (Student 3). "All the student assignments that are completed by Thursday are returned to each student by the following Monday with a grade and assessment feedback" (Online Teacher 2).

Principal
If there are any serious academic issues with students the principal of the program will talk to them right away and sort out the problem (Mentor 6).

Integration
The students interviewed described how immediate and weekly feedback from both the online teachers and mentors is critical to their academic success. "If I have a question I get immediate feedback from either the mentor or online teacher – there is no waiting around or confusion" (Student 2). In addition, every Monday the mentors "get a report from the online teachers about each student's progress. It contains two columns – an average for assignments completed and an average for all assignments, including the ones not completed. I then add my comments to the report and email it to the student. I then sit down and review the report with each student each week" (Mentor 2).

Principle 5: Good Practice Emphasizes Time on Task
Time plus energy equals learning. Learning to use one's time well is critical for students and professionals alike. Allocating realistic amounts of time means effective learning for students and effective practices for mentors and online teachers. In the interviews, the students and the mentors stressed how the computers, the learning centers, and the weekly emphasis on organization and scheduling helped them stay focused and on-track with their academic studies. (Figure 5).

Figure 5: Focused student work in the learning centers

Computer-based learning
Some of the students interviewed had encountered conflict with teachers and peers at other schools. They indicated that “when I’m on the computer – I’m focused on just learning not worrying about getting along with other students or teachers” (Student 1). I can “focus on learning not on classroom ‘drama’ – it’s not based on your personality like a normal school” (Student 3)

Learning Centers
For many of the students involved in the Sunchild E-Learning community the home environment is not an ideal place for academic studies. Students commented that the learning centers are a “Safe and quiet place to learn – not like my home” (Student 2). The mentors indicated that they “really work hard to make sure there are no distractions” at the learning center (Mentor 2). “The students can work at their own pace. They get their headsets on and they just focus on their learning. They don’t worry about other people in the room or any other distractions” (Mentor 3).

Organization and scheduling
The mentors provide on-going support for the students with the organization and scheduling of their academic studies. “We help our students to continually stay on track with their studies. I meet with each of my students once a week. We go over where they need to be and where they are with their studies. For example, if they have 9 assignments and only 6 have been handed in, what is going on with the other 3?” (Mentor 2). We also “help the students organize and schedule their high school program – funding forms, weekly schedules and progress reports” (Mentor 6).

Challenges
The only challenge identified for keeping students focused and on task came from students and mentors at the Calgary Urban Centre. They indicated that their learning center needs “more computers and printers – as students often have to wait for access” (Student 1).

Principle 6: Good Practice Communicates High Expectations
Expect more and you will get it. High expectations are important for everyone — for the poorly prepared, for those unwilling to exert themselves, and for the bright and well motivated (Chickering & Gamson, 1999). Expecting students to perform well becomes a self-fulfilling prophecy. The Sunchild E-Learning Community has developed a series of strategies to communicate high expectations to their students (Figure 6).

Figure 6. Learning center wall of success

Wall of Success
At “each of our centers there is a Wall of Success – where student accomplishments are posted and profiled” (Mentor 2). In addition, there is a bulletin board at each learning center that advertises careers, future learning opportunities, and colleges and universities – providing goals for the students to strive for.

Additional Strategies
The mentors indicated that the program uses a combination of strategies to communicate high expectations “deadlines, real online teachers to talk to and get help and encouragement. Sunchild is much more motivating

that just using workbooks on your own" (Mentor 7). And, one of the students commented that "all the support makes me want to step up my game and graduate from high school" (Student 4).

Principle 7: Good Practice Respects Diverse Talents and Ways of Learning

Many roads lead to learning. Different students bring different talents and styles to their studies. Brilliant students in a classroom might be all thumbs in a lab or studio; students rich in hands-on experience may not do so well with theory. Students need opportunities to show their talents and learn in ways that work for them. Then they can be pushed to learn in new ways that do not come so easily. Everyone interviewed commented how the Sunchild E-Learning Community's blended approach to learning supports diverse talents and ways of learning (Figure 7).

Figure 7: Synchronous online tutorial in Blackboard Collaborate

Blended Learning – Flexibility

The blended approach utilized by this program provides students with the flexibility to succeed in their academic studies. "Flexibility for students like myself who are single parents with children under the age of 12. I could still log on from home and continue my studies. I let the mentor know that I was sick but could still connect with the online teachers. If it wasn't for this flexibility I would probably not have graduated with my Grade 12 diploma (Mentor 6). "This program takes the best of face-to-face and online learning to provide flexibility and alternative learning pathways for our students. Sunchild is more than just passing or failing our students. We actually want our students to learn and understand what they are being taught – to take ownership for their learning" (Mentor 2).

Blended Learning – Communication

In the online sessions "we can communicate either by speaking or texting – depending on how comfortable we feel" (Student 3). In addition, "online learning is easier and more environmentally friendly – not a lot of paper" (Student 2).

Blended Learning - Self -pacing

All of the online tutorial sessions are recorded and archived "so students can play them again at their own pace and location – at the center or at home (Online Teacher 1). The students indicated that these "recorded sessions are really helpful because sometimes I forget important points or ideas" (Student 4).

Blended Learning – Challenge and Recommendation

One of the online teachers believes there is a "direct correlation between student attendance in the live sessions and student success in a course" (Online Teacher 2). I would recommend that students should be strongly encouraged to not only attend but to actively participate in these live sessions – either by voice or text chat.

Recommendations – Additional Courses
The vast majority of students, mentors, and online teachers interviewed were satisfied with the current courses offered by the Sunchild E-Learning Community. They indicated that these courses provided a solid foundation for an accredited Alberta High School Graduation Diploma. As the program continues to grow and evolve, recommendations were made for additional life skills, options, and college and university bridging courses.

Life Skills
The mentors and online teachers interviewed suggested that there should be “more basic level knowledge and employability skills courses” (Online Teacher 2). For example, “maybe some more life skills courses like coping with conflict and issues. A lot of our students are having problems at home which keeps them from passing or doing any school work” (Mentor 6). In addition, one mentor suggested “more single credit CTS courses” in order to encourage student success and course completion (Mentor 4).

Options
Several mentors suggested the addition of Fine Arts courses such as Art 10. “There are no Fine Arts courses but maybe in the local community they could find someone to teach them piano or art work” (Mentor 5). In the southern part of Alberta, mentors would “like to see us getting the Blackfoot language courses up and running so that we are covering the languages relevant for our students. Sunchild now has sites in all three Blackfoot reserves in Alberta” (Mentor 2).

College and University Bridging Courses
One mentor indicated that “we have some adults who have finished high school who would like to come back but we don’t have any College courses to offer them right now” (Mentor 1). Another mentor mentioned that there are some bridging courses and programs to “NAIT and DeVry but that these should be expanded to other Alberta colleges and universities” (Mentor 6). Hopefully, as a result of this program evaluation study Mount Royal University will become a more active bridging partner.

Conclusion and recommendations

> If students learn to make education a priority they are going to succeed in life. (Mentor 3)

The study participants indicated that the blended approach of the Sunchild E-Learning Community program through the deliberate and intentional integration of mentors at local learning centers with online teachers, who provide synchronous tutorials through the use of a web-based learning management system and conferencing tool, was the key to academic success. They also emphasized how this blended approach helped First Nations students overcome major learning challenges such as remote locations, lack of access to digital technologies, high speed internet access, and quality teachers. An evaluation of this program through the lens of the *Seven Principles of Effective Teaching* (Chickering & Gamson, 1999) clearly demonstrates that this task is being accomplished.

Principle 1: Good Practice Encourages Student-Teacher Interaction

Synchronous and asynchronous communication technologies are being used by students in the Sunchild E-Learning Community to increase access to their online teachers and mentors, help them share useful resources, and provide for joint problem solving and shared learning that is being combined with face-to-face mentoring at the learning centers. These communication technologies are strengthening online teacher interactions with all students, but especially with shy students who are reluctant to ask questions or challenge the teacher directly. These students find that it is often easier to discuss values and personal concerns in writing rather than orally, since inadvertent or ambiguous nonverbal signals are not so dominant.

The roles and responsibilities of the online teacher in this program can become overwhelming and a recommendation has been made to have each of the online teachers log their daily activities for a one week period. Then, at one of the monthly team meetings the results can be shared and strategies developed for managing the workload of an online teacher in the Sunchild E-Learning Community.

Principle 2: Good Practice Develops Reciprocity and Cooperation among Students

The Sunchild E-Learning Community strategically works at creating a cooperative learning environment amongst the students, parents, mentors, and online teachers. The focus of the program is on self-paced learning but the study participants suggested that communication and information technologies could be used to support additional opportunities for study groups, collaborative learning, group problem solving, and discussion of assignments.

In addition, many of the students and mentors emphasized how important it is to create a sense of community at the learning centers (e.g., displaying student work on the walls, creating a student council, creating a lunch and leisure space). A recommendation has been made to have senior mentors travel to new sites to help the new mentors establish their learning centers.

Principle 3: Good Practice Uses Active Learning Techniques

The range of technologies that the Sunchild E-Learning Community uses to encourage active learning is extensive. In the past, apprentice-like learning has been supported by many traditional technologies: libraries, laboratories, art and architectural studios, athletic fields. Newer digital technologies can now enrich and expand these opportunities – especially for those students located in rural and remote parts of Alberta and the Northwest Territories. For example:

- Supporting apprentice-like activities in fields that themselves require the use of technology as a tool, such as statistical research and computer-based music, or use of the Internet to gather information not available in the local library.
- Simulating scientific techniques such as helping chemistry students develop and practice research skills in “dry” simulated laboratories.
- Helping students develop insight. For example, students can be asked to design a radio antenna. Simulation software displays not only their design but the ordinarily invisible electromagnetic waves the antenna would emit. Students change their designs and instantly see resulting changes in the waves. The aim of this exercise is not to design antennae but to build deeper understanding of electromagnetism.

Many of the students enrolled in this program also have their own mobile devices and a recommendation has been made to have them use these devices to document and record their learning in their local communities. For example, they could use their phones to take pictures and record videos that could then be used in the creation of digital stories for course assignments (*Center for Digital Storytelling* - http://www.storycenter.org/).

Principle 4: Good Practice Gives Prompt Feedback

The combination of a learning center mentor and online teacher for each course ensures that all students enrolled in the Sunchild E-Learning Community receive timely and regular feedback about their academic studies. Computers also have a growing role in recording and analyzing personal and professional performances. Teachers can use technology to provide critical observations for an apprentice; for example, video to help a novice teacher, actor, or athlete critique his or her own performance. Teachers (or other students) can react to a writer’s draft using the “hidden text” option available in word processors: Turned on, the “hidden” comments spring up; turned off, the comments recede and the writer’s prized work is again free of “red ink.”

In addition, as Alberta Education moves toward portfolio assessment strategies, computers can provide rich storage and easy access to student products and performances. Computers can keep track of early efforts, so teachers and students can see the extent to which later efforts demonstrate gains in knowledge, competence, or other valued outcomes. Performances that are time-consuming and expensive to record and evaluate — such as leadership skills, group process management, or multicultural interactions — can be elicited and stored, not only for ongoing critique but also as a record of growing capacity.

Principle 5: Good Practice Emphasizes Time on Task

The Sunchild E-Learning Community program allows students to work at their own pace in a safe environment with constant monitoring of their progress. The mentors and online teachers interviewed indicate that some students have problems completing their assignments in a timely fashion and thus, have to hastily complete a large portion of them at the very end of the semester. Strategies have been put in place to enforce regularly-distributed deadlines that encourage students to spend time on tasks and help them avoid procrastination. These deadlines also provide a context for regular weekly contact with the mentors and online teachers.

Principle 6: Good Practice Communicates High Expectations

This program does an excellent job of communicating high expectations and publicly praising students through the *Wall of Success* (student course completion certificates) at each learning center. Communicating high expectations for student performance is essential. An additional way for teachers to do this is to give challenging assignments. For example, assigning tasks that require students to apply theories to real-world situations rather than remember facts or concepts. This case-based approach involves real-world problems with authentic data gathered from real-world situations.

Another way to communicate high expectations is to provide examples or models for students to follow, along with comments explaining why the examples are good. Teachers can provide examples of student work from a previous semester as models for current students and include comments to illustrate how the examples met the required expectations. In addition, the online teacher can provide examples of the types of interactions she or he expects in the discussion forum. One example would be to provide an exemplary posting while also providing an example of what *not* to do, highlighting trends from the past that she or he would like students to avoid.

Principle 7: Good Practice Respects Diverse Talents and Ways of Learning

Finally, the Sunchild E-Learning Community clearly demonstrates how communication and information technologies can be used to support different methods of learning through powerful visuals and well-organized text; through direct, vicarious, and virtual experiences; and through tasks requiring analysis, synthesis, and evaluation, with applications to real-life situations. These digital tools are also being used to encourage self-reflection and self-assessment. In addition, technologies are being used in this program to help students learn in ways they find most effective and broaden their repertoires for learning. The technologies, with the mentor and online teacher's support, are supplying the structure for students who need it while leaving assignments more open-ended for students who don't. Fast, bright students can move quickly through materials they master easily and go on to more difficult tasks; slower students can take more time and get more feedback and direct help from the online teachers and mentors.

Finally, every Sunchild E-Learning Community student who participated in this study commented on the "passion and commitment" that the mentors, online teachers, and administrators involved in this program had for student success. They all emphasized that the Sunchild E-Learning Community was "making a difference for their lives". This enthusiasm for learning is definitely infectious and it is strongly recommended that more government departments, educational institutions, and corporations partner with this program in order to expand the positive impact on the lives of First Nations students in Canada.

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What's the risk of disease? Software tools to support learning concepts of risk perception and assessment

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Risk assessment for human and animal diseases is performed to clarify pathways that may result in disease, and estimate the likelihood of this outcome in specific settings; the outputs are typically used to inform decisions and support policy development. It is often performed using a structured process of elicitation of opinion from subject experts, which aims to minimise the inherent element of uncertainty due to the subjective nature of elicitation. User-friendly software tools can generate insights into risk perception of assessors, elicitation of expert opinion and quantitative estimation of risk. Such tools were incorporated into an online postgraduate course on risk analysis delivered to 36 veterinarians across South Asia. The activities developed to apply these tools required careful staging and scaffolding within the course framework. They highlighted the importance of good coordination and effective communication between the assessors, as well as with the course tutors.

Keywords: risk analysis; risk perception; cognitive maps; network analysis; online learning.

Introduction

The rate of emergence and global spread of new, highly infectious diseases such as severe acute respiratory syndrome (SARS), avian influenza (H5N1) and H1N1 influenza is accelerating (Jones et al., 2008). A common feature of these diseases is that they originated in animal populations before crossing the species barrier to infect humans. Timely identification of such novel infections is essential to implement measures for preventing their spread. This can be challenging for a number of reasons. Firstly, differentiating such new infections from known infections can be difficult, especially if the symptoms are quite generic ("flu-like"). Secondly, their diagnosis requires the presence of suitably skilled human and animal health professionals, as well as adequate facilities and resources. A third prerequisite is the effective coordination between public health and animal health professionals, within as well as between countries. The rapid globalisation of diseases such as SARS and H1N1 influenza has exposed shortcomings in all three of these areas. This has mobilised substantial investment to increase capacity. A key perceived need is the strengthening of cross-sectoral collaboration between doctors and veterinarians, an approach known as 'One Health' (Zinsstag et al., 2011); the foundation of effective action begins with education (Conrad et al., 2009; Osburn et al., 2009).

In 2010 Massey University launched a 'One Health' programme in Asia to strengthen the management of current and emerging human and animal diseases (Vink et al., in press). This programme provides formal training of public health doctors and veterinarians through two Masters degrees: a Master of Public Health (Biosecurity) and a Master of Veterinary Medicine (Biosecurity). The first cohort of students, who commenced their studies in May 2010, consisted of 70 doctors and veterinarians with relevant experience in disease control activities from Afghanistan, Pakistan, India, Bangladesh, Nepal and Sri Lanka. Equal numbers of doctors and veterinarians were enrolled, the objectives being a) to strengthen technical capacity, and provide a unified epidemiological lexicon, b) to foster interaction, communication and active collaboration between the professions and between the participating countries, c) to establish an effective professional network that will be able to bring into practice the principles of 'One Health', and d) to improve the candidates' competence at using information and communication technologies, and confidence in working in an online environment. The Masters programmes require completion of eight courses, as shown in Figure 1. Seven of these are taught entirely online, using the Moodle Learning Management System (LMS) (Moodle, 2012); the remaining course (the fourth of the foundation courses) is a combination of online and face-to-face training. The first four courses provide a foundation in epidemiology and are common to both degrees. The remaining four courses address specialised topics related to human or animal health.

This paper presents a selection of interactive learning activities that were integrated into the veterinary specialty course entitled "Risk and Decision-making During Disease Outbreaks" (Figure 1). In the subsequent section, we will summarise the aims, pedagogical considerations, design and structure of the course. This will be followed by a description of three specific activities, successively defining the objectives, implementation and outcomes of each. The paper will conclude with a general discussion on how these activities contributed towards achieving the course aims.

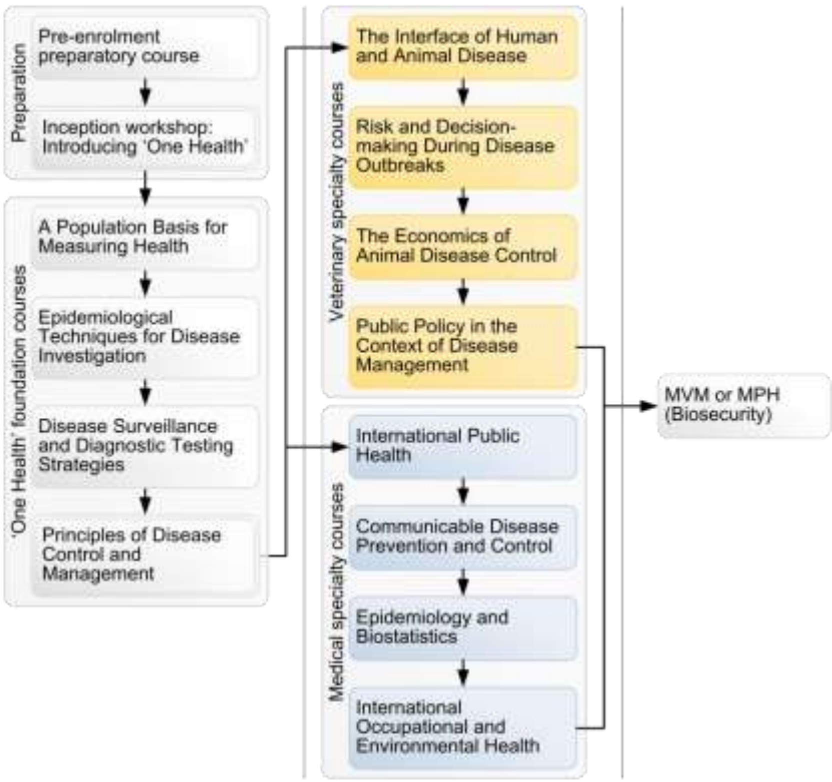

Figure 1: Programme structure of the MVM (Biosecurity) and MPH (Biosecurity) programme. The activities described in this paper fall within the second course in the sequence of veterinary specialty courses, "Risk and Decision-making During Disease Outbreaks".

Considerations informing course design and structure

Risk assessment is performed for human and animal diseases to clarify and quantify pathways that may result in disease, and estimate the likelihood of this outcome in specific settings. The outputs are typically used to inform decisions for the management and control of disease. In analogy with evidence-based medicine, the risk assessment process strives to make use of the most reliable and current knowledge. We can distinguish between explicit knowledge (which is recorded or quantified) and tacit knowledge (which is individual and experiential) (Sandars and Heller, 2006). As the amount of available explicit knowledge on which to base an assessment of risk is often limited, structured techniques have been developed to incorporate the tacit knowledge held by "subject experts". This conforms to the social constructivist view of knowledge, which holds that the knowledge base used for decision-making is not static, but is constantly being expanded and augmented by information-sharing and incorporation of tacit knowledge. This is an integrative process: learners are actively attempting to "update" meaning (Siemens, 2005) and are "learning by doing" (Harasim, 2000). The constructivist theory has led to the concept of "communities of practice" consisting of individuals or members who actively contribute to and expand this collective knowledge base. Such communities can be formally or informally structured, and can meet face-to-face or virtually (Sandars and Heller, 2006).

The course aims were to enable students to formulate risk pathways that may result in disease, estimate the likelihood of this outcome, and utilise these outputs for decision-making. A key objective of the course design was to implement "active" modes of learning which encouraged small-group work and active collaboration. Thirty-six students from Bangladesh, India, Nepal, Pakistan and Sri Lanka were enrolled and grouped into six groups with as diverse a membership as possible in terms of nationality, professional experience and ability. This strived to foster a sense of community of practice, which is reflective of the environment within which risk assessments are carried out in reality. One tutor supported each group when they undertook specific activities; at other times the course coordinator (the second author) provided student support. She also oversaw the delivery of the course, and was involved with overall course assessment and evaluation.

The course was delivered online over a six-week period with a study load of about 20 hours per week. All study materials were made available in the Moodle course, including readings and resources; in addition, all students had full access to the Massey University library. Intensive use was made of native Moodle functionality to perform a combination of individual and group work, including discussion forums, lessons, quizzes and questionnaires. To carry out the specific risk assessment exercises, use was made of additional software tools which were embedded as seamlessly as possible into the LMS. As the course was delivered over a compressed time period, the sequence of content and activities was quite rigidly staged. To ensure students could plan for and engage in the synchronous and asynchronous group activities, they were informed of key calendar dates one month before the course started, and upon course commencement were presented with a clear 'roadmap' that outlined activities and assessment dates. Assessment consisted of a combination of individual and small-group outputs. The main assignment (50% of the course total) consisted of an individual risk assessment performed by the student on a topic of his or her own choosing, applying the techniques taught in the course. The activities described below counted for a total of 30%, with the remainder made up of quizzes and the student's participation in the small-group activities.

Course activities

Three specific activities are described in this section. Each made use of a specific software tool. The activities represented a logical sequence, namely:

- Ranking of disease hazards and agreement between assessors, to illustrate the importance of discussion for overcoming ambiguities in individual risk perception.
- Cognitive mapping of a disease outcome, to illustrate differences in perception and outlook, even when developed as a group, that is, that different "communities of practice" will reach different endpoints.
- Formal specification of a risk model, to quantify the likelihood of a disease outcome under different conditions.

The first two activities were performed in groups, while the third was individual.

Risk ranking and risk matrix development

Definitions and objective
The central concept of a risk matrix is that the likelihood and consequence of disease events are individually scored on a discrete scale by a number of assessors. These descriptors are then used to quantify the level of risk. When repeated for different disease hazards, the hazards can be ranked by risk, and the variability of the risk scores between the assessors can be measured. As the categories on which the scales are based are descriptive, this process is qualitative. This can hinder interpretation, reducing the level of agreement; a process that is referred to as linguistic uncertainty (Regan et al., 2002). Typically, several rounds of risk scoring and discussion are needed to satisfactorily deal with the problems of language and interpretation.

The objectives of this activity were to emphasize problems associated with myopia and overconfidence in performing risk analysis, and to instil an appreciation of the capacity of communication and discussion to buffer against these problems. This demonstrates that it is unwise to rely on the perception and tacit knowledge of the individual, and that even within a group, an iterative process is required to refine the analysis.

Implementation

The activity was structured in a similar fashion as described by Carey and Burgman (2008). In a questionnaire in Moodle, students were asked to qualitatively estimate the consequences associated with eleven infectious animal diseases. Each disease was assigned a numeric score ranging from 1: Insignificant to 5: Catastrophic. Subsequently, the students were asked to estimate the likelihood of these diseases occurring, ranging from 1: Rare to 5: Almost certain. The results were compiled into a risk matrix using Subjective Risk Assessment, a Flash-based tool (Australian Centre of Excellence for Risk Analysis, 2012). Outputs for each group were made available, including a correlation matrix, which measured the level of agreement between each pair of students in the rank order of risk posed by the eleven disease hazards (Figure 2) and a hazard ranking graph, which ordered the disease hazards by magnitude of risk while also displaying the variability of the responses for each disease (Figure 3).

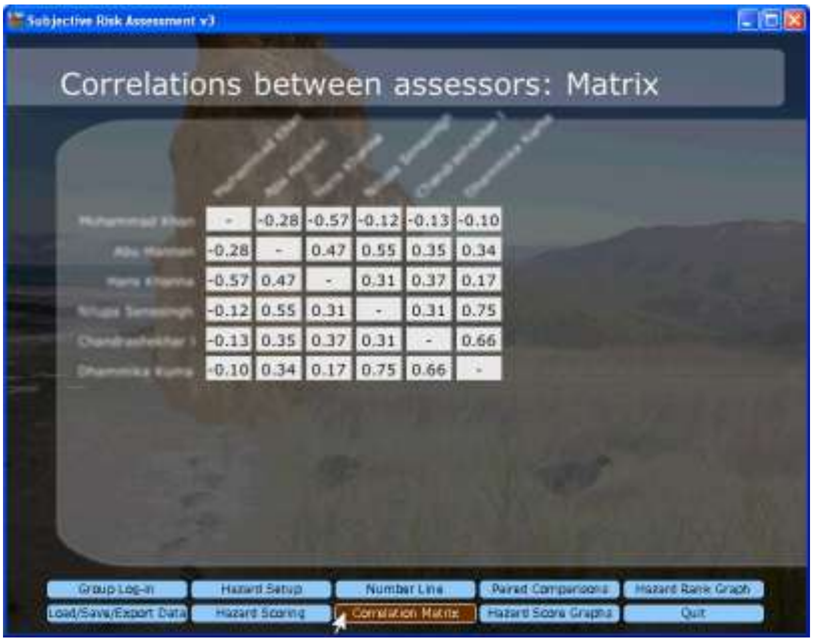

Figure 2: Screenshot of the Subjective Risk Assessment interface, showing the rank correlation matrix between six students in one student group. The scores range from 1 (perfect agreement in rank order) to -1 (complete disagreement), with 0 indicating the level of agreement that could have arisen purely by chance.

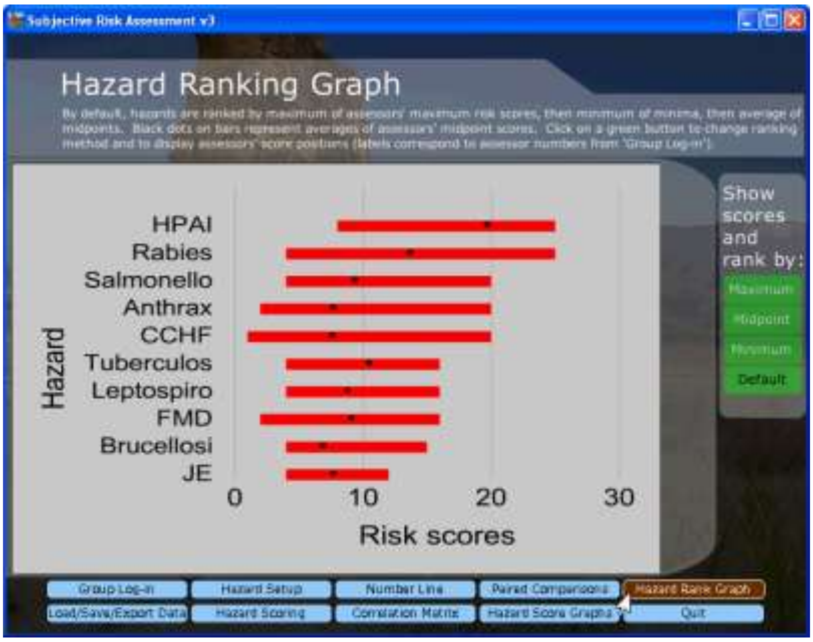

Figure 3: Screenshot of the Subjective Risk Assessment interface, showing the hazard ranking graph for the top ten of eleven diseases of one student group.

In a grouped Moodle discussion forum, students were asked to interpret and discuss the results. They had the opportunity to directly discuss their scores with whomever showed poor agreement to themselves. Subsequently, the sequence of steps was repeated to assess the consistency of the ranking, and whether the agreement between the students had improved.

Students attributed poor agreement entirely to the fact that groups included members from different countries within South Asia, representing a diverse range of backgrounds. To show that these factors could not explain all the variability, the responses of the two questionnaires were also used to generate five country risk matrices.

Outcomes
The level of agreement in the first round of assessment was generally poor; there were substantial differences in the risk rankings of the disease hazards, as well as in the variability in the perceived risk of each hazard.

In the discussions that followed in the Moodle forums, the six groups generated 187 discussion threads with over 300 comments posted over a four-day period. However, while the hazard rankings in the second round of assessment were somewhat more consistent, and the within-group variability did decrease, the magnitude of the effect was not substantial. For the country-level groups, the students expected the rankings to be more consistent than the regional groups, with smaller variability; this was not the case.

In summary, no clear patterns emerged. This result can be primarily attributed to linguistic uncertainty (Carey and Burgman, 2008), that is, uncertainty arising from inconsistent interpretation of words, or different or imprecise meanings of words. This was alluded to in the discussions, in which students mentioned that they found it difficult to assign scores to consequence or likelihood in such a general context.

Cognitive mapping of a disease

Definitions and objective
Cognitive maps, which were introduced in the 1970s by Robert Axelrod (1976), are graphical tools for organizing and representing knowledge, and reflect a ‘narrative’ of cause and effect (Novak and Cañas, 2006). They are directed graphs in which nodes represent key concepts, and interconnecting edges represent causal relationships. They are developed following a process of elicitation, which involves selecting relevant concepts, and specifying the direction and sign (positive or negative) of the associations between the selected concepts (Maule et al., 2004). Cognitive maps have been extensively used in education, including in the medical field (Pinto and Zeitz, 1997; Cañas et al., 2003). In medical education, they were found to assist learning for causal mechanisms in the development of disease (Kumar et al., 2011).

In the context of disease causation, it is customary to define an outcome (disease) and putative factors which influence the risk of this outcome occurring. Cognitive maps can effectively visualise the complex and dynamic processes that lead to disease, incorporating factors which are directly related to the outcome (e.g. an infectious agent) as well as factors exerting more indirect effects (e.g. social, cultural and economic drivers). As a consequence of inherent differences in perceptions and outlook, it is inevitable that different people will construct different cognitive maps for the same problem, even when presented with a common set of defined concepts. Elicitation within a community of practice representing multiple stakeholders draws on collective insights, knowledge and experience: this can improve and prioritise exposure pathways. The collaborative nature of elicitation can reconcile different perspectives and reduce linguistic misunderstanding through clear articulation and communication of causal pathways.

The objective of this exercise was to demonstrate that, even when constructing cognitive maps for the same outcome and starting with the same set of factors, and communicating in real time rather than asynchronously, there is substantial variability in the final maps produced; in other words, that the communities of practice represented by the groups had developed distinct ideas and perceptions.

Implementation
This activity was performed as a combination of small-group and individual activities. The disease chosen was rabies, at it has serious implications in human and animal populations, and is prevalent throughout the region in which the course was taught. Consequently, all students had good understanding and knowledge of the disease. Use was made of the IHMC CmapTools software (Institute for Human and Machine Cognition, 2012). A CmapServer was installed on a web server at Massey University, and used to develop the cognitive maps. The students downloaded and installed CmapTools on their laptops, and connected to the CmapServer (Figure 4).

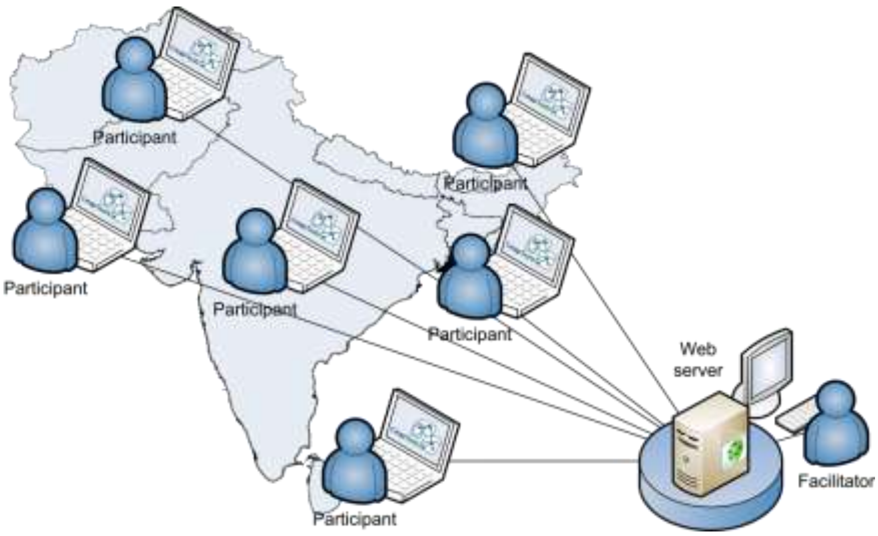

Figure 4: Schematic diagram of the cMapTools activity. One facilitator mediated two synchronous sessions with an average of six participants from throughout the region.

Each of the six student groups could access a folder on the server (Figure 5), which contained a cognitive map containing an outcome node (a human case of rabies, shaded black), and a "parking lot" of concepts: 20 or so risk factors (shaded blue) and six management interventions (shaded green). The maps were developed by the groups using the IRC facility which enabled synchronous collaboration. At appointed times, the students accessed their group map to discuss its development. The group tutor moderated the discussion and followed the lead of the students to construct the map, using the available concepts. To avoid excessive complication, groups were asked to include no more than two management options and six to eight factors. Groups had the option of defining any missing concepts, if they considered these to be essential to discerning the merit of alternative management interventions. The cognitive maps were developed in two sessions of up to two hours each.

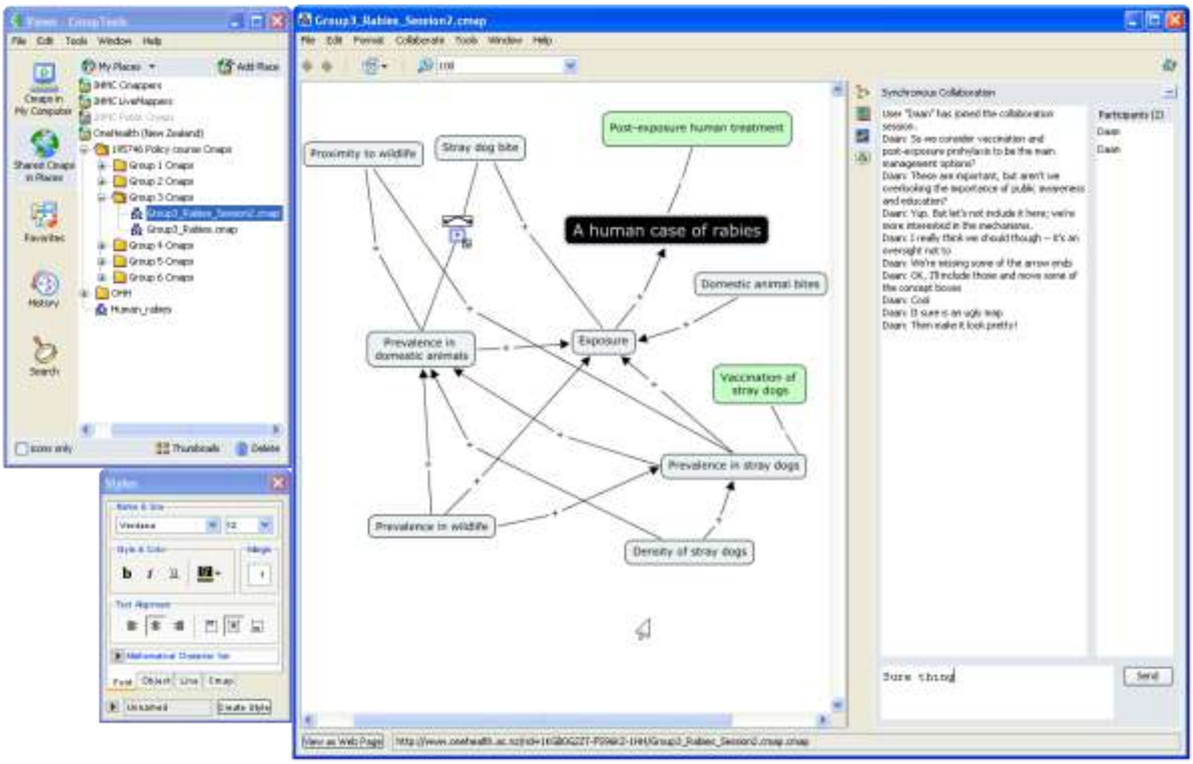

Figure 5: Screenshot showing the cMapTools interface, including the location of the server (left top), formatting dialog (left bottom), main user interface (main panel) with real-time IRC.

After finalisation of the maps, they were uploaded and shared to all students. As part of their assessment, students were asked to constructively review the output of one other group.

Outcomes

As expected, there were substantial differences between the cognitive maps produced by the six groups, in terms of the overall structure (which included linear and hierarchical causal pathways and maps characterised by high interconnectivity and multiple feedback loops) as well as in the number and selection of concepts chosen. The activity was effective in that it demonstrated the variability between groups; it did help to structure thinking, leading to the definition of exposure pathways and mechanisms; and restricting the number of concepts stimulated discussion on which interventions and risk factors to prioritise.

Constraints of this activity included the logistic requirements (installation of CmapServer, setting up for the activity, providing detailed and accurate installation information to the students); the time differences between New Zealand and the five countries; and limitations in internet connectivity, which made participation very difficult for a small number of students.

CmapTools was voluntarily utilised by students in successive courses in the programme, in different assignments; this indicates that the software was considered user-friendly and insightful.

Quantifying risk by specification of a probabilistic model

Definitions and objective

The methods and models considered up to this point were qualitative in nature, or relied on qualitative inputs. As described above, cognitive maps can provide a loose structure for articulating perspectives and pathways. In addition, they can provide a visual model which can form a basis for the specification of a quantitative model, i.e. one in which the inputs and outputs are expressed numerically (Maxwell and Buede, 2003; Mingers and Rosenhead, 2004). The objective of this third activity was to introduce one method of specifying a quantitative model. Such models can easily become mathematically complex. However, the software used for this activity enabled graphical specification of the relationship between variables. This was followed by entry of input values; the software then computed the output value.

Implementation
As the objective was to familiarise the students with the software, this activity was implemented in Moodle as an individual lesson, rather than as a group activity. The starting point was a simplified cognitive map representing the relationship between several concepts and the occurrence of a human case of rabies (Figure 6).

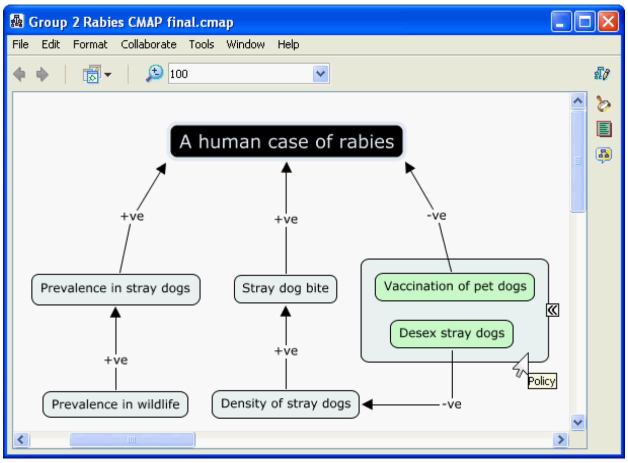

Figure 6: Simplified cognitive map which was used as a basis for quantifying the risk probabilities.

The activity made use of specific software called Netica (Norsys Software Corp., 2012) which enabled the students to replicate this cognitive map, and assign probabilities to the levels of each concept (Figure 7). The software used probability theory to estimate the likelihood of the outcome (a human case), for each of four policy conditions under consideration. All input values were given. Students were asked to update the model by altering parameters and recalculating the estimated outcome.

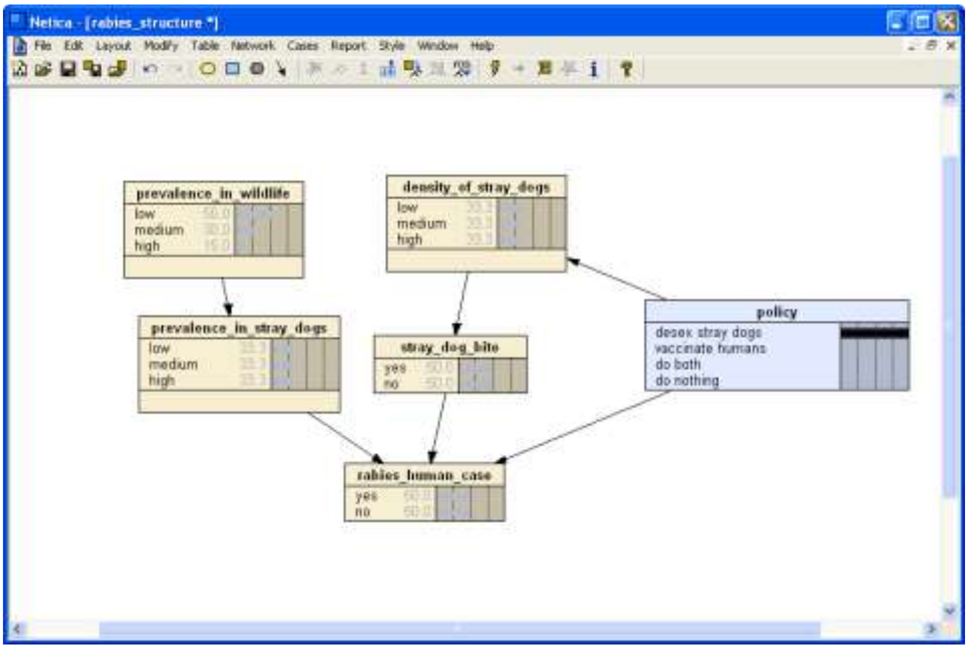

Figure 7: Screenshot of the Netica user interface, showing the network of factors leading to the outcome (human case of rabies). The blue node represents a decision node: for each of the four policy options, the likelihood of an individual person contracting rabies is estimated, given the estimates entered for the other factors.

Outcomes
As this activity illustrated a more advanced concept, it was incorporated into the course as an individual activity, and successful completion was not assessed. However, it was felt to be relevant for inclusion as it

- introduced the students to quantitative methods for risk assessment;
- extended the more advanced students; and
- allowed students with a specific interest in this field to benefit from this ‘state of the art’ material.

General discussion

Establishing this Master degree programme was challenging from a number of perspectives. Firstly, developing a programme tailored to the evolving and fast-developing concept represented by ‘One Health’ meant that the curriculum and the course content had to be designed and built from the ground up. Secondly, online learning was a new experience for almost all the South Asian students, the teaching model was unfamiliar to most, and a large range in the students’ pre-knowledge and experience needed to be accommodated.. Thirdly, the technical aspects of delivering online distance education into a region with highly variable internet availability required careful consideration.

The concept of ‘One Health’ is, by definition, highly multidisciplinary, spanning human, animal and environmental health. In spite of its complexity, support for this concept has grown exponentially in recent years. One reason for its appeal is that it explicitly aims to counteract the divergence of the human, animal and environmental health professions arising from increasing specialisation. Consequently, the leading objectives of this programme were to establish a consistent lexicon and mastery of relevant competencies. Key strategies to achieve this were to teach into a common learning space, and to establish effective communication and collaboration between students from the different countries. A consistent approach for bringing this into practice was the incorporation of relevant, engaging and multifaceted case studies, which required completion of a set of interactive activities, where applicable in a small-group setting. Students were encouraged to make the best possible use of various information domains, including traditional sources such as the University library, but extending to the internet as well as the knowledge and experience held by the participating students themselves. Our experience has been that online learning lends itself organically to the ‘One Health’ approach: De Laat et al. (2006) comment that the field of networked learning, too, is increasingly interdisciplinary and draws upon theoretical perspectives from the domains of education, the social sciences, computer sciences and linguistics. Sandars (2009) succinctly reviews the changing needs and competencies required for the medical learners of the future, and endorses Siemens’ (2005) approach of ‘connectivism’ as a means of identifying and linking information from multiple sources into a dynamic personal knowledge base.

In the risk assessment course presented in this paper, human and animal rabies in South Asia was chosen as an appropriate case study due to its regional relevance and impact. The learning activities that were developed made use of several software tools embedded into the LMS to facilitate the application of the analysis of risk. These activities consisted of a mix of small-group and individual work; a key objective was to establish groups of students from a wide range of countries, professional expertise and experience as “communities of practice”. As there is a relative paucity of verifiable information (explicit knowledge) on the case study in question, this approach was especially important to utilise the tacit knowledge held by these groups for the risk assessments. In addition, this approach closely reflected the sequence of techniques which is followed when risk assessment is performed in actuality, and thus presented a learning experience that was intended to feel “real”. By following this natural sequence of steps, we could demonstrate and highlight constraints and limitations. The first exercise in subjective risk analysis was designed to illustrate the importance of discussion for overcoming ambiguities in language and individual risk perception, and overconfidence in individual opinion. Subsequently, developing cognitive maps as a group activity emphasized the differences in perception and outlook between groups or “communities”. Using a simplified cognitive map as a starting point, the specification of a formal risk model showed how the likelihood of a disease outcome could be quantitatively estimated.

A number of additional activities were incorporated into the course, but were omitted from this paper. For instance, after the specification of the quantitative model, a master class in the elicitation of expert opinion, using a Delphi technique (Linstone and Turoff, 2002), was organised as a teleconference. In two facilitated sessions, panels of eight to twelve student “experts” strived to reach a consensus of opinion on five key questions related to rabies. The scenario was set in a country from which there were no students (Bhutan), to ensure that no students considered themselves to be more highly qualified than others.

To implement the activities within this course over the six-week period of delivery, careful staging within the course framework was required, as well as providing appropriate scaffolding to individual students. This relied on clear communication and effective coordination on between the course tutors and students. The use of the software tools was very highly rated in the course evaluation questionnaire, although a number of students found the subject and content challenging. In addition, the collaborative nature was appreciated, particularly the synchronous group communication sessions. The largest constraints stemmed from difficulties in communication. Firstly, limitations in internet connectivity, speed and reliability made it difficult for a number of students to participate fully in the synchronous sessions. The second constraint was language-based: it was evident that linguistic uncertainty not only applied to risk-related concepts, but also extended to some students' ability to perform the activities! From the submitted individual assignments, it was clear that most students had grasped the fundamental concepts of risk assessment, and a number submitted excellent assignments. Three students failed the course, due primarily to insufficient time spent studying rather than a lack of ability.

Conclusion

The software tools described in this paper have been successfully used for teaching risk assessment in a face-to-face delivery mode. However, integrating the combined set of these tools coherently into a fully online learning environment, and supporting this with the native functionality of the LMS to facilitate learning, extended the utility of these tools and enabled students to understand the contexts in which they should be applied. This enabled 'state-of-the-art' techniques in the field of risk analysis to be easily incorporated into the course.

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The importance of power dynamics in the development of asynchronous online learning communities

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This research explored how a more student-directed learning design can support the creation of togetherness and belonging in a community of distance learners in formal higher education. Postgraduate students in a New Zealand School of Education experienced two different learning tasks as part of their online distance learning studies. The tasks centered around two online asynchronous discussions each for the same period of time and with the same group of students, but following two different learning design principles. All messages were analyzed using a two-step analysis process, content analysis and social network analysis. Although the findings showed a balance of power between the tutor and the students in the first high e-moderated activity, a better pattern of group interaction and community feeling was found in the low e-moderated activity. The paper will discuss the findings in terms of the implications for learning design and the role of the tutor.

Keywords: power dynamics, online discussions, learning design, online tutors, social network analysis

Introduction

Student-directed learning has been featured in research within the expanding field of online learning (e.g. Boud, 2006; Comeaux, 2002; Harasim, 1990; Hiltz, 1994; Jonassen, et al., 1995; Wheeler, 2002) for a number of years now. Central to the discussions about student-directed learning is the issue of 'power and student-centeredness' in an online environment, where students and tutors interact online within a fixed curriculum (Boud, 2006). Boud discussed the evolution of the concept of student-directed learning and concluded that 'power is not a zero sum game to be shifted from teacher to student; the goal of this type of learning was not to move the power from teachers to students but to recognise ways in which it was exercised within different teaching and learning practices' (2006: 31). Self-directed learning has at its core the study of how adult learners exercise power and control over their own educational activities (Brookfield, 2005). The issue of power, however, was not found to be of significant importance in the literature of online learning to date, with a few exceptions. For example, Jones (1995:20) was very clear about the importance of considering the issue of power in online discussions. He wrote that 'just because the spaces with which we are now concerned are electronic there is no guarantee that they are democratic, egalitarian or accessible and it is not the case that we can forgo asking in particular about substance and dominance' (20). More recently, Anderson (2006), who conducted a study on writing power in online discussions, found that students are more concerned in 'satisfying' their tutors than with shaping their own learning in their replies. He called for more focused research in the area of power dynamics online with a particular focus on how learning design can create the conditions for student-directed learning. This paper attempts to offer a better insight in an area of studies that it is still very much fuzzy, that of power relationships in online learning settings. It starts with a short overview of the role of the tutor in facilitating asynchronous online learning. It then introduces two learning design approaches which required different levels of online facilitation. It finally reports the results of the learning design approaches in terms of their impact on the establishment of power relationships between tutor and students and students with fellow students.

The role of the tutor in developing sustainable learning communities

The facilitation or e-moderation of discussions in e-learning had early attention (Berge, 1995). This led within a few years to rather deeper and more informed publications. Guides offering advice to tutors about their online teaching are certainly available (Bender, 2003; Ko and Rossen, 2004; MacDonald, 2006). The literature certainly also offers some generalizations about what is held to constitute desirable approaches to e-moderation that facilitates student-centered learning. These comprise conceptual frameworks and models, as given by Garrison and Anderson (2003).

At the core of a tutor's role in adult learning is the manner in which he or she creates a community feeling among learners by developing social relationships and by intervening in the affective, as well as in the cognitive, domain of the online discussions (Garrison & Anderson, 2003). It was argued that by so doing tutors may better assist students to sustain their work on the learning task (Goodyear, et al., 2001). Rourke, et al. (2001) placed an emphasis on the need for online socialization and community building. They developed a conceptual framework for ‘social presence’ online and argued that a high social presence on the part of the tutor may motivate learners to better engage with the online discussions. Drawing on Rourke, et al.’s model, Stacey (2002) then conducted two studies in a search for effective social presence online. She found that tutors’ social interventions, such as humour, expression of emotions and openness, were acknowledged and welcomed by the students. She also claimed that online social behaviour initiated by the tutor was quickly emulated by many students. With this in mind, Bender (2003: see 88-90) also suggested some strategies for effective online communication on the part of the tutors. Drawing on her experiences as a student and as a teacher online, she focused on some techniques of online communication for the tutors, such as appearing to be listening and caring. In the centre of her online socialization she placed the responsibility to create an online environment where ‘students feel safe to express themselves …and they feel listened to by the tutors’ (89).

MacDonald (2006) argued for a facilitator who works online to ‘engender confidence, and to build a working relationship with individual students’ (24). McConnell (2006) further embraced the need for online facilitation, but he warned that facilitating a networked learning community is hard work. According to McConnell (2006), facilitation requires constant attention to what is going on in the community, and a willingness to make it possible for those participating to "own" the ways in which the community develops. However, he argued that this passing over of the power relationship (from tutor to a community in which the tutor is a member) is full of contradictions. It forces tutors to be open about their educational intentions and to reflect long and hard on their own practice as it becomes manifest in the community. He concluded that there is much still to be understood about what is involved in the process of becoming a facilitator and how this influences the way that students interact. A more specific breakdown of the facilitative options online is given in Vlachopoulos and Cowan (2010a). They analytically distinguish modes of interaction under the colloquial, and somewhat enigmatic, headings of: “one track mind, top of the list, going the second mile, critical friend, balancing priorities and rescuing.” These are explained, amplified and critically compared in their paper. Recently, Laurillard (2012) re-emphasised the importance of having carefully conceptualised roles for teachers supporting learners in different formal learning contexts, including learning through online discussions.

Overall, there is a fair amount of “folk wisdom” available, regarding best practice in facilitation. But there is very little researched evidence to justify the effectiveness of these assertions in the way that learners are learning as part of a community that is ‘free’ to learn. This was the focus of a research project conducted by Vlachopoulos & Cowan (2010b). After analyzing ineffective examples of e-moderation, they introduced the significance of “ring-fencing of facilitative interactions”. They postulated that problems arise for students and their tutors when the facilitative role of a tutor or moderator in learner-centred learning is confused with an educational administrative activity such as planning, arranging, assessing and evaluating student learning. They summed up the need to distinguish between these areas of activity as the desirability of “ring-fencing” facilitation within the area involving learner activity. The paper puts the ‘ring fence’ learning framework to further testing by trying to explore what happens in terms of power dynamics and patterns of interaction between students and tutor when they work within and out of the notional ‘ring-fenced’ arena of learning development.

The context of the study

The author of the paper taught for a full academic year a distance learning postgraduate course offered fully online in a School of Education in New Zealand. The course was designed for people with specific interest in the use of new educational technologies to support the learning and teaching process. It offered a unique blend of theory, research and practice. Seventeen students from a range of backgrounds from early childhood through to tertiary education and to e-learning professionals in the industry took the module. Most of the students were New Zealand based (n=12) with a few others participating from overseas (Malta, India and United Arabic Emirates). The age of the participants ranged between 22 and 40 years old. The module was taught entirely online using a Virtual Learning Environment, a Synchronous Conferencing System and an e-Portfolio System. Students had to participate in a number of online activities in order to successfully complete the module and evidence their learning progress in an e-portfolio. Participation in the online discussions was compulsory and directly assessed following clear assessment criteria which were given to the students at the start of the course. The student had an online induction, which introduced them to the tools and allowed them time to familiarize themselves with both the technical and pedagogical requirements for studying this particular module at a distance.

As part of their online activities students were introduced to the idea of ‘ Guided Thought Discussions’, which was developed as a core activity as part of a fully online MSc in Blended and Online Education at Edinburgh Napier University, in which the tutor was also a guest online lecturer. The main focus of the 'Thought Discussion' is around guided content explorations when students read from a selection of articles prescreened by the tutor and with particular questions raised by the tutor. The tutor's role is to facilitate the discussion and intervene as appropriate to take the discussion further. This activity, although student-centered, cannot be considered student-directed as a number of decisions about the content, the questions and the process has been decided at the outset for the students. For the purposes of this research, this setting was perceived to be operating outside the notional 'ring-fenced' learning area described in the previous section. The students worked for three weeks on such a 'Guided Thought Discussion'.

A second type of online discussion activity was introduced to them two weeks after the 'Guided Thought Discussion'. This time the students selected the articles or other materials they wanted to discuss based on their own personal and professional interests and agreed a set of discussion rules between them, including the key questions to be asked: how often they should be contributing; the length of the messages posted; etc. The role of the tutor in such arrangement was that of a critical friend. The 'Discovery Thought Discussion', which also ran for three weeks, provided a context which for the purpose of this research fits within the notional 'ring-fenced' learning arena, as many of the decisions to be made in working online has to be made by the students themselves.

The important question to ask is whether there were observed differences in both the power dynamics between tutor and students and students and fellow students and if there were differences in the pattern of the interactions between the participants in the two learning designs. This answer, in turn, would help future online facilitators to design appropriate activities that help the creation of a learning community and, most importantly, to be aware of their roles within the communities they aim to set up.

Methods

All online discussion messages from both settings were archived and extracted from the Virtual Learning Environment, in the form of text, after all students had completed their study of the particular module. They were then entered in NVivo 7, a specialized software for qualitative data analysis, and were analysed using a revised version of a coding system developed by the author as part of his doctorate studies following principles of grounded theory. The revised coding system comprised five codes and it is presented in Table 1 below with explicit criteria and indicators from the raw data. The unit of analysis was the whole message. A Kappa reliability check was conducted with one independent coder. A result of agreement of 62% was achieved, which according to Robson (2002), can be considered as satisfactory.

A total number of 311 messages were coded from the first learning activity whereas 334 were coded from the second learning activity. The results from this first part of the analysis provided a useful insight in the intended or unintended purpose of the message posted. It was noticed, for example, that particular students will never initiate a discussion and appear to only be reactive to the tutors' messages. Or that other students will prefer to be proactive but then will never come back to reply to fellow learners' messages or ask follow up questions.

This first part of analysis did not show whether there was any difference in the way that patterns of interaction changed as a result of either a lower e-moderation on the part of the tutor or as a result of the different learning setting. The author revisited, therefore, the data and applied a basic social network analysis (Everret & Borgatti, 1999).The social network perspective suggests that the power of individual actors (e.g a tutor or a learner) is not an individual attribute, but arises from their relations with others. Using the specialized software UCINET the author added all participants (S1 to S17) and the tutor (T1) in a matrix and recorded the interactions between them in the two different settings. For more details about entering data in UCINET see Borgatti et al., (2002). This allowed a closer examination of the group of students and the tutor as a network. Of particular interest to this research were the measures of 'Degree Centrality' and 'Core/Periphery Class Membership'. Degree Centrality is a measure that shows how central a particular actor in a network of people is. Core/Periphery Class Membership seeks to identify a set of actors who have high density of ties among themselves (the core) by sharing many events in common, and another set of actors who have very low density of ties among themselves (the periphery) by having few events in common.

Table 1: The Purpose of Interaction Coding Scheme

Code	Criteria	Indicators
GPI Group Proactive Interactive Message	Student or tutor looks for a response from someone in the group – anyone	Hi all, I've not added messages to this group as I felt you were all having some very interesting discussions without me! Please share your messages/ thoughts with others in the class in the summary section.
GRI Group Reactive Interactive Message	Student or tutor responds to one of the above, or some other message, playing reply back to group	Two rich contributions here, from student 1 and student 2. Thanks for all the work which has gone into these. Student 1writes to a great extent about distance education, which is OK by me.
PI Proactive Interactive Message	Student or tutor looks for a response from a specific contributor, and even asks for it	Student 1 , You said "I also think that information overload can make people… Can you explain a little further for me? Why is it so? Thank you!
RI Reactive Interactive Message	Student or tutor responds to one of the above, or some other message, from and then to a specific contributor	Dear student, thank you for your reply! I am really happy to "communicate" with you here. It was interesting to read your comment….
M Monologue	A new thread. No evidence of interaction with any other participant	The form of E-learning brought me new feeling, which was just like some fresh air! It's really special experience. I tried to control and hide my excitement and made myself involved with the online discussion...

Findings & Discussion

As it can be seen from Table 2, the two most frequent types of postings in relation to the purpose of interaction were the Individual Proactive (PI) and Individual Reactive (RI) Messages with an average number of postings of 7.53 and 4.00 respectively falling into each category. This was not surprising given that the task was set up by the tutor and the majority of the students were asking (proactively) for individual clarifications from the tutor and then were offering replies to the tutor or to particular individuals. They avoided being proactive themselves in terms of motivating each other as a group to take ownership of the activity or by suggesting ways to move on with the discussion or being involved in more than one-to-one interaction with other fellow learners. This was the case despite the fact that the activity itself was clear in the expectations that students should post their own views and also comment on other participants' messages. It is possible that the students felt that it was the tutor's job to prompt further questions and bring the group to together. However, the tutor's presence in this setting was mostly associated with interventions related to assessment and feedback on the process of the activity.

Table 2: The Purpose of Interaction in Activity 1

Participant No	No of GPI	No of GRI	No of PI	No of RI	No of M	Total No of Messages
Student 1	6	4	12	4	3	29
Student 2	3	4	6	3	0	16
Student 3	3	2	9	5	2	21
Student 4	2	1	6	3	1	13
Student 5	2	1	4	2	0	9
Student 6	6	2	9	5	3	25
Student 7	2	2	8	4	2	18
Student 8	3	2	7	3	0	15
Student 9	3	3	8	5	2	21
Student 10	1	4	9	4	1	19
Student 11	1	2	3	4	1	11
Student 12	3	1	7	4	3	18
Student 13	3	4	9	6	2	24
Student 14	1	1	8	4	1	15
Student 15	3	3	7	4	2	19
Student 16	4	3	12	5	3	27
Student 17	0	2	4	3	2	11
Total	46	41	128	68	28	311
Average	2.71	2.41	7.53	4.00	1.65	

The social network analysis results for Activity 1 added extra trustworthiness to the claims made above that the majority of the students were proactively interacting with the tutor and that overall the group appeared to be more on the passive/reactive end of the spectrum of the types of interaction. Of particular importance is the In-Degree value (the number of messages received) for the tutor (T1) in Table 3. The theory of social network analysis would argue that the greater the Out-Degree of an actor in a network, the more influential this actor is. In this case, though, influential appears to be the actor who attracts the most messages, and this is surely T1 with a value of In-Degree of 76. However, it should be noted that T1 also had a comparatively high Out-Degree of 53. It is also worth reporting that the overall Network Centralization values show a higher In-Degree value (Outdegree = 30.147%, versus Indegree = 36.765%). This means that on average, as a community of learners, the students were receiving more messages than they were sending. Many of the approaches to understanding the structure of a network emphasize how dense connections are built-up from simpler dyads and triads to more extended dense clusters such as ‘cliques’. The ‘clique’ analysis in the community of learners in the first activity revealed two major cliques with a strong core and a weak periphery. This means that a small number of students, together with the tutor dominated the discussion, whereas the majority of them were only partially intervening to add to the interactions. It became apparent that in activity one, the students were not interacting as a group of participants who were empowered to take responsibility for their learning, but were mostly working towards satisfying the tutor’s and assessment requests. This has implications for learning design in distance learning, where one of the desired expectations is that students will find their intrinsic motivation to set their own goals and learn as a community of learners from and with each other.

Table 3: Freeman's degree centrality measures for activity 1

		1 OutDegree	2 InDegree	3 NrmOutDeg	4 NrmInDeg
6	S6	12.000	8.000	70.588	47.059
1	S1	10.000	10.000	58.824	58.824
5	S5	10.000	9.000	58.824	52.941
4	S4	10.000	9.000	58.824	52.941
5	S15	9.000	8.000	52.941	47.059
8	S8	9.000	6.000	52.941	35.294
8	T1	9.000	13.000	52.941	76.471
3	S3	8.000	7.000	47.059	41.176
3	S13	8.000	7.000	47.059	41.176
2	S2	7.000	10.000	41.176	58.824
7	S17	7.000	9.000	41.176	52.941
0	S10	6.000	3.000	35.294	17.647
2	S12	6.000	4.000	35.294	23.529
9	S9	6.000	7.000	35.294	41.176
6	S16	6.000	8.000	35.294	47.059
1	S11	6.000	6.000	35.294	35.294
7	S7	3.000	5.000	17.647	29.412
4	S14	2.000	5.000	11.765	29.412

In Activity 2 the students were offered the flexibility by design to arrange their own reading lists, questions, and rules of their discussion. Not surprisingly perhaps the highest number of contributions appeared to be Group Proactive Interactive (mean = 7.43), followed by an almost equal numbers of Group Reactive (mean = 3.12) and Individual Reactive (mean = 3.06) as shown in Table 4. To some extent this proactive attitude to the interactions was the result of the need for the students to move fast as a group to arrange the rules of the discussion in the absence of a high tutor presence. This resulted in a number of replies which were more open to the whole group. These replies were follow up suggestions and prompts for further discussion as opposed to closed answers. Interestingly, this pattern appeared to continue in the main part of the actual discussion activity.

Table 4: The Purpose of Interaction in Activity 2

Participant No	No of GPI	No of GRI	No of PI	No of RI	No of M	Total No of Messages
Student 1	10	7	7	8	4	36
Student 2	7	5	3	1	1	17
Student 3	7	3	2	3	0	15
Student 4	9	2	4	2	1	18
Student 5	9	1	3	1	1	15
Student 6	7	3	4	2	3	19
Student 7	9	3	6	1	1	20
Student 8	6	4	4	3	3	21
Student 9	6	4	4	3	0	17
Student 10	6	3	1	5	1	16
Student 11	7	2	4	2	0	15
Student 12	5	3	6	1	0	15
Student 13	14	2	10	4	1	31
Student 14	8	2	4	2	0	16
Student 15	4	2	10	5	0	21
Student 16	9	4	6	5	1	25
Student 17	5	3	6	4	0	17
Total	128	53	84	52	17	334
	7.53	3.12	4.94	3.06	1.00	

Looking now into the social network analysis data, as presented in Table 5, it can be observed that the occasions in which the tutor (T1) was asked to intervene was significantly lower when compared with Activity 1. This is reflected in the lower In-Degree value of 41.17. The tutors Out-Degree value was pretty much the same as in

Activity 1, but the messages sent were more in relation to the content of the actual discussion and not so much in relation to helping students to sort out the rules of the discussion. This is a very encouraging finding as continuous findings in the area of online distance education show that students without the explicit guidance of a tutor online can lose their motivation to interact or that students can be in a constant need of confirmation by the tutor (De Wever et al., 2010). The overall centralization values of the network in Activity 2 showed a highly balanced communication pattern: Outdegree = 25.735% and Indegree = 25.735%. Finally, it was interesting to notice that in Activity 2 there were nine ‘cliques’ (or small groups) formed , which means that the network appeared to have a strong periphery.

Table 5: Freeman's degree centrality measures for activity 2

		1 OutDegree	2 InDegree	3 NrmOutDeg	4 NrmInDeg
3	S3	12.000	12.000	70.588	70.588
5	S5	11.000	9.000	64.706	52.941
9	S9	11.000	9.000	64.706	52.941
1	S11	10.000	6.000	58.824	35.294
8	S8	10.000	10.000	58.824	58.824
8	T1	10.000	7.000	58.824	41.176
7	S7	10.000	9.000	58.824	52.941
5	S15	8.000	8.000	47.059	47.059
0	S10	8.000	12.000	47.059	70.588
2	S12	7.000	10.000	41.176	58.824
6	S6	7.000	7.000	41.176	41.176
6	S16	7.000	9.000	41.176	52.941
7	S17	7.000	6.000	41.176	35.294
4	S14	7.000	6.000	41.176	35.294
3	S13	6.000	7.000	35.294	41.176
1	S1	6.000	7.000	35.294	41.176
4	S4	5.000	7.000	29.412	41.176
2	S2	4.000	5.000	23.529	29.412

Conclusion

Much use is currently made of virtual learning environment, such as Moodle and Blackboard, to enable “discussion” amongst students. These learners may be in widely separated locations, and so can only interact virtually. There seems to be no agreement amongst tutors and researchers regarding the similarity or otherwise of online discussions with those occurring face-to-face. Most importantly there is little research done into looking how different learning design changes the dynamics of the interactions. A major difficulty when researching interactions, whether between students in groups or between students and a facilitative tutor, is to capture for analysis the fine detail of what was said, or is communicated by written text and especially the pattern of interaction at different times in the online experience. This paper tried to show how a mixed used of methodologies can provide a better overview of what is happening online with students in terms of interactions. More common approaches, like content analysis and coding of messages, can provide a good first understanding of the quality or the depth of the discussion, but methodologies like social network analysis can take us a step further into the domain of networked learning, which in turn provides us with useful information about the extent to which our online learners are working towards a community development or not.

The key message from this study for learning designers and tutors who teach online in fully distance or blended courses is that students who are empowered from the outset through a carefully designed activity that allows them more ‘freedom to learn’ (Rogers, 1969) will find their way of interacting without always needing the strict monitoring of a tutor. This is particularly important if we consider the future of online education to be about flexibility and sustainability of resources, including human resources. . However, it should be noted that in formal learning design enforced participation and authority assessment are usually expected as measures for quality assurance purposes. Therefore, the main exercise of power and authority seems to always take place outwith the ring-fence, even when authority is fully delegated. It became clear that the important thing was not to have a balance of power between the tutor and the students but rather to have a community of empowered learners who are willing to exercise their power to benefit the community After all, if learning is to be truly student -directed there should be a period of learning activity during which the activity, the decisions which matter, the interpretations placed on sourced material and experiences, should be the sole responsibility of the learners, free at that time from pro-active inputs by people who set out to teach, however they define that word, and with whatever benevolent intent.

The research reported here does very little to identify and compare learning outcomes and effectiveness of the learning experience. It only reports findings about the establishment of a community feeling among distance learners. It does not recommend that one type of activity works better than the other in terms of academic performance. In an ongoing course of one year, the researcher could only take snapshots for analysis, and information could not arrange a full and rigorous research enquiry on learning outcomes as a result of the different activities. This is an important limitation which the readers should take into account when interpreting the findings.

Future research will analyse the social network data in terms of the attributes of individual students to explore if there are particular patterns of interactions among students based on attributes such as gender or years of experience.

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A Preliminary Investigation into Technology and Processes Facilitating the Assurance of Learning

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This paper reports on the outcomes from a preliminary evaluation of technologies and processes intended to support the Assurance of Learning initiative in the business faculty of an Australian university. The study investigated how existing institutional information systems and operational processes could be used to support direct measures of student learning and the attainment of intended learning goals. The levels at which learning outcomes had been attained were extracted from the University Learning Management System (LMS), based on rubric data for three assessments in two units. Spreadsheets were used to link rubric criteria to the learning goals associated with the assessments as identified in a previous curriculum mapping exercise, and to aggregate the outcomes. Recommendations arising from this preliminary study are made to inform a more comprehensive pilot based on this approach, and manage the quality of student learning experiences in the context of existing processes and reporting structures.

Keywords: rubric, assurance of learning, learning analytics, accreditation, TEQSA, AACSB

Introduction

There is an increasing trend for universities to take a holistic approach to managing the quality of educational programs based on objective data and learning analytics (Elias, 2011; Hrabowski, Suess, & Fritz, 2011; Johnson, Smith, Willis, Levine, & Haywood, 2011). Drivers for doing so include ensuring a quality learning experience for students (Curtin University, 2011), and to comply with the reporting requirements of regulatory agencies (TEQSA, 2012) and accrediting bodies (AACSB, 2012). These generally require that students are provided with consistent and equitable learning opportunities that produce the intended learning outcomes, regardless of a student's location or study mode (AACSB, 2007b; Curtin University, 2011).

Curriculum mapping is the process in which generic graduate attributes or program-level learning objectives are mapped to the learning outcomes and assessment in individual subjects (Oliver, Jones, Ferns, & Tucker, 2007; Sumsion & Goodfellow, 2004). This is usually undertaken at the program level to document where students will develop the intended capabilities and skills in conjunction with a given program of study. The Assurance of Learning closes the loop on this design by using objective data to identifying what students have actually learned as a consequence of their participation in the program (AACSB, 2007a). Direct measures of learning can be achieved through standalone testing, or through a course-embedded approach in which regular assessments undertaken in conjunction with formal coursework are used to measure student learning (AACSB, 2007a). Assessment rubrics that are aligned with program-level learning objectives can be used to facilitate the course-embedded approach (Kerby & Romine, 2010). This can be implemented using online tools that are generally available as standard features of a Learning Management System (LMS) (Blackboard, 2012; Cooch, 2012).

Learning analytics available from some LMS providers and third party software suppliers can be used to aggregate and report on course-embedded measurements at the program level. This requires that detailed assessment outcomes for individual students are stored in backend information systems, external web applications, or that these data are retained in the LMS over the duration of the reporting period.

In those cases where LMS data is cleared out in preparation for new teaching periods and assessment data for individual students are not directly available in the University's backend information systems, an alternate approach must be sought to collect and report on program outcomes. This paper reports on the processes and practices for such an approach, and is the principal contribution of this paper.

Context for the pre-pilot study

The business faculty of a large Australian university has established five generic learning goals that can be further expanded into 8 program-level learning objectives. These are discipline knowledge, discipline skills (theoretical principles), critical thinking skills, written communication skills, oral communication skills, collaborative team skills, ethical skills, and socio-cultural skills. Program-level rubrics have been developed that contain descriptors for these objectives at three levels of attainment: below expectations, meets expectations, and exceeds expectations. Generic assessment rubrics have also been developed that expand on the program-level rubrics. These generic assessment rubrics contain criterion descriptors for five attainment levels corresponding to the Fail (F), Pass (P), Credit (CR), Distinction (D), and High Distinction (HD) grade ranges. These are aligned with the program-level rubrics, where the F attainment level corresponds to below expectations, and P and CR map to meets expectations, and D and HD correspond to exceeds expectations.

The intention is to develop unit specific assessment rubrics that are aligned with these generic assessment rubrics for a representative sample of assessments from the Bachelor of Commerce during a subsequent pilot study. This will be used to aggregate and report on outcomes for the program as a whole. This paper reports on a preliminary investigation into the technology and process that will be used in that study, using the Blackboard 9.1 (Service Pack 6) LMS and data extracted from its online rubric tool.

Methodology

Three assessments from two units were selected for participation in this preliminary investigation. These were a spreadsheet modelling assignment from an undergraduate unit called Business Software Tools 200, and a critical essay and a business report from a first year unit called Communication in Business 100.

Business Software Tools 200 is a unit about information systems that support decision-making using spreadsheets and databases. The spreadsheet modelling assignment has criteria associated with the program learning objectives for discipline knowledge, critical thinking and written communication. The discipline knowledge criteria in the assessment rubric involve analysing data and completing two case problems from a textbook. The critical thinking criteria deal with a more advanced and open-ended problem that requires a variety of analysis techniques and considerable interpretation. The written communication criteria cover documentation, referencing and English expression.

The curriculum in Communication in Business 100 has been designed with authentic assessments that examine real business cases. The unit develops communication skills, including critical thinking, persuasive argument development as well as presentation and writing skills. The first assessment is a critical essay in which students examine the social performance of a business and present a critical review in a manner appropriate for academia. The second assessment is a business report. The audience is senior executives of businesses and the writing must be concise and persuasive. These assessments are designed to challenge students to:

- write in ways that are appropriate for different audiences;
- develop arguments that are well supported and use appropriate evidence; and
- demonstrate an understanding of the complex social and ethical issues facing business today.

Unit coordinators for the units to be sampled in this study developed assessment rubrics using the online rubric tool and associated this with their respective assessments in the LMS. The rubrics specified attainment levels for the five grade bands, and had criteria associated with the program-level learning goals. Rubrics were not aligned with the generic assessment rubrics, as the latter were not finalised at the commencement of the semester. A rubric statistics report containing the percentage of students performing at each attainment level was downloaded from the LMS as an MS Excel workbook. Merged cells in the statistics report were unmerged to facilitate copy-and-pasting these into reporting spreadsheets that linked rubric criteria to program-level learning goals, as it was not possible to specify this in the online rubric tool itself.

Two different types of MS Excel workbooks were used in this study. The first workbook type was for recording assessment data. There was one assessment workbook for each assignment in the sample. The workbook contained a tab for data entry. Each criterion and the corresponding percentage of students performing at a given level was copied-and-pasted from the LMS rubric statistics report. These were associated with a program-level learning goal from a drop-down list. Figure 1 shows an example from the spreadsheet modelling assignment.

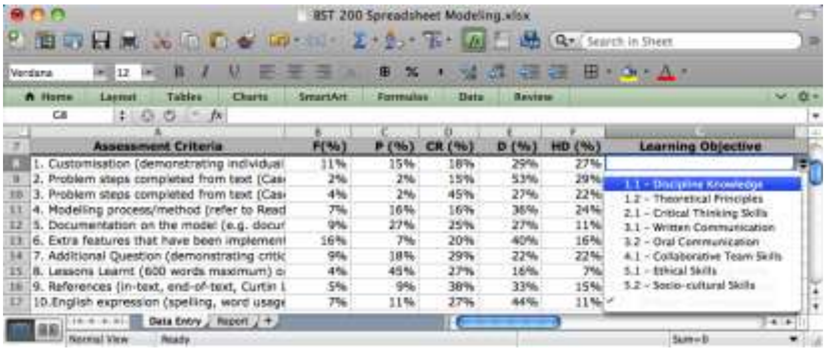

Figure 1: Data entry tab of the assessment workbook for the spreadsheet modelling assignment

A second tab in assessment workbooks automatically tabulated and displayed results for the assessment in text format and as a stacked bar chart. These were presented based on the fraction of students performing at the below, meets, and exceeds expectation levels for the program-level learning outcomes with which rubric criteria were associated.

The second type of workbook was an administration workbook for aggregating results using links to the assessment workbooks. Data was aggregated in tabs associated with each program-level learning objective. A separate tab was used to display aggregated results for all assessments in the sample.

Results

The assessment rubric in the spreadsheet modelling assignment contained three criteria that were linked to the discipline knowledge criterion, four criteria were linked to critical thinking, and three were linked to written communication. Rubrics for the critical essay and business submission assessments each contained two criteria linked to written communication and one criterion linked to critical thinking. Aggregated results for the three assessments are shown in Figure 2. This shows that the majority of students performed at the meets expectation level, except for discipline knowledge in which the majority performed at the above expectations level.

Figure 2: Aggregated sample in the administration workbook for three assessments and two units

There are no results for program-level learning objectives related to discipline skills (theoretical principles), oral communication skills, collaborative team skills, ethical skills, or socio-cultural skills because these assignments did not include rubric criteria and descriptors related to these. For example, although the goal of the written essays in Communication in Business 100 was to undertake a critical review of the social performance of a business, the rubric assessed written communication and critical thinking in developing a sound argument. Criteria for ethical and socio-cultural skills were not included in the rubric and hence these were not assessed.

Discussion

Positive outcomes of using the online rubric and the aggregation results identified were: structured feedback for individual students, an evaluation report showing the percentage of students performing at each criterion and achievement level, and a demonstrable link between assessment criteria and program learning objectives. Challenges identified during this preliminary investigation were limitations of the structure and interface of the online rubric tool in the LMS, writing effective rubrics with concise yet meaningful descriptors, and issues related to workflow using the online tools. This would suggest the need for substantial staff training, up-front technical assistance, and pedagogical support in writing effective rubric descriptors.

Based on observations from this preliminary investigation, it is proposed that individual Unit Coordinators or LMS Administrators with access to the online rubric tool be given responsibility for producing the individual assessment workbooks. This would be done after results are finalised for each assessment.

It is further proposed that Major Coordinators, Heads of Discipline, or an LMS Administrator collect the individual assessment workbooks at the end of each teaching period and maintain the administration workbook that produces the aggregation report. That is, each major such as accounting, management, marketing, and information systems would have its own administration workbook. Such an approach would assist in annual reporting and course reviews, the latter of which are undertaken on a periodic basis. In part, implementing Assurance of Learning at this granularity is manageable in the sense that number of assessments in such a sample would be relatively small. However, it should be noted that the solution described here does not scale well when the number of assessments in the sample set is large. This is because assessment reports must be open for links in the administration workbook to be active.

Longer term, it is reasonable to consider adding a Blackboard building block in which rubric criteria are linked directly to program-level criteria in the online rubric statistical reporting function, alleviating the need to maintain individual assessment workbooks. It is also conceivable that a future enhancement to the Blackboard rubric tool could align rubric criteria to program-level learning objectives using the Blackboard “goals” feature introduced in Blackboard 9.1 (service pack 8).

The approach outlined in this paper will require assignment rubrics to be aligned with the generic assessment rubrics, and to ensure that the sample set includes coverage of each rubric criterion for the set of generic assessment rubrics. This is because different criteria from generic assessment rubrics for a given program-level learning objective might be covered by multiple assessments from different units.

Conclusion

The LMS online rubric tools provides a means to set an assessment rubric, from which meaningful data can easily be extracted. These data give the fraction of students performing at each attainment level for all criteria. From an Assurance of Learning perspective, what is missing is the ability to link criteria to program-level objectives, a means to designate the set of assessments to be included in the measurement, and to aggregate the results. This study has demonstrated that a set of linked spreadsheets managed by staff in accordance with routine reporting processes and practices can be used for this purpose, and will inform a more comprehensive pilot to be conducted in the near future. It is indicated this will lead to a sustainable approach based on objective data from the LMS to ensure that academic programs are of high quality and that the learning outcomes attained by students are consistent with the intended educational design.

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Developing a Moderation Community of Practice

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This paper reports on a study to evaluate technology-based processes for assessment moderation. The aim was to evaluate standard features found in an institutional Learning Management System, and their compatibility with the values and practices of a large teaching team. The process used an online discussion board forum for tutors, the paring of more experienced tutors with those new to the process, and further meetings conducted in both face-to-face and web conferencing environments. Online rubrics were used for assessing student work and the provision of feedback. A focus group conducted after marking was concluded and the analysis of the discussion board forum demonstrated a strong community of practice with a shared understanding of assessment requirements.

Keywords: discussion board, rubric, assessment, moderation, online community of practice

Introduction

There are many challenges associated with managing quality in higher education. Amongst these are moderating assessments and the provision of feedback to students studying in different locations and modes of study and necessitating the coordination of large teaching teams (ALTC, 2010, 2012; Kuzich, Groves, O'Hara, & Pelliccione, 2010). Drivers include a desire to offer timely and consistent feedback to students in a manner contributing to student learning, and consistent with institutional policy (Curtin University, 2012) and the expectations of regulatory agencies (TEQSA, 2012) and accreditation bodies (AACSB, 2012).

Background

Moderation aims to ensure the consistency of assessment and feedback provided to students (ALTC, 2012). Despite having marking criterion and rubrics that outline assessment expectations, variation in marking is known to be a common issue. In part, this is due to the tacit knowledge that individual markers bring to the assessment process (Bloxham, 2009; Hunter & Docherty, 2011). While controlled studies have shown than marking briefings and training can reduce the variation between markers (Crotwell Timmerman, Strickland, Johnson, & Payne, 2011), there is evidence that this should include group activities and discourse that fosters the emergences of an assessment community of practice (Price, 2005). Such a community would ordinarily rely less on transmitted knowledge, and operate with the goal of developing a shared understanding of assessment expectations.

Research Context

This study evaluates processes that use standard online features of an institutional Learning Management System to moderate assessments outcomes, provide feedback to students, and report on the level to which students have attained intended learning outcomes. This investigation was part of a larger study to evaluate how technology currently in use at the authors' institution could be used to support ongoing assurance of learning initiatives. Work is reported here in the context of using technology that is compatible with the existing values and practices for assessment moderation used in a large first year communication unit. This unit is taught in multiple locations in the business faculty of an Australian university.

The aim of this study was to evaluate the impact of introducing technology into the moderation process with respect to the development of a:

- community of practice amongst the teaching staff associated with a large undergraduate unit;
- shared understanding of marking criterion; and
- consistent approach to the provision of student feedback.

There are typically up to 52 staff and 2,300 students associated with the unit that was the subject of this study during any one study period. It is conducted in multiple face-to-face locations and fully online. Students complete two written assignments and give an oral presentation. All assignments are submitted and marked using a rubric through the assignment manager of the Blackboard 9.1 Learning Management System (LMS).

A range of strategies has been employed to ensure the consistency of marking and the provision of student feedback. Key to this has been encouraging a team approach to marking based on a moderation processes that pairs new and veteran tutors and uses online tools that are embedded in the LMS. The electronic moderation process commences with the posting of a past student paper submitted by the Unit Coordinator to a discussion board forum on the dedicated staff LMS site. This is known as the 'pre-moderation process'. This process commences one week before an assignment is due. All tutors are requested to review the paper that has had all identifying information removed. Tutors are specifically requested to provide feedback that is:

- clear, direct and prescriptive;
- focused on meaningful aspects of the task including content, level of analysis and text structure;
- targeted global feedback that explains the mark relating to the rubric and specific to the task;
- not focused on surface features such as spelling, grammar and referencing conventions; and
- reflects both positive areas of student performance as well as areas needing improvement.

Once the tutor has marked the sample paper and submitted the marked work to the staff-only online discussion forum, they are requested to comment on at least one other tutor's mark and feedback within the forum. At the end of the process, the Unit Coordinator posts a summary on the forum. This summary outlines the key consensus areas, points to consider when marking, and expectations in regards to the quantity and focus of feedback. The pre-moderation process is asynchronous and spans seven days.

The moderation community of practice is further developed in a follow up meeting, conducted in both face-to-face and web conferencing environments. The focus is to discuss outcomes arising from the pre-moderation process and the summary posted by the Unit Coordinator. The goal is to develop consensus and a shared understanding regarding assessment objectives and the manner in which feedback is to be provided.

Upon the conclusion of the pre-moderation process and the commencement of the marking period, tutors are partnered with another tutor. New tutors are paired with a veteran tutor. A veteran tutor is defined as one who has completed all prior training sessions and at least one semester of teaching experience in the unit. Novice tutors may have prior teaching experience, but are new to the unit. During the marking period, tutors are encouraged to send questions or examples to their "moderation buddy" via email or to post these to the discussion board moderation forum.

Upon receipt of students' assignments, tutors are given four days to mark three papers and include student feedback using the online rubric tool, which is a standard feature of the LMS. The Unit Coordinator provides individual feedback to each tutor via email before the remainder of the assessments are marked.

The use of rubrics in this unit is not new. They have been an integral part of the marking process for the past five study periods using an MS Word-based marking form and feedback sheet. Previously, tutors would append an annotated rubric to each student's assignment along with relevant feedback. The level of attainment was indicated by highlighting a descriptor at a given attainment level in a specified colour, and providing feedback by copy-and-pasting from a bank of common feedback statements.

Commencing in Semester 1, 2012, marking and the provision of student feedback was conducted entirely online using the LMS rubric tool. Tutors indicated the level of attainment by clicking in the appropriate cell of the online rubric. Marks were not directly computed based on this, so as to focus student attention on feedback rather than the mark awarded for individual rubric criterion. Instead, the tutors awarded one mark for the assignment as a whole. Global feedback was provided to justify the overall mark via text or via an attached audio file. Additional feedback could also be supplied in a text box at the level of individual rubric criterion and level descriptors.

In previous study periods, the pre-moderation process required tutors to email marked samples as part of the pre-moderation process, rather than using the discussion board. Tutors would utilise email to communicate or attend 'round table' discussion meetings open to anyone who wished to discuss marking concerns. These were not compulsory meetings but rather took place in an organised venue for tutors to meet during the marking period.

Reporting on the affordances and limitations of using an online discussion board to share tacit knowledge during the pre-moderation process, and the extent to which the online rubric tool is consistent with established marking and moderation workflows are the principal contributions reported in this paper.

Methodology

The study adopted a triangulation mixed methods design to "simultaneously collect both qualitative and quantitative data, merge the data, and use the results to understand the research problem" (Creswell & Plano Clark, 2007). Tutors participated in a focus group where semi-structured questions were asked. The research questions were designed to elicit the challenges and benefits that tutors experienced in terms of making the transition from a marking rubric implemented in an MS Word document to using the online rubric tool. Additionally, the challenges of interpreting learning goal statements and level descriptors were investigated. Tutors were asked to reflect on the impact of using technology on the student and academic workflow and on the quality of feedback provided to students. An articulation of the interviewees' reflections on their experience was made as complete as possible by following up with probing questions (Fraenkel & Wallen, 2006). Focus group data were transcribed and analysed using NVivo software.

Learning analytics is defined as "the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environments in which it occurs" (SoLAR, 2011). Analyses of quantitative data included the application of SNAPP, a learning analytics tool that visualises the network of interactions resulting from LMS discussion forums. Tutor posts from pre-moderation discussions related to an assignment (n=47) from the staff-only LMS site were used to explore data interrelationships. Visual representations were developed in order to ascertain the nodal connections between tutors. The names used in these visualisations and quotes in the analysis of discussion board posts have been randomised to protect the identity of participants.

Additionally, student data for the first written assignment (n=1027) were extracted from the LMS and the distribution of attainment levels were evaluated.

This research was approved by the Human Research Ethics Committee at the authors' institution.

Results

There were 41 tutors involved in this unit during the study period reported in this study. Of these 34% (n=14) were men, and 66% (n=27) were women. All of the tutors taught in the blended delivery mode, except 1 tutor who taught in a fully online delivery mode. There were 24 tutors (59%) who posted in the tutor-only pre-moderation discussion board forum. Of those participating in pre-moderation exercise, 100% (n=24) posted a mark and feedback on the sample student paper, and 78% (n=18) offered feedback on the marked sample posted by at least one of their peers. There were 46% (n=19) members of the tutor community who participated in the focus group, held during an end-of-semester debriefing meeting.

Results arising from the analysis of the pre-moderation discussion board form and the focus group are given below, along with the levels of attainment distribution for the assignment.

Pre-moderation in the Online Discussion Board

The pre-moderation discussion board pattern of participation and interaction pattern for assignment 1 is shown in Figure 1. Each red square represents a tutor, and each arrow represents a discussion board post in response to another member of the teaching team.

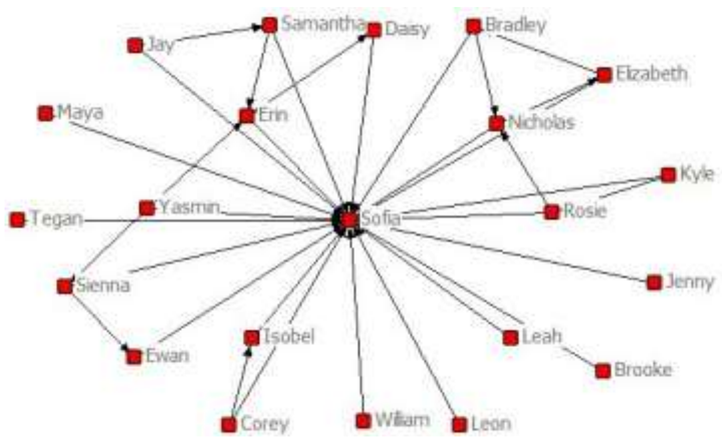

Figure 1: Pre-moderation discussion board participation and interaction.

Most of the posts contained reviews in which tutors applied the marking rubric to the sample paper posted by Sofia, the Unit Coordinator, as part of the pre-moderation exercise. Other posts fell into one of several categories described below.

Confirmation of findings and areas of agreement

In responding to Erin's review and feedback, Daisy wrote, "I like Erin's approach to this feedback. Her comments are positive and helpful. Erin also commented on the student's strength's and weaknesses and recommended places where the student can find further help in academic writing." Yasmin agreed, supplying a bit more detail in her response to Erin: "I like the way you have structured your feedback. You have identified a number of positive points in the first paragraph that would encourage the scholar to take overall feedback into account for the next assignments."

Suggestions for improving student feedback

Corey reported that he found many of the same issues identified by Isobel in her review, but offered suggestions on ways she could improve her review. He posted, "I picked up a lot of the same things you did with this example. The student obviously faced issues with the mechanics and execution of language, which unfortunately interfered with their argument construction and clarity. I did appreciate the fact that they had put some effort toward the structure though. My feedback for your example would be to try and find some positive aspects to comment on the written feedback section, and put them first. Hopefully students will have something positive to take away from their efforts, and a good set of feedback from which to receive further coaching". It is interesting to note that Corey is modelling the advice given to Isobel in his post to her. That is, he starts his post by offering positive feedback before offering suggestions regarding how she could improve her feedback.

Points of disagreement and ensuing discussion

Ewan, a veteran tutor, posted "I have attached the marked sample. I will comment on Sienna's when it appears as she wanted to be my moderation buddy." Interestingly, while Sienna responded to Ewan, he never responded to her assessment of the sample assignment. In part, this was because the novice tutor had disagreed with Ewan, who was the veteran tutor which whom she was paired. Although she starts her post by identifying points of agreement with Ewan, she continues, " Not having time to proof read is no excuse and I feel the referral to the Comm[unication] Skills Centre is necessary. I'm not sure I agree with the high mark you have given this scholar. I feel this level of academic writing and lack of research in the reference list is not worthy of a credit pass." Because Siena disagreed with Ewan, they chose to continue their communication privately via email instead of the more public discussion forum. Sofia, the Unit Coordinator, eventually intervened and moderated a broader discussion on the points being discussed by this veteran/novice pair at the next tutor meeting. Ewan, the veteran tutor, changed his view following the moderated synchronous meeting with his peers. These meetings are held face-to-face and simultaneously via web conferencing for the benefit of remote staff.

Aligning assessment feedback with the rubric

Several posts emphasised the importance of linking feedback to the marking rubric. For example, Brook posted the following in response to Jenny: " I like how the overall feedback is given in a positive attitude. It would even be more helpful for the scholar if he/she was given insights on why he/she had 'pass' on the first two columns [of the marking rubric], which would increase her understandings on the unit and he/she would be able to carry this forward to the second assignment."

Communication outside of the discussion board
There were instances in which posts referred to communication taking place amongst tutors outside of the discussion board. For example, Yasmin posted the following in response to Erin: “As we discussed earlier on Facebook, our marking is quite similar…” Similarly, an obvious absence of posts was due to communication that shifted to email, or that was brought to the subsequent tutor meeting conducted face-to-face and via web conferencing. The later became evident following Sienna’s post outlining her disagreement with Ewan’s assessment that was noted previously.

The importance of making student referrals to the Faculty’s Communication Skills Centre
In response to cases where a tutor focused their review on correcting grammar, sentence structure, and referencing, some posts suggested that a better approach would be to refer students to the Faculty organisation responsible for assisting students in improving their written and oral communication skills. For example, Rosie posted the following in response to Corey’s review: “Correction of the grammar issues in the introduction seems generous given the volume of marking when we go ‘live’. I’m not sure if it will improve the student’s future performance in academic writing. It is more likely that intervention by the Communication Skills Centre as Corey recommends will improve the student’s English skills.” Similarly, Brooke posted the following in response to Jenny’s review: “Given the level of urgency (the scholar scores a ‘fail’ on language and convention), it would be better to strongly emphasise the necessity to look for assistance.”

Feedback and Levels of Attainment

Figure 2 shows a sample of the feedback provided to students using the online rubric tool and the descriptors associated with each range. The level of attainment for each assessment criteria is indicated, along with the associated descriptor. In this instance, the tutor has provided feedback to the student to justify the level awarded for each criterion, along with global feedback. Positive aspects of the assessment are indicated, along with suggestions for improvement.

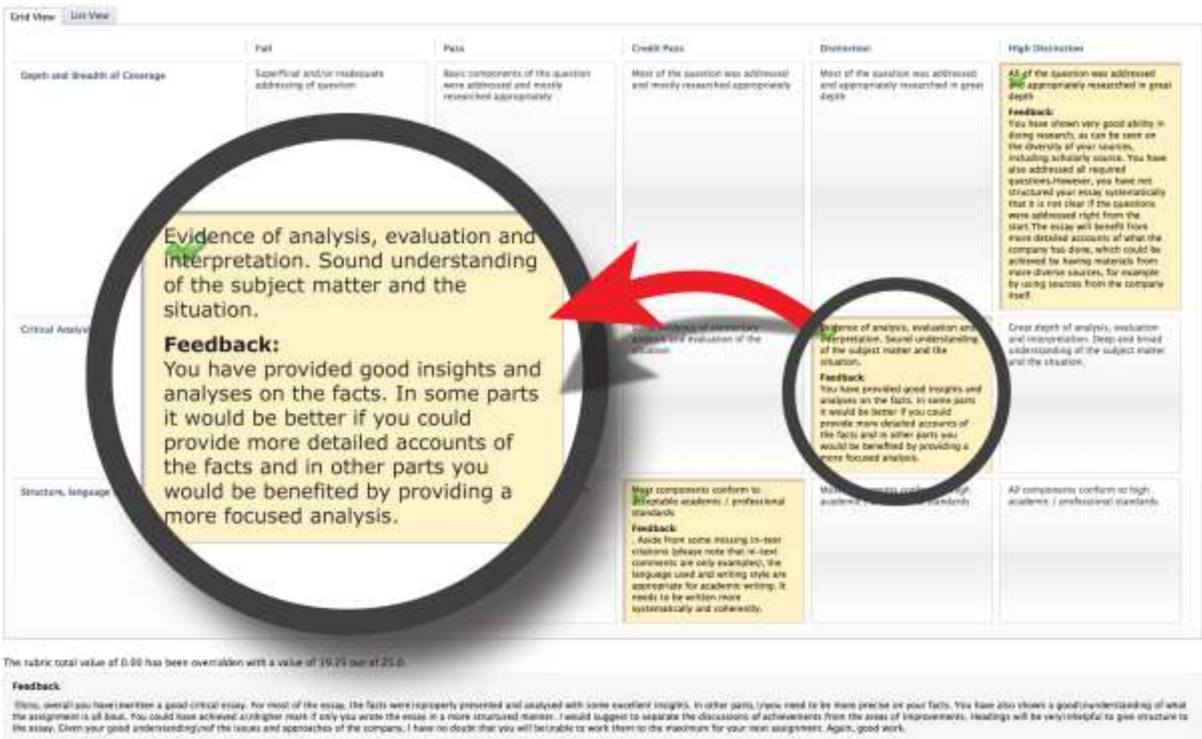

Figure 2: Feedback associated with each level of attainment in addition to global feedback

Levels of attainment for the entire cohort following moderation are shown in Table 1. The table shows the distribution across Fail (F), Pass (P), Credit (CR), Distinction (D), and High Distinction (HD) grade ranges. Within the Faculty of Business at the authors’ institution, Fail is an unsatisfactory level of attainment, whereas Pass and Credit levels denote that a student has met the stated learning objectives, and Distinction and High Distinction levels denote that they have exceeded these expectations.

Table 1: Percentage of students performing at each level of attainment

Rubric Criteria	Levels of Attainment				
	F	P	CR	D	HD
Depth and breadth of coverage	10%	26%	33%	22%	9%
Critical analysis	11%	25%	37%	22%	5%
Structure, language, conventions	13%	24%	36%	21%	6%

The rubric was used as a framework for providing student feedback. In this instance, the rubric was not used to directly compute the overall mark awarded. However, the observed distribution for the levels of attainment is generally consistent with expectations, with the majority of student falling into the pass and credit bands.

Analysis of the Tutor Moderation Focus Group Data

Following the completion of marking, a formal focus group was held as a debriefing activity in conjunction with a regularly scheduled tutor meeting. Common themes identified related to the nature of multiple pathways for tutor-tutor interaction and the varied mechanism used by the tutor community to interact. The type of information tutors exchanged related not only to provision of rubric-focused feedback, but also included information about successful workflows given the idiosyncrasies of the online technologies being introduced for marking and the provision of feedback.

Multiple Pathways for Tutor-Tutor Interaction and Information Exchange
A variety of formal and informal communication pathways were available to the tutor community, including the tutor-only discussion board, veteran/novice moderation partner pairings, and moderated discussions during formal meeting. Together, these provided multiple opportunities for peer interaction and the flow of information between tutors. The collegiate and routine manner in which tutors shared information through these many channels was a common theme that emerged from the focus group. For example, commenting on information exchange between members of the teaching team, Sofia stated: "[the community shared information] through the tutors, hats off to them. They were talking to each other and letting each other know, I've learnt this in conversations. And when people would raise questions I'd be learning too, so I would be, 'I'll try this. I've just learned this.' So imparting that information on an individual basis."

Interestingly, there was evidence that the flow of information between paired veteran/novice moderation partners flowed in both directions. That is, veteran tutors learning from their more junior counterparts and other members of the tutor community. For example, during the focus group, one novice tutor said, "I learned a lot from her" in reference to the veteran counterpart with whom she was paired. The veteran tutor responded by saying, "I learned more from you." Other examples of veteran tutors learning from other members of the community or adapting their viewpoint were also identified elsewhere in this study. Recall the experience of Ewan and Sienna in their disagreement regarding the mark they awarded the sample paper during the pre-moderation exercise. As has been noted, Ewan, the veteran tutor, changed his view to that of Sienna, the novice tutor, following a discussion with theirs peers that was moderated by the Unit Coordinator during a formal tutor meeting.

In some cases, it was reported that the interaction between veteran/novice moderation partners extended beyond email, discussion boards, and formal meetings. During the focus group, for example one participant said "Jenny and I are marking buddies, so we made it a habit to meet on each assignment, just take one day and discuss everything."

However, some tutors reported working alone, but later coming together to share information at the formal meetings, held face-to-face and simultaneously through web conferencing. For example, one tutor said: "Yeah, we had that first meeting and then after that it was very much off you go. We have another meeting after you met [the first time]. We caught up but we all were learning on the job like, for instance, put your grading first [before entering feedback in the LMS rubric tool]. None of us knew that. So a lot of it was learning on the job, me included."

For some tutors, the pre-moderation process conducted in the discussion board was an important exercise. It illustrated the potential for marking variation in the absence of a shared understanding regarding the meaning of marking descriptors, and fostered dialog amongst tutors that informed their marking. For example, during the focus group, one tutor reported that "… we put the paper up and then everyone can look at the paper and mark it to give some feedback. And there were some wide ranging marks for some of those papers. And there was quite a lot of discussion before we actually starting marking."

The provision of rubric-focused feedback

In general, tutors in the focus group reported being comfortable interpreting assessment rubric descriptors. In part, this may be because rubrics have been used in this unit for the past five teaching periods, but also because they were the focus of discussion using the various formal and informal communication pathways available to the tutor community. One tutors said, "I found the descriptors fine. I mean, they're really basically an outline between the five distinctions between terrible and brilliant and you interpret it how you interpret it, I guess. And we didn't have any problems. I guess we have similar thoughts on what the descriptors [mean]…"

Focus group comments like these reflect, in part, that the online rubric tool was configured to support the provision of feedback against levels of achievement for individual assessment criterion, rather than as a means for calculating and allocating a mark. That is, tutors were instructed to provide feedback based on each rubric criterion and associated level descriptors, but the final mark was not directly computed on the basis of this. In part, this was an intentional part of the assessment design. The aim was to focus student attention on the feedback they received, rather than on the number of marks awarded for attainment of each criterion at a given level. One tutor described a process in which he referred to the descriptors rather than the titles for the corresponding level of attainment, the latter of which better reflect the nomenclature associated with a mark band (e.g. Fail, Pass, Credit, Distinction High Distinction). He said, "I went to the grade related descriptor and checked to see if the paper satisfied that, within those parameters…. I probably kept that more in my head than the titles that were on the rubric."

"My biggest problem," said one tutor, "it's got nothing to do with the rubric… [My biggest problem] is working out the workflow. That's taken me a couple of hours to fathom out which is the best process for me." The rubric tool, for example, prescribed a particular workflow that some found to be problematic. "The problems that I had for quite a few days was I didn't want to put the grade in," said on tutor. "I wanted to put the [feedback] comments in but it wouldn't save my comments until I'd put my grade in because my comments were always going to stay. My grade, I just wanted to mark a few first before, to give myself an idea of where they were on a scale. And the rubric wouldn't allow me to do that. I spent absolutely hours trying to work out what I was doing wrong. I thought I was totally incompetent." Later, following consultation with a senior tutor, he learned that there was a prescribed order to the operations he was trying to perform.

Some tutors described how the online rubric tool assisted them in providing feedback that was aligned with the rubric descriptors. For example, one tutor said, "I'd always click on 'show description' and 'show our feedback," so viewed it in a way that I could see my feedback as I was entering it in. And I guess, for me, as a first marker, it was structuring my feedback into those three criterias [sic]."

Although the assessment rubric was intended to guide the provision of feedback rather than the calculation of an overall mark, it was clear that at least some tutors used it for the later. For example, one tutor said: "… I used three [rubric criterion] sections independently and gave feedback on three sections independently. So I marked them all at 33.3 effectively. So if they were a distinction in this area I had a comment on why, so it did relate to that content on the rubric. And the same with the middle component and the same with the language structure, so some I might have had a fail with the language but a pass in the other two areas or some were even a credit, pass, distinction. But it averaged out to their grade, so I didn't find that a problem at all because I marked the independent sections." One participant expressed concern that if the assessment rubric had been used for calculating the mark rather than guiding the provision of feedback alone that it may have skewed the results distribution. He said: "I think if we just marked basically, responded to those descriptors, we wouldn't have given out very many high distinctions. Because it talks about … I can't even remember the words but they're words that preclude much of the material that was submitted. But we'd have to interpret that material in the context of where these students are at and within their cohort. So exceptional or exceeds academic standards, or whatever the words are…"

Workflow and technology issues

A significant portion of the focus group discussion centred on issues related to how technology impacted workflow and the provision of feedback. Issues included the order of operations and the time taken to provide feedback using the online rubric tool, and the process for providing audio feedback for tutors who chose to supply their feedback in that format.

There was disagreement amongst the tutors regarding the length of time that it took to mark. "So basically we are given 15 minutes to do a marking and this clearly exceeds 15 minutes," said one tutor. While some agreed, others did not. While individual tutor competence with information technology-based tools may be a factor in this, workflow was also seen to impact the time it took to mark each assessment. One tutor said, "…I found that I was creating my own bank of [feedback] comments and that sometimes I'd pull them together, this bit from there and that bit from there." This was reminiscent of an approach that had been taken during previous teaching periods when an MS Word version of the rubric was used in conjunction with a bank of common feedback statements that could be cut-and-pasted into the correct place on the rubric feedback sheet that was returned to students. The Unit Coordinator commented that the unit had moved away from using a centralized bank of tutor feedback statements, as it had grown too large to be practical, was too impersonal, and not in the tutor's own voice or style. "So that big bank of comments that we've previously had in the previous version didn't always suit the tutors, " she said. "Because some would look at it and just go, 'I can't make that comment. It's obviously not from me. This is from a middle aged woman making a comment, or a middle aged guy'."

All tutors supplied students with global feedback, guided by the level of attainment they had selected for each assessment criterion in the online rubric. Some tutors also provided feedback at the detail of each rubric cell to further justify why the assessment was deemed to demonstrate performance at particular level. This difference in workflow may have contributed to variation in the time to mark an assignment in some cases. "… I think there's a bit of a misunderstanding. You don't have to give comments on every box in the rubric, as far as I understand," said one tutor. She continued saying, "One global comment is fine in the selection of the areas. So it's actually a time saver because you don't need to copy and paste the rubric and then go to Word and click the different colour to highlight it [as was done when we used the MS Word rubric in the past]. You just click three times…"

Discussion

The educational design of the unit in this study involved engaging students through a variety of communication channels and activities that use technologies like Facebook, Twitter, Hotseat and Voicethread. These were used alongside more traditional forms of communication and engagement that included classroom-based discussions and group presentations. As described in the Unit Outline, co-curricular participation in the activities of the student Debate Society encouraged to assist students to further develop their communication skills. To a great extent, providing students with multiple learning experiences and modes of engagement was an intentional part of the educational design of the unit. This approach was based on research that shows that students tend to gravitate to different kinds of learning resources and experiences based on individual learning styles and preferences (Allert, 2004). It was also based on the philosophy that it is best to provide a range of these to suit the needs of a diverse cohort (von Konsky, Ivins, & Gribble, 2009). This same philosophy has transcended the boundaries between student and learning facilitator, leading to a range of communication and interaction strategies designed to engage a diverse tutor community while fostering a team approach to marking and assessment.

Just as students gravitate towards those activities that match their individual learning styles, preferences, and perceived learning needs, so to did members of the tutor community. For example, the focus group demonstrated that some veteran tutors had the capacity and ongoing desire to improve their skills and learn from other members of the community, including from their more junior peers. In contrast, other veteran tutors demonstrated a "know-it" attitude, and felt less inclined to participate in community exercises having participated in similar activities during prior semesters. Encouraging these veteran tutors to remain active participants in ongoing tutor community activities remains a challenge in some cases.

Additionally, tutors generally possess a variety of attitudes regarding the use of technology (Dooly, 2009; Kessler, 2007). This can be due to a variety of factors including gender, confidence (Guichon & Hauck, 2011) and the amount of time a tutor has been working in the role. The extent to which a tutor's level of information technology competence impacts participation in the pre-moderation discussion board activity is unclear, and represents an opportunity for further research. Interestingly, the tutor responsible for the fully online implementation of the unit discussed in this study did not participate in the pre-moderation discussion board forum.

Whilst a strong collegial team exits, an element of resistance to the introduction of the new technology was evident in the present study. New tutors generally accepted that the technology was required to complete their role. At the onset of the present semester, however, the Unit Coordinator noted that some veteran tutors expressed a preference for continuing to use the old MS Word-based assessment rubric. The intention was to address this by emphasising the benefits of using the new tool during a training workshop. Indeed, Despont-Gros, Mueller and Lovis (2005) suggest that acceptance of change and the successful use a new information system is better achieved if it is perceived to have a positive impact upon an individual's work. Consequently, the training workshop emphasised how the new technology was to be employed on an operational basis and with respect to the management of workload. This included a presentation on the online rubric tool and a live demonstration provided by a University expert. The relevance of the online rubric tool was also discussed in the larger context of the business faculty's Assurance of Learning initiative.

Despite this training, the workflow employed by individual tutors and the impact of the rubric tool on marking time was seen to vary. To some extent, this may be because the online rubric tool was not used in conjunction with the pre-moderation exercise. Instead, tutors appended a marked up MS Word version of the rubric to the sample of prior student work, as was the practice in prior semesters. This placed the emphasis on the feedback tutors provided on the past student paper in the exercise and was easy to implement in the context of the discussion board. However, this did not provide hands-on exposure to the new online rubric tool, or an opportunity for tutors to discuss the workflow associated with the new technology based on personal experience prior to the commencement of marking.

That is not to say that implementing the pre-moderation exercise in the discussion board was unsuccessful. The new version retained the original activity in which tutors practiced marking and providing feedback on the prior student paper. In previous semesters, tutors sent their assessment and feedback on the paper to the Unit Coordinator. She later summarised the feedback of the entire tutor team before they began marking. In this sense, the discussion board version of the pre-moderation exercise was consistent with the values and practices of previous semesters. However, in the original version of the exercise there were no structured opportunities for tutors to interact or discuss the exercise as a community. Implementing the activity within the discussion board extended the exercise to one that fostered interaction and discussion amongst the tutor community. Individual tutors still provided a mark and feedback on the prior student paper, but were effectively given the responsibility of analysing the contributions of their peers for the benefit of the entire community, which was originally a responsibility solely vested in the Unit Coordinator.

Participation rates in the new version of the exercise were very encouraging, with 78% of those posting their assessment and feedback on the past student paper also commenting on at least one post made by a peer. While not all tutors posted within the forum, the extent to which lurkers may have benefited from reading the posts of their peers is not clear, nor is the extent to which this may have informed the offline dialog amongst veteran/novice moderation pairs. This highlights the need for periodic synchronous meetings, whether they occur face-to-face or via web conferencing, as an opportunity to consolidate community views and share the interactions that have taken place both within and outside the discussion board forum. Increasing participation rates amongst all members of the community will remain a goal of the exercise, as it is adapted in future semesters.

Moreover, implementing a robust moderation process has been a goal of this unit, with the aim to provide students with more consistent, timely, reliable and relevant feedback. There is anecdotal evidence to suggest that this has led to a significant reduction in appeals and discussion amongst students about mark variation, and represents an opportunity for further research. The collection of meaningful analytics that demonstrate the effectiveness of the evolving moderation process and the quality of its outcomes will remain also an important consideration as the moderation process evolves. This is not only because of the teaching and learning implications, but also to demonstrate compliance with university policies (Curtin University, 2011) and the expectations of regulatory agencies (TEQSA, 2012) and accrediting bodies (AACSB, 2012).

Conclusions

The use of assessment rubrics has the potential to reduce the time taken to mark assignments while providing more consistent feedback to students. However, the present study has illustrated the importance of establishing efficient workflows based on the experience and shared expertise of the tutor community, particularly when it involves the introduction of new technologies like the online assessment rubric.

Moreover, the research presented in this paper corroborates prior work demonstrates the value of marking briefings and tutor training (Crotwell Timmerman, et al., 2011), and of group activities and discourse that fosters the emergence of a moderation community of practice (Price, 2005).

This paper has described a moderation community of practice that provides members of the community multiple opportunities for interaction and engagement. The goal has been to foster a community of practice in which all members of the community take responsibility for the consistency and quality of the feedback provided to students. This reflects the evolution of moderation processes in a unit where there has been a culture of open communication amongst the tutor community for several semesters.

The establishment of the pre-moderation discussion forum was seen as an extension of this culture. It was not the intention to extinguish tutor interaction through other communication paths, nor has it. The data suggest that tutors engage with the established processes and interaction opportunities to varying degrees. Formalising participation expectations, establishing mechanisms to share tacit knowledge and managing offline communication within the wider tutor community will remain an ongoing challenge for the Unit Coordinator.

The pre-moderation discussion board forum was designed to complement existing moderation strategies and provide a range of opportunities to meet the needs of a diverse tutor community. The analysis of the discussion board forum and of the focus group held during the end of semester debriefing has provided data that will inform future iterations of these processes as the moderation community of practice described in this paper continues to evolve in future semesters.

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Twitter Learning Analytics in R

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There is presently no literature about the application of learning analytics to student learning activities that use Twitter beyond those describing the Twitter activities themselves and/or student survey feedback about these activities. This paper seeks to address this gap by examining the application of some data visualisation analytics to student activities on Twitter using the R statistics software programme. For those who already use Twitter as a teaching tool it illustrates some useful methods for analysing learner data in order to more effectively use Twitter in their teaching. For those who do not use Twitter in their teaching, they will hopefully still find the descriptions of various ways that Twitter is currently used, and the application of learning analytics informative for their teaching practice.

Keywords: Learning analytics, data visualisation, statistical software,

Introduction

Twitter is increasingly being used as a tool for student engagement and interaction in tertiary education (Lowe & Laffey, 2011). However, the analysis of the use of Twitter in academic literature to date has been based around either student surveys and/or the reflections of the teacher. This paper contributes to the conference theme of “leading in a climate of change”, extending the existing research by illustrating some learning analytics techniques that can be applied to Twitter data in order to examine student’s patterns of usage and interaction.

The goals of the paper are twofold. The first is to describe some of the ways in which Twitter is being used in tertiary education. The second is to encourage the use of learning analytics to enhance this teaching by providing examples of using Twitter-based data. In particular, this paper focusses on using the R statistical software programme (www.r-project.org), and showing how it can be used to extract and work with Twitter learning data. R is an open-source, free to download, statistical software tool. It has a wide user base, particularly in academia, and is well supported by email and web groups.

Learning Analytics

Learning analytics, which is also known as academic analytics, is the application of statistical analysis to learning data. Baepler and Murdoch (2010) describe it as the business intelligence tools to teaching and academia, with the goal of enhancing student outcomes. The state that, “academic analytics combines select institutional data, statistical analysis, and predictive modeling to create intelligence upon which students, instructors, or administrators can change academic behaviour”. Learning analytics involves the use of objective quantitative data rather than just quantitative measures of student surveys (Phillips et.al., 2011) and provides richer data that can be analysed to help inform instructor practice. Dawson, McWilliam and Tan (2008) highlight the importance of academic analytics, especially the ability to take data that is generated by learning activities, analyse it, interpret and then translate the findings into practice. This paper will focus on using several visualisation tools from R to examine some of the data generated by students using Twitter. This data visualisation will be the precursor to quantitative analysis to be completed in future research.

Twitter as a Teaching Tool

Twitter is used in a number of different ways in teaching. These include information transmission (student and/or teacher), collaboration and discussion (both in-class and outside of class), and micro-blogging. Kassens-Noor (2012) showed how Twitter can be used in and out of class, providing instant feedback in lectures, as well as being used as a discussion and collaboration tool. Twitter’s asynchronous nature allowed Saeed and Sinnappan (2011) to have students micro-blogging, and interacting across time and space in an e-commerce course. Rinaldo, Tapp and Laverie (2011) describe how to use Twitter as a pedagogical tool in a marketing course to engage students in class activites, and also to demonstrate to the students how social media are used in that discipline.

Cochrane (2010) showed how web 2.0 tools, including Twitter, could “facilitate learning experiences that bridge time and distance” and allowed students to collaborate internationally. Cochrane describes how Twitter was used to facilitate communication between students and lecturers in New Zealand and Ireland. Crews and Stitt-Gohdes (2012) describe how twitter was used as part of a business communication course. They had students use Twitter as a business communication tool, tweeting messages in order to promote a non-profit organization. Twitter can also be used in a large lecture theatre situation to create dialogue between individuals, and to increase student engagement (Tyma, 2011).

In each of these examples, the use of Twitter is described, and is generally supplemented by the reflections of the academic, and in some cases, student feedback or surveys. However, learning analytics could provide additional information to help direct efforts and use Twitter more effectively in teaching.

Tools for Analysing Twitter in R

The R software provides the ability to download Twitter related data, and to be able to plot and analyse it. One of the more useful downloadable packages is *twitteR* (http://cran.r-project.org/web/packages/twitteR/index.html). This package allows users to extract information on followers, those following, posts, hash tags, etc. It can be integrated with other packages to allow for data visualisation and analysis. The three areas where analytics could help to investigate student usage of Twitter are: examining the frequency of use, mapping users and their social networks, and examining the content of student tweets.

Frequency and intensity of use

The simplest analysis of Twitter is to examine when, and how often students are posting. Rinaldo *et.al*. (2011) comment on the positive impact that Twitter has had on their teaching but lament the fact that it is difficult to monitor usage, particularly for a large class, and that this is problematic if they wish to include Twitter contributions as a summative component of their course. However, the usage information required to track and grade students can be accessed using the twitteR package, and much of the tracking and analysis could then be automated.

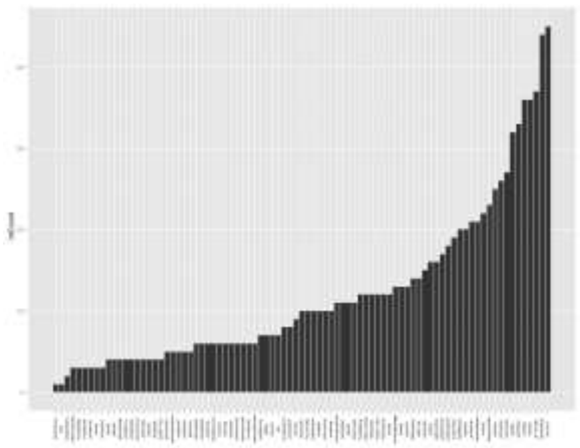

Figure 1: Tweet counts by user (from http://www.r-bloggers.com/a-quick-view-over-a-mashe-google-spreadsheet-twitter-archive-of-ukgc12-tweets/).

Figure 1 shows a sorted bar graph of the number of tweets for a selection of users. In this example, the tweets were saved to a Google spreadsheet for archival purposes, then loaded into R and plotted. However, the *searchTwitter* function in the *twitteR* package also allows for the retrieval of tweets. This could be used as a grading tool, or to inform future activities in Twitter.

Mapping relationships and social networks

Kassens-Noor (2012) and Saeed and Sinnappan (2011) talk about using Twitter to create collaborative communities, and to foster collaboration between students. However, in each case little was done to examine whether this was occurring. Figure 2 shows a map of Twitter followers (left) produced using the *twitterMap* function (http://biostat.jhsph.edu/~jleek/code/twitterMap.R) and a social network diagram (right). For online education, the ability to track student locations on a world map can be useful for tracking where your students are working from, which in turn can be useful for organising interactions and collaborative work, such as the activities described by Cochrane (2010).

Figure 2: Map of Twitter followers (left) and social network graph (right)

Student interactions can be examined in more detail by looking at how students are interacting with one another using social network analysis and social network graphs. Dekker (2011) describes the social network analysis of discourse, where interactions between individuals are graphed and modelled. By mapping the connections between students we can examine relationships and get a more detailed picture of interactions between participants (and identify non-participants). Figure 2 also shows a social network map, with the points representing students, and the lines representing the connections between them. In this example we can see that all of the students are interconnected, but with this kind of analysis we can identify students who have disengaged from Twitter based activities. This graph was produced using the *sna* (social network analysis) package in R.

Hashtags, word clouds and sentiment

One further level of advancement in the analysis of tweets is to examine the content of the tweets themselves. Bollen, Mao and Pepe (2009) describe how text-mining can be used to extract mood and sentiment information from tweets over a period of time. These can be graphed in terms of positive or negative, but also examined by translating key words into a word cloud, where the size of the word represents how often it occurs.

Figure 3: Word cloud

Figure 3 shows a word cloud, produced using the *tm* (text mining) and *wordcloud* packages. It allows for a quick visual analysis of keywords that are being used. Using the *twitteR* package, tweets can be searched and organised, and examined by keywords, hash tags or other patterns. This can give an instructor an idea of the key themes that are running through student Tweets, and help inform future teaching, and can be shown to students to help them seem the patterns in their collective tweets. The student activities presented by Crews and Stitt-Gohdes (2012), where students are promoting a non-profit organisation, could be collaged and used in future classes, where students could examine patterns and themes in their tweets.

Conclusions and Future Research

This paper has described some examples of how Twitter is used in tertiary education, and how the R statistical software could be used to analyse Twitter information generated in some of these teaching activities. Although R is not the only analytics tool that can be used to analyse Twitter usage, patterns and networks, it is free, open-source, and has a well-supported user community. The analysis packages are flexible and integrate with easily with one another. This makes it a good choice for those looking to start working with learning analytics.

For those who already use Twitter in their teaching, learning analytics can improve the practice of current Twitter activities in higher education by allowing users to examine patterns in student usage, student interaction, and message content. Beyond this, one of the appealing future possibilities is to make the teaching/learning/analysing process with Twitter more circular, where learning analytics will not only inform the teacher but also the learner. Students can be provided with analysis and output of the analytics during the course, allowing them to reflect on Twitter their use, and possibly alter their learning behaviours.

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Preparing to Teach Architecture Online: The Hurdle of the Design Studio

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"Technology is transforming the practice of architecture and design from the conceptual stages right down to the actual construction" (Bender 2005). Recent technological developments in educational delivery have the ability to transform and redefine teaching in the discipline of architecture. To be able to offer a complete Architecture course online, the unique requirements of the practical design studio must be addressed and supported in the online environment. This poster sets out to illustrate what these features are and the process by which an Australian university has maintained the pedagogical requirements of the learning space.

Keywords: architecture, virtual design studio, design studio pedagogy

Introduction

The opportunity to deliver the Bachelor of Architecture and Master of Architecture as online programs was presented to the School of Built Environment and the Department of Architecture in 2011. The delivery scenario of the practical design studios – an integral, long term component of architectural learning, is a collaborative, creative and tangible space. The pedagogy of this practice was seen as one that could not be replicated, replaced or improved upon in an online learning environment. This poster explores the history of the architectural design studio, the pedagogy underpinning this approach and how we intend to translate a face-to-face design studio to the online environment.

The History of the Virtual Design Studio

The Virtual Design Studio (VDS) refers to a networked studio computer mediated and supported, distributed across space and time to participants in different locations (Broadfoot and Bennett 2003, 4). Virtual design studios, used since the mid-1990s, have influenced not only the role of the educators but also pedagogical models and outlooks (Shao, Daley and Vaughn 2007, 919). However it is important the pedagogical features and learning outcomes that are critical to successful learning in a face-to-face studio are replicated in the online design studio. The virtual design studio is by no means a new way to conduct design studios; they have been set up and used in several ways including asynchronous and synchronous delivery, and using various tools and e-technologies.

The Pedagogy of the Virtual Design Studio

The same fundamental questions asked of traditional design studio pedagogy need to be asked in the virtual design studio environment with the additional consideration of the possibility of a more radical, innovative and dynamic pedagogy being identified and delivered (Reffat 2007). Although there is a change in communication *methods* in an online environment, the learning tasks, outcomes and environment are the same, as is the importance placed on the communication between student and teacher. Both Schön (1987) and Kvan (2001) uphold that *one-on-one* communication is essential for exposure to the *tacit* knowledge inherent in designing. The VDS must be a highly interactive, collaborative learning environment allowing students to digitally display their work, including sketches and physical models, for critique from staff, industry professionals and fellow students.

Translation of design studio to the online environment

The infusion of digital media into practice of design and architecture is changing how the design process is carried out, what is designed (ie: artefacts), and the culture of design education (Reffat 2007). Students will set up a social network page using Ning and then join a 'special interest group' or 'community' for their unit. Ning was chosen not as 'another social network', rather to provide a tool that harnesses the engaging power of social networking for interaction and communication. Using Google SketchUp students will sketch their designs in 3D and then geo-reference them in Google Earth. The students will then create a physical model and produce a 5-10min video of the model and upload their sketch, link to Google Earth and the video of their model to their

Ning page. Alternatively the video can be uploaded to YouTube and embedded directly to Ning. Critique and online feedback by tutors, peers and industry professionals will take place through Ning.

What next?

The online architecture course will be delivered in study period 1, 2013. We will then conduct a full review of how the course was delivered, taking into account feedback from students, staff and industry professionals and make any enhancements if necessary.

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Ready for m-learning? Access to mobile devices by tertiary students studying Japanese

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This paper reports on the ownership and use of computer hardware, including smart phones and tablet computers, among the students learning second year level Japanese at a university in Australia. The survey of 160 students shows that these mobile devices are taken up rapidly by current students, and are gaining popularity as a method of accessing study-related materials. Owners of a tablet computer seem more likely to use it for their education purpose. Yet, the significant majority of students still seem to prefer using desktop computer at home to access the university's Learning Management System, indicating that students are selective about their use of technologies for different purposes. The foundation for implementing m-learning at tertiary level seems to be almost set from the hardware point of view, but the students' pattern of using the hardware must also be taken into account when developing m-learning contents. (145 words)

Keywords: smart phone, tablet computer, ownership, use, survey, language learning

In the last 5 years, two products, iPhone and iPad, have given us alternative ways to interact with the world, organise our lives and obtain information. Both items have enabled us mobile access to the internet, and invited other companies to introduce similar products, thus created two new categories of technology that were not readily available to general population previously. Devices in both categories have penetrated the market rapidly. Telstra, an Australian telecommunication provider, claims that in 2011, 46% of mobile phone owners in Australia own a smart phone and this will continue to increase in the future (Telstra, 2011). Tertiary students are no exception to this trend. The learning in the future will most definitely utilise these technologies. Various mobile learning (m-learning) contents have been developed and delivered, capitalising on this trend (e.g., Cochrane & Bateman, 2010; Kinash, Brand, & Mathew, 2012).

However, despite being referred to as 'Digital Natives' who grew up surrounded by digital technologies and who are always ready to learn and processing information (Prensky, 2001a), not all digital natives who are now entering tertiary education are equally capable of using the latest mobile devices nor adept at learning at any time (Kennedy, Judd, Churchward, Gray, & Krause, 2008). In order for m-learning to be effective, students' access to, their level of familiarity with, and their preference and patterns of using different technology that they have must be considered (Kennedy *et al*., 2008).

The data analysed in this paper was collected as a preparation for upcoming development and implementation of m-learning program to enhance the learning of Japanese language. Through analysis, this paper intends to find out what array of technologies the students in 2012 own, how the available technologies are used by them, and whether there is a space for educational contents to enter into students' time and lifestyle via these technologies. It will also draw comparisons from the similar survey conducted at the same university in 2006 (Kennedy *et al*., 2008) to see how the introduction of the two categories of technologies, i.e. smart phones and tablet computers, have affected the students' use patterns of other technologies.

Background

Although smart phone ownership is spreading rapidly among students, there does not seem to be a clear definition of a smart phone. However, modern smart phones seem to share the following common features in addition to being able to make a phone call: data communication capability through applications such as a web browser, an email client and a calendar, an ability to compose and view documents, an ability to view and play photos, music and video clips, a camera to take photos and videos, and a LCD touch screen which doubles as touch keyboard (Incept Inc., 2011). Further, a user can add extra functions to their smart phones by downloading applications, or 'apps', such as foreign language dictionaries and games. A tablet computer can be described as a larger version of a smart phone without the ability to make phone calls (Incept Inc., 2012). With a larger screen, a tablet computer can be used as a substitute for a larger desktop or laptop computers (Telstra, 2011). In addition, the touch screen on tablet computers and smart phones can record where on the screen was touched, and when recorded continuously it can act as a digital notepad. With fingers and/or stylus pen, a user can create a note and send a digital copy to other users via the internet.

With the development of data communication infrastructure, users of smart phones and tablet computers are able to access the internet anywhere in the world where there is a mobile phone coverage or a WiFi access point. This capability can make smart phones and tablet computers ideal tools to not only deliver m-learning contents, but to ask students to interact with their teachers and peers. Especially for learning a language, where an extended amount of exposure to the target language is necessary for memorising and constructing another system of language, m-learning or Mobile Assisted Language Learning (MALL) is an attractive option for both students and teachers to increase contact hours. However, development and implementation of MALL activities will be limited by the students' access to mobile devices and use patterns. Surveying potential clients seemed appropriate to determine how students use different types of technologies for their study and other needs.

There are three studies that surveyed students' ownership and use of various technologies including mobile devices in Australian higher education context. Oliver and Goerke (2007) surveyed 413 students in 2005 and 290 students in 2007. In both survey they asked students about ownership of four mobile devices: laptop computers, handheld computers (PDA), mobile phones and portable MP3 players (e.g., iPod). It was found that in both survey just less than half of the respondent owned a laptop computer, less than 10% owned a handheld computer, while more than 96% owned mobile phones. They also found that majority of students (93.4 in 2005, 86.6% in 2007) use the online resources for study purposes. Although it is not stated how these students access the internet resources, one would imagine it was done from a desktop computer, given that mobile internet was not widely available in those days.

A larger scale study was conducted by Kennedy et al. (2008). They surveyed 2120 first-year students in 2006 at the University of Melbourne about their access to various technology hardware, including mobile phones and desktop computers, and use of them to access the internet resources. They found that 96.4% of students had unrestricted access to a mobile phone, 89.5% to a desktop computer, 63.2% to a laptop computer, and 10.8% to a PDA. Over 90% of students responded that they use the internet for study purpose, and most of them do so on daily or weekly basis. However, when asked about accessing the internet from their mobile phones, either for study purpose or otherwise, only 32.2% responded affirmatively.

Both studies mentioned above occurred before the introduction of the smart phone and the tablet computer. Fujimoto and Stockwell's study in 2010 surveyed 180 students studying various languages (Fujimoto & Stockwell, 2012). Their study also showed that more than 96% of students own mobile phones and more than half of them readily use them to access information on the internet. What was interesting was that almost 4% of students being surveyed do not use their mobile phones to make phone calls, meaning their use is limited to sending and receiving text messages and accessing the internet. However, the distinction between smart phones and ordinary mobile phones were not made in their questions. The ownership of tablet computer was not questioned either.

Aiming at using a smart phone to implement MALL activities in the near future, the students' ownership of smart phones will be surveyed in this study. Further, the students' use of various mobile and other technologies to access internet resources for study purpose will be included in the survey questions. Finally, students' willingness to use their smart phones and mobile phones for learning Japanese will be asked.

Methodology

Participants

Data used for this analysis was collected from students undertaking second-year-level Japanese subject at the University of Melbourne in May, 2012. Out of 190 enrolled students, 160 students participated to the survey. All participants were aged between 17 and 22 at the time of survey, thus belonging to 'digital native' generation.

At the University of Melbourne, students can take Japanese language subjects as their major or minor study area or as breadths subjects. All students at the university are encouraged to take 4 subjects from outside their home faculties, and this is how the majority of the students access Japanese subjects. Out of 160 participants, 131 (81.9%) indicated they are in this category, outnumbering both students studying Japanese as their major (21, 13.1%) or minor (7, 4.4%) area of their study. Among the teaching team, students in this category is said to spend less effort and time on their Japanese study because it is not their major study area.
The male/female ratio was close to even, with 70 male participants (43.75%) against 90 female (56.25%), while the number of international students was not as high as expected (59 participants, or 36.9%).

Procedure

A 1-page questionnaire, containing questions about students' access to, frequency and location of using various technologies and their likeliness to use their mobile devices in the m-learning or MALL activities being developed in the near future, was used. The format of the questions and the technologies included in the questions were selected following Kennedy *et al.*'s study (2008) in order to draw direct comparisons from their survey in 2006 to see the changing landscape of technology use over the 6 years at the same university. However, some items of technologies were substituted to reflect the technological development over the 5 years. For example, PDA which attracted the least proportion of affirmative answer in 2008 was dropped in favour of the two pieces of new technology, i.e., smart phones and tablet computers. The range of activities students conduct on-line was reduced to what can be done on mobile devices and substituted to reflect the possible use of the devices for a language learning purpose.

The anonymous questionnaire was distributed during a tutorial in May, 2012. There were 9 tutorial groups this year, each containing 16 to 22 students. The tutors in each tutorial group distributed the survey and were asked not to give specific instructions on answering the questions, other than to make general comments such as "students in this course seem to use their smart phones a lot during the tutorials." The students then had about 5 to 10 minutes to complete the questionnaire during the tutorial, before returning it to their tutors. The main researcher was not present during this time.

Results

Students' access to technology

Students were asked about their ownership and the access to a range of technology hardware. Three choices, unlimited access, limited access and no access, were given to each of the following devices: smart phone (e.g., iPhone and Android phone), ordinary mobile phone, tablet computer (e.g., iPad, Galaxy Tablet), laptop computer, desktop computer, and MP3 player (e.g., iPod). Smart phone and mobile phone are asked as separate items in order to see the penetration of the smart phones to this group of students independently from the older-generation mobile phones, although the distinction between them were not made explicit other than the examples given before. Students were advised to select 'Unrestricted access' if they own the device, and 'Limited access' if they use a shared facility.

Table 1: The percentage of students who owns or have access to mobile devices.

	2012			2006*		
	Unrestricted access	Limited access	No access	Unrestricted access	Limited access	No access
Smart phone	76.3	7.5	16.3			
Mobile phone	55.6	5.0	36.9	96.4	0.9	1.5
Tablet computer	22.5	10.6	66.9			
Laptop computer	84.4	8.8	6.9	63.2	10.0	24.0
Desktop computer	46.9	19.4	33.8	89.5	4.9	3.7
MP3 player	72.5	6.3	21.3	68.9	5.7	23.3

* The data from 2006 adopted from Kennedy *et al.* (2008)

Table 1 shows that majority of students have unrestricted access to the devices asked about, other than tablet computers. More than one in four students now owns a smart phone, while the ownership of ordinary mobile phone has dropped to 55.6%. Further analysis shows that 39.4% of students own both a smart phone and a normal mobile phone, while 0.6%, or 1 student, indicated that he/she does not have an access to either. The percentage of students who answered they only have access to a mobile phone, but not a smart phone or a tablet computer, was 10%.

Within 2 years of being on the market, tablet computer has penetrated a third of student population; 33.1% answered they either own or have access to a shared tablet computer. None of them answered that they have an unlimited access to a tablet computer on its own; of 36 students who answered they have an unlimited access, 35 (97.2%) indicated they also have an unlimited or limited access to a laptop computer and 27 (75.0%) indicated they also have an unlimited or limited access to a desktop computer. Twenty-six, or 72.2% of students indicated they have an access to all three types of computers.

When compared with the data from 2006, the access to a desktop computer has significantly dropped, with 33.8% claiming they do not have access to a desktop computer. In comparison, the access to a laptop computer has increased by around 20%. No student indicated that they do not have access to either a desktop or a laptop computer.

The proportion of students who have access to a MP3 player did not change significantly. Although a slight increase in ownership percentage is observed, it can be attributed to the difference in the size of participants between the two studies.

Frequency of use

Table 2 shows what proportion of students use their mobile devices for different activities. The question did not specify which device is used for a particular activity, but asked the students' general tendency to do the various activities from their mobile devices. Although some students indicated which device they use for each activity, they are not reflected to Table 2.

Table 2: Percentages showing how often students use mobile devices for different activities.

<table>
<tr><th></th><th colspan="4">2012</th><th colspan="4">2006*</th></tr>
<tr><th></th><th>Daily</th><th>Weekly</th><th>Monthly</th><th>Not used</th><th>Daily</th><th>Weekly</th><th>Monthly + over monthly</th><th>Not Used</th></tr>
<tr><td>Make phone calls</td><td>75.6</td><td>18.1</td><td>4.4</td><td>0.6</td><td>76.2</td><td>16.1</td><td>4.3</td><td>3.4</td></tr>
<tr><td>Send/receive SMS</td><td>91.9</td><td>6.3</td><td>1.3</td><td>0.0</td><td>79.5</td><td>13.2</td><td>3.1</td><td>4.1</td></tr>
<tr><td>Send/receive email</td><td>58.8</td><td>23.1</td><td>3.8</td><td>13.8</td><td>7.4</td><td>5.9</td><td>10.9</td><td>75.8</td></tr>
<tr><td>Take digital photo/movies</td><td>36.3</td><td>31.9</td><td>20.6</td><td>10.6</td><td>32.2</td><td>25.0</td><td>12.6</td><td>30.1</td></tr>
<tr><td>View Learning Management System</td><td>46.3</td><td>31.9</td><td>1.3</td><td>20</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Access website for study purpose</td><td>43.8</td><td>32.5</td><td>6.3</td><td>16.9</td><td rowspan="2">8.1</td><td rowspan="2">9.5</td><td rowspan="2">14.5</td><td rowspan="2">67.8</td></tr>
<tr><td>Access website for other purposes</td><td>73.8</td><td>15.6</td><td>1.3</td><td>9.4</td></tr>
<tr><td>As a dictionary</td><td>45.0</td><td>30.6</td><td>2.5</td><td>21.9</td><td></td><td></td><td></td><td></td></tr>
<tr><td>As a personal organiser</td><td>36.9</td><td>24.4</td><td>9.4</td><td>29.4</td><td>29.8</td><td>21.6</td><td>12.2</td><td>36.5</td></tr>
<tr><td>Take notes for study purposes</td><td>18.8</td><td>25.0</td><td>4.4</td><td>51.3</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Listen to music/podcast</td><td>70.0</td><td>5.6</td><td>2.5</td><td>21.9</td><td></td><td></td><td></td><td></td></tr>
</table>

* The data from 2006 adopted from Kennedy *et al*. (2008)

The use of mobile devices to make phone calls, regardless of the type of phones, did not change greatly from 2006 data. However, the uses of mobile devices for other activities have increased since 6 years ago. The uses of mobile devices to send/receive emails have increased dramatically, from 7.4% in 2006 to 58.8% in 2012. Furthermore, mobile devices are used much more frequently to view websites, both for study and private purposes. While the data in 2006 only surveyed students for their experiences in using information from the web, the students in 2012 appear to use the web to gain information for their study as well. Unfortunately the data does not show the quality of students' experiences viewing various websites.

Students in 2012 seem more open to using their mobile devices for their study purposes. It is significant to see almost half of students have used their mobile devices to take notes for study purposes, and 43.8% on more than weekly basis. In language courses, almost 4 in 5 students have used their mobile devices as a dictionary, and 45% of them on daily basis.

These increases could be the result of enhanced capability of new mobile devices, especially smart phones and tablet computers, to readily access the internet and handle larger amount of texts on their larger screen. To check this, the data gathered from the owners of tablet computers and smart phones are contrasted with the students who do not have access to these devices. Tables 3 to 6 shows the percentage of students accessing email, accessing websites for both study and other purposes, and taking notes for study purposes according to their access to a tablet computer, smart phone and ordinary mobile phone.

Table 3: Percentages of students accessing email according to their access to mobile devices.

		n	Daily	Weekly	Monthly	Not Used
Access to a tablet computer	unlimited	35	65.7	28.6	0.0	5.7
	limited	17	70.6	17.6	0.0	11.8
Access to a smart phone	unlimited	121	66.1	23.1	3.3	7.4
	limited	12	50.0	25.0	0.0	25.0
Access to a mobile phone only		16	25.0	12.5	12.5	50.0

Students who have access to a tablet computer and a smart phone appear to send and receive emails from their mobile devices more often than students who only have access to an ordinary mobile phone. However, more students from the mobile phone only group are accessing the email from their mobile phones compared to students in 2006, as shown in Table 2.

Table 4: Percentages of students accessing websites for study purposes according to their access to mobile devices

		n	Daily	Weekly	Monthly	Not Used
Owns a tablet computer	unlimited	35	62.9	28.6	2.9	5.7
	limited	17	29.4	47.1	5.9	17.7
Owns a smart phone	unlimited	121	47.9	36.4	5.0	10.7
	limited	12	41.7	25.0	16.7	16.7
Owns a mobile phone only		16	18.8	18.8	6.3	50.0

Table 5: Percentages of students accessing websites for other purposes according to their access to mobile devices

		n	Daily	Weekly	Monthly	Not Used
Owns a tablet computer	unlimited	36	88.9	8.3	0.0	2.8
	limited	17	76.5	17.6	0.0	5.9
Owns a smart phone	unlimited	122	83.6	12.3	1.6	2.5
	limited	12	50.0	33.3	0.0	16.7
Owns a mobile phone only		16	25.0	25.0	0.0	50.0

A significant majority of students with accesses to a tablet computer and a smart phone indicated they view websites both for study and private purposes in daily or weekly basis. However, students with an access to a tablet computer appear slightly more willing to use it for study purpose than students with an access to a smart phone on more frequent basis. For example, 92.3% of students with a tablet computer use it for study purpose on daily basis, as opposed to 89.6% of students with a smart phone. In comparison, only half of the owners of a normal mobile phone have used it to view websites for both study and private purposes.

Table 6: Percentages of students taking notes with their mobile devices for study purpose according to their access to mobile devices

		n	Daily	Weekly	Monthly	Not Used
Owns a tablet computer	unlimited	35	40.0	25.7	0.0	34.3
	limited	17	17.6	23.5	11.8	47.1
Owns a smart phone	unlimited	120	19.2	30.0	5.0	45.8
	limited	12	16.7	8.3	8.3	66.3
Owns a mobile phone only		16	12.5	6.3	0.0	81.3

Although there are still a portion of students who do not use their tablet computers and smart phones for a note-taking purpose, students with a tablet computer are twice more likely to use it on daily basis than owners of a smart phone and a mobile phone. Ordinary mobile phones are not used for note taking, although there seem to be some dedicated users of their mobile phones.

Learning on mobile devices

The next section asked array of questions to determine whether mobile devices can be a tool for delivering mobile learning, and students' willingness to use them to learn Japanese on the move. As shown in Table 7, when asked directly, 83.1% of students answered they would like to use their mobile devices to receive m-learning or MALL activities.

Table 7: Percentages of students willing to receive m-learning instructions on their mobile devices.

Yes	83.1
No	10.0
Maybe/No Answer	6.9

However, when asked where students use their mobile devices, and where they access the university's Learning Management System (LMS), a different picture emerges. Table 8 shows the percentages of students using their mobile devices in different situations, and Table 9 shows the percentage of students accessing the LMS from different locations. Multiple answers were allowed for these questions.

Table 8: Percentages of students using their mobile devices in different situations (multiple responses).

At home	49.4
On the way to/from uni	66.9
At uni during classes	14.4
At uni between classes	43.1
Weekend	25.0

Table 9: percentage of students viewing LMS from different locations (multiple responses).

At home from a desktop computer	96.9
From university computer lab	21.9
On the move from a mobile device	27.5

Approximately two out of three of students (66.9%) indicated they use their mobile devices on the way to and from the university, while 43.1% indicated they use mobile devices between classes on campus. Mobile devices are also used by 14.4% of students during classes, presumably for note-taking purposes. Almost half (49.4%) responded that they use their mobile devices at home. Interestingly, only 25.0% of students use them on weekends.

Table 9 shows that the vast majority of students access the LMS at home from desktop computers rather than from mobile devices, while 27.5% indicated they access LMS on the move from their mobile devices. The choice “at home from mobile devices” was not included in the survey. University computer lab is used by 21.9%.

Discussion

The findings confirm that ‘digital native’ students are not homogenous group (Kennedy et al., 2008). When a new piece of technology becomes available, it does not always completely replace the old ones, but leaves behind some who are comfortable with not using the new technology (Kennedy, 2011). For example, although tablet computers have been used by one in three students, their use patterns are widely varied. Some have embraced the technology in various aspects of their life, including study purpose; others seem to prefer the old methods of studying. The number of students with an access to smart phones has now overtaken the number of students with an access to ordinary mobile phones with limited functions. When providing m-learning activities for the current students, alternative accesses to the same materials must be made available, not just from equity point of view to those without an access to a smart phone, but to fulfil the different choices that students make.

The selective nature of ‘Digital Native’ students, in terms of what technology to use for their learning, is noted by other authors too. For example, Stockwell (2010) reports that when given a choice to work on the same task between a mobile phone and a desktop computer, students who initially chose to work on their mobile phone have changed to work on desktop computers during the project. He also reports that the students who worked on desktop computers showed a higher level of achievement than those who worked on mobile phones (Stockwell, 2010).

From the findings of this study, too, it is unknown whether students who participated to this study will use their mobile devices to engage in the proposed m-learning or MALL activities, despite their overwhelming enthusiasm to attempt such a mode of learning. Despite a wider ownership of smart phones and an increased access to the internet from the mobile devices, it has not translated to accessing study-related website, in particular, the university LMS. Although it can be accessed from smart phones, this author’s own experiences with viewing the LMS on smart phones show that the pages are difficult to navigate from the smaller sized touch screens on these devices. The issue of screen size is widely acknowledged by practitioners of MALL (e.g., Stockwell, 2010). Perhaps the current generation interface design of the LMS is not suited to the use from smart phones. The issue of user interface still remains despite smart phones having larger screens and more intuitional interfaces than the older generation mobile phones.

However, it is notable to see 45% of students use their mobile devices as a dictionary. This may include both accessing the dictionary website via the web browser and using dedicated language dictionary apps. From this author’s personal observation in tutorials, the latter is the case for majority of students, giving them an alternative to buying a dedicated electronic dictionary that was once popular among language learners and international travellers. The dictionary data used in these apps can be stored in the smart phone or accessed via the internet connection. There are pros and cons for both types of dictionary apps, but ability to connect to the internet is exclusive to dictionary apps installed on smart phones. Furthermore, students seem to like using these dictionary apps in classes. It can be suggested that developing a dedicated app to access LMS, such as Blackboard Mobile Learn (Kinash et al., 2012) may invite more access to information on LMS from smart phones.

Access issues aside, it is also notable to see that mobile devices are used at home by most students, and that preparation for university studies seems to take place the most often at home. The similar findings were reported when a wider population of Australians were surveyed (Telstra, 2011). It seems that despite ‘Digital Natives’ are always ready to integrate new knowledge (Prensky, 2001b), in order to learn systematically, as required by the current tertiary education system, they still need a place to spend time on the contents to be learnt in peace. It appears their mobile devices are used to access information that they need instantly when they need it, in addition to using their less mobile devices, such as desktop and laptop computers. This may also shed light on the fact that students who have unrestricted access to a tablet computer also have regular access to desktop and laptop computers. Using mobile devices ‘at home’ does not necessarily mean they are used ‘at a desk’; it can be used in bed or in toilet (Telstra, 2011). Students are selective about which technology to use for different purposes.

Finally, one question that is yet to be answered is how tablet computers will be taken up by ‘Digital Native’ students in the near future. The cost of tablet computers may be preventing some students from owning one, in comparison to smart phones which can be owned with small or no initial outlay.[1] While it seems clear that it will not replace desktop or laptop computers in the next couple of years, it is also evident that the students with access to a tablet computer are more likely to use it to access websites for study purpose, including the LMS, and even during the classes to take notes. This seems to be the technology that can be transferred to learning purposes easily. Follow up surveys in the future may find a different picture.

Conclusion

For now, this author is satisfied to see that the students are willing to use their mobile devices to receive m-learning instructions. However, the challenges ahead are to design m-learning and MALL tasks that are unique to smart phones and can be used from a simple interface, as seen in various dictionary apps. It may be the case that the learning of the future is something that is downloadable as an 'app' to the students' mobile devises.

At the same time, in order to sustain the current mode of tertiary learning, which demands students to synthesise and create new knowledge, learning contents to encourage quiet thinking and learning time is also necessary. Strategies to use mobile devices for such purposes should also be considered.

The future surveys will need to incorporate questions specific to user interface as this appears to affect students' willingness and frequency to access information on smart phones. To see the changing landscape of technology use by students, a continued study of similar kind is ideal in order to determine how best to incorporate technology in the teaching at higher education level.

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[1] At the time of writing, iPad WiFi only model with 16GB memory is sold for A$539, and WiFi + 3G model is sold for A$679. Smart phones in Australia can be purchased from under $50 plus appropriate network usage fee for calls and data communication.

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Sustaining a problematic innovation: A ‘grounds-eye’ view of video conferencing through teachers’ experiences

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This paper reports on a study that explored the engagement of 17 academic staff with video conferencing technology in four large first-year classes in higher education during 2011. While the video conferencing brought a number of benefits, its implementation was far from straightforward, raising many issues about whether it should endure, and if so, in what form. Using an insider research approach, this paper considers ‘grounds-eye’ perspectives from teachers involved with the video conferencing. The findings identify three key issues that affected the sustainability of the video conferencing: a lack of synergy between individual, pedagogical, and organisational levels; the adoption of ‘safe’ practices by teachers when faced with uncertain learning settings; and the endurance of the video conferencing in an altered form. The paper casts some doubt on the positioning of teachers as ‘future makers’, showing how teachers can retreat into established practices when technology creates uncertainty in an educational context.

Keywords: technological innovation, sustainability, teacher perspectives, video conferencing, insider research

Introduction

The sustainability of innovation remains a pressing concern in the educational literature (Haigh, 2012; Nichols, 2008; Southwell, Gannaway, Orell, Chalmers, & Abraham, 2005), and e-learning is no exception (Breslin, Nicol, Grierson, Wodehouse, Juster, & Ion, 2007; Gunn, 2010). While early enthusiasm can often accompany technological initiatives, many are transitory, struggling to endure past their initial development stage, particularly when funding ceases. To borrow an analogy from Haigh (2012, p. 20) who discusses scholarship of teaching and learning (SoTL) projects, a new initiative can be like a “…wild flower, which suddenly bursts into full and striking bloom, delights those in the immediate neighbourhood for a brief period of time, then fades rapidly and disappears”. This paper reports on a study that investigated teacher engagement with an institutionally driven technological innovation that was perceived to be problematic by teachers. While it can be argued that all innovation is problematic to varying degrees, this paper is significant because it follows an innovation that seemed particularly disruptive, endangering its longevity, and because it provides an insider view of technological innovation through the experiences of mainstream tertiary teachers.

Sustaining technological innovation

Innovation “involves learning to do something in a completely different way by developing new practices which are both personal and social”, often using new technologies that allow us to act in different ways (Somekh, 2007, p. 1). Sustaining technological innovation can be challenging and Gunn (2010, p. 90) highlights three central characteristics: it has to go through a “proof-of-concept stage” and show clear benefits to teaching and learning; it must have “proven potential” to be used beyond its original setting; and it must not be dependent upon only one or two individuals for its continued success. Finding a “single formula for sustainability” is problematic (Gunn, 2010, p. 92); however, Owston (2006) has identified numerous factors that can support long-term sustainability, including teacher and student support, teacher perceived value, professional development for teachers, and administrative support. When embedding and spreading innovation, it is important that: (1) leaders and managers have clear goals and a strong commitment to the innovation (2) there is a willingness in the learning context to undergo substantive changes to embed and sustain the innovation (3) there is ongoing-access to institutional and external support (4) there is access to and use of institutional and national systems for communication and planning and (5) risk-taking, change and dissemination are supported through the innovation's design (Southwell et al., 2005). These factors show that technological innovation occurs within a socio-cultural context, affecting individuals, classrooms, institutions, and national organisations (Somekh, 2007). Aligning differing (and sometimes conflicting) educational and organisational perspectives is crucial (Synder, Marginson, & Lewis, 2007), yet this level of collective action often seems difficult to achieve (Gunn, 2010).

Teachers as agents for sustaining (or impeding) technological innovation

Teachers are often positioned as "agent[s] of change" (Ertmer & Ottenbreit-Leftwich, 2010, p. 255), playing important roles in deciding whether an innovation endures or not (Blin & Munro, 2008; Hannon, 2009). While there has been a degree of optimistic rhetoric surrounding technological innovation, the adoption of technology may not be an "easy road to travel" for academics (Gunn, 2010, p. 94). Pedagogical innovation is often disruptive as "…it involves disturbing the established routines through which individuals and groups perform and continuously re-affirm their identity" (Somekh, 2007, p. 2). Indeed, using technology can entail a degree of risk; technical breakdowns can occur, distorting the innovation, leading to limited use of the technology (Hannon, 2009), and eroding teacher confidence (Cuban, Kirkpatrick, & Peck, 2001).

In order to better understand teacher engagement, many scholars have studied the drivers and barriers of technology use by teachers, identifying various inter-relationships between individual, pedagogical, and institutional factors (Birch & Burnett, 2009; Kennedy, Jones, Chambers, & Peacock, 2011). Some key factors are workload, time, knowledge and skills, staff development and training, tools and infrastructure, recognition and rewards, beliefs about teaching and learning, and institutional support (Shannon & Doube, 2003). There are complex relationships between teacher beliefs and practices (Bain & McNaught, 2006) with personal characteristics such as motivation to use technology, comfort with change, and willingness to take risks playing major roles in the uptake and use of technology (Birch & Burnett, 2009). In addition, the perception that there is little institutional recognition and few rewards for the use of technology can be a powerful inhibitor (Birch & Burnett, 2009).

While much is known about the factors that influence academics' use of technology, there has been a tendency to focus on early adopters, neglecting the experiences of mainstream faculty (Nicolle & Lou, 2008). Such examples of exemplary practice may not reflect the daily experiences for many teachers and learners (Convery, 2009). There is a continuing need to understand how mainstream faculty engage with technology (Nicolle & Lou, 2008); one way to meet this need is to conduct fine-grained studies that provide insider views of the day-to-day use of technology over time. Temporal perspectives can provide important insights about sustainability by revealing why academics continue to use (or reject) technology. This paper builds on the work of others who have explored innovations that have failed to thrive (see for example, Blin & Munroe, 2008; Hannon, 2009) by considering why teachers struggle or fail to sustain their use of a technological innovation over time. In this instance, the innovation under study is video conferencing – a useful choice considering that the field of video conferencing remains under-researched as a "hidden mode of delivery" (Lawson, Comber, Gage, & Cullum-Hanshaw, 2010, p. 307).

The study

Background

As a recently introduced technology, the video conferencing was a response to the formation of large first-year classes at an Auckland university. Previously, the same lecture had been repeated many times during the week to a cohort of more than 1000 students. Using the video conferencing, one expert lecturer was able to simultaneously connect with students in four different venues located on three campuses across the greater Auckland region. It was argued that the video conferencing was beneficial in two main ways: students were provided with flexible learning opportunities as they were able to attend a convenient venue rather than travel to a central location and staff workload could be decreased as fewer lectures were presented. However, during its first year (2010), the video conferencing initiative experienced numerous technical breakdowns, disrupting learning and teaching activity. At the conclusion of 2010, there was a sense that the video conferencing was not realising its full potential to support pedagogical objectives. In response, this study was proposed. The study had three main objectives: to deepen understanding of the complex relationships between teachers, pedagogy, and technological innovation; to enhance learning and teaching with video conferencing; and to explore the use of insider research as a methodological approach.

Methodology

The study aimed to provide 'backstage' access to mainstream teacher engagement with a technological innovation. To achieve this objective, a qualitative design was chosen that drew heavily upon contemporary ethnography by studying "real-life human behaviour to gain a unique understanding of the context and thought that informs such behaviour" (Murchison, 2010, p. 13). An insider research approach (the researcher being a member of the social group under study) was used whereby three of the seventeen participating teachers occupied the dual roles of participants and researchers (Westberry, McNaughton and Gaeta). Seventeen lecturers from four large first-year classes participated in the project over a 12-week period from February to June 2011 (one semester). A number of qualitative methods that supported an ethnographic approach were employed. Immediately after the weekly sessions using the video conferencing, the staff member teaching that day used research prompts to record a ten-minute (maximum) post-lecture recording of her/his experience using the video conferencing. To enrich the data, lecture sessions showing staff interacting with the video conferencing were discretely video-recorded by a technician (with permission from participating staff). Also, four group interviews scheduled at regular intervals provided opportunities to pursue interesting leads in the data. Finally, differing perspectives were obtained through interviews with key informants involved with managerial or technical dimensions of the video conferencing. A thematic analysis was chosen for this study which is defined as "…searching *across* a data set – be that a number of interviews or focus groups, or a range of texts – to find repeated patterns of meaning" (Braun & Clarke, 2006, p. 86). This form of analysis was considered appropriate because we wanted to create a rich description of the data to show key themes. Another benefit is that this approach has "theoretical freedom" in that it is not tied to any particular theoretical framework (Braun & Clarke, 2006, p. 78).

Findings and Discussion

The application of video conferencing did provide some benefits such as enhancing collaboration between staff, communicating consistent information to students, and decreasing the number of lectures presented by teachers. However, at the time of writing (June, 2012), the original video conferencing system had been replaced with Mediasite ™ (http://www.sonicfoundry.com/mediasite). While the concept of connecting lecture theatres had been proven as a useful way to engage with large groups of students, the initial technology had not. The following findings provide some initial insights into why the video conferencing was not sustained in its original form.

A lack of synergy between different organisational levels

The findings from this study suggest that misalignments at organisational, pedagogical, and individual levels affected the sustainability of the innovation. As funding for the video conferencing was not confirmed until late in the year, the technology had to be obtained and installed quickly over the summer months (January/February) when staff availability was limited. The video conferencing was to be used in the first semester (end of February), so there was little time for testing, trialling, and professional development of staff. Indeed, some of the equipment was still being installed when lectures began. The limited lead-in time between funding, installation, and use of the technology suggested a lack of alignment between different levels at the university, fuelling a sense of being unprepared amongst the staff. As lecturers moved, rather abruptly, into a changed teaching environment, it appeared that they lacked sufficient opportunities to negotiate their beliefs, practices, roles, relationships with other staff (including technicians) and identities as lecturers. This exacerbated the mismatch between their expectations and actual use of the video conferencing. Misalignments between different organisational levels resulted in a failure to provide an adequately resourced transition zone in which the new technology could have been better understood, and beliefs and practices could have been negotiated and conflicts reconciled.

Adapting to an uncertain environment by 'playing it safe'

The lack of preparation coupled with ongoing technical problems injected a sense of uncertainty into the lecture environment, affecting the ways teachers thought and acted as they made sense of this new setting. Many lecturers adapted to this uncertainty by avoiding risk and instead adopting practices that were perceived as 'safe' such as using the video conferencing as a tool for transmitting information to the students. One such example involved interactivity in lectures. Many presenting lecturers wanted to have two-way communication with all students, expecting to interact with students across the venues. These expectations were often unmet. Some presenting lecturers attempted to conduct inter-venue question and answer sessions; however, difficulties communicating with the venues (such as poor sound, loss of sound, or loss of venue due to technical problems) hindered this approach. Also, delays in venue responses were frequent and students were observed displaying restless and off-task behaviour as they listened to numerous questions from different venues. As ongoing problems were experienced, there was a move to limit inter-venue interaction as it entailed levels of difficulty and risk that were deemed unacceptable. However, by adopting 'safe' practices that reinforced transmission approaches to lectures, lecturers often expressed a strong sense of loss, perceiving that they were required to make many concessions with their beliefs and practices. There was a perception that technology was leading pedagogy rather than acting as a tool to support teaching and learning, and that lecturers were compromising their beliefs and practices to avoid disruptions in lectures. As one teacher participant noted, teachers were adopting "dumbed down learning outcomes". Rather than being agents of change, teachers often seemed to be retreating into established practices.

Sustaining the concept, not the technology

Despite difficulties, the use of video conferencing was sustained, although this point needs clarification. In this case, the concept of video conferencing was sustained, but the actual technology was not. This is probably because, in theory, video conferencing filled a basic need – to allow one expert lecturer to connect with multiple venues in large classes, facilitating the delivery of content. When asked, all teachers except one were adamant that they did not want a return to delivering five lectures a week (the previous system). The findings confirm Gunn's (2010) position that the use of a technology will be sustained if it passes a 'proof-of-concept' stage by bringing added value to teaching and learning. However, while the concept was proven, the actual video conferencing technology was perceived as highly problematic; another tool was required. This finding highlights the importance of distinguishing between the idea that lies behind technology adoption and the actual technology itself when considering the sustainability of technological innovation.

Conclusion

By obtaining 'grounds-eye' views of teaching with technology, this paper has shed some light on how a technology is sustained over time. The video conferencing initiative provided some benefits, and yet, a lack of alignment between individual, pedagogical, and institutional levels led to an uncertain environment in which teachers adapted by avoiding new ways of thinking and acting, instead opting to adopt 'safe' practices. The innovation has, to date, endured, and yet in a weakened or attenuated form that appears to reinforce transmission approaches to lectures. Innovation is often disruptive, and yet in this case, it seemed too destabilising. Perhaps teachers can be agents of change, but when innovation destabilises a context too much, it may trigger adaptive responses that reinforce existing practice.

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Promoting engagement and interaction through a technology supported learning activity

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In this paper we describe a technology supported learning activity that was developed, implemented and evaluated in a postgraduate, online unit of study offered by the University of New England in 2011. A learner analysis and an analysis of the learning outcomes of the unit informed the development of this activity. The online activity was created within a Wiki and students completed it in the first few weeks of the teaching period. This design was intended to build social presence by encouraging ongoing interaction and engagement in the unit. A constructivist approach was utilised to facilitate this authentic activity in line with theories for learning futures. The activity provided scaffolding for subsequent assessment tasks in the unit. Students' outcomes and their feedback on the activity suggested it was successful in achieving the intended goals.

Keywords: Engagement, interaction, learning futures, lifelong learning, online activity, social presence

Introduction

The focus of this paper is a technology supported learning activity that was adopted for the first time in trimester three, 2011. It involved the development and implementation of an optional online activity early in the teaching period which was aimed at encouraging interaction and engagement in a postgraduate professional ethics unit of study. The design was intended to align learning outcomes with assessment tasks. A constructivist approach was used to engage students in a discovery process aimed at development of skills intended to enhance future studies and lifelong learning. The use of such online collaborative spaces has demonstrated benefits for learners in terms of encouraging active learning (Chickering & Gamson, 1987), and experimental problem solving, thus enabling students to develop the skills required to construct their own understanding. This approach aligns with a learning futures approach which is about "education and learning which is concerned with preparing individuals and groups to respond to the challenge of life" (Kehrwald, 2006, p. 4). Andres (2002) suggests that in group learning environments "students are frequently more motivated to work when there is an audience beyond that of the teacher" (p. 2). Students were surveyed at the end of the teaching period to evaluate the success of this activity.

Activity development

Daigre (n.d) suggests that the "key to instructional design is to work around the participants rather than the content" (p. 1). Keeping this in mind, the design project began with consideration of the learners enrolled in the program of study. This analysis was conducted utilising statistical data available through the University's Planning Office, and a review of admission procedures for the program. A selection of previous offerings of units in the program was also examined to determine general participation rates and level of interaction as well as technological experience and access issues for the cohort. Finally, an analysis of the unit itself in terms of learning outcomes and content was undertaken to inform the activity design.

Learner analysis

Historical data shows that the cohort enrolled in this unit largely consists of mature-aged students. Statistics show that almost 70% students are aged between 30 and 49. Gender distribution is relatively even. The unit (and the program) is offered in distance mode and online only at postgraduate level. The Graduate Certificate is the main entry point with almost 75% of students enrolled in this program. These students have completed an Advanced Diploma through TAFE, suggesting that a majority of students have limited experience studying in a tertiary environment, and they may have little or no experience in online studies. Admission requirements to the Masters program include completion of a three year degree or its equivalent in a relevant discipline, or completion of a Graduate Certificate in Professional Accounting. Entry into both programs requires at least two years full-time equivalent of relevant work experience and current associate membership of a professional accounting body. It can be assumed that students are familiar with the use of information technology applications as the unit is explicitly described as fully online, which implies students who enrol have a reasonable level of confidence and willingness to participate in studies using information technology as a means of delivery. Interestingly, the age range of the majority of students indicates that many will be 'digital immigrants' (Prensky, 2001), which could impact on the level of student interaction.

The program is a full-fee paying degree therefore personal motivation to succeed is high. While this is not the same as motivation to participate, it does indicate that students enrol in this program for personal benefit and self-improvement and, as such, would be interested in engaging in discussion activities with peers. A review of discussion boards in other units in the program supports this assumption. In addition, previous student feedback from a similar cohort revealed students' willingness to view material and multimedia resources online and to participate in discussion groups. However, students expressed concerns about participation in assessed group work, with a majority of students indicating that they would not 'enjoy' this type of task. Reasons cited included time and organisation issues, problems with participation levels and preference for individual submissions. This indicated that group activities would need to be carefully structured to encourage active participation and engagement.

Unit analysis

The unit of study – Professional Ethics – is offered online through a Learning Management System (LMS) accessible via the Internet. It is a compulsory unit in both the Masters and Graduate Certificate programs, so all students are required to complete the unit successfully to ensure progression. Ethical theories and concepts are an integral part of the content, with the main outcomes of the unit dependent on knowledge, understanding and application of these theories – '*identify and explain major ethical theories and concepts'* and *'employ ethical theories and concepts to analyse particular business activities'.* The content lends itself to the use of constructivist, authentic activities, particularly those which enable students to use knowledge relevant to their own situations (Brown, Collins & Duguid, 1989). In addition, to achieve graduate attributes relating to the unit, students are required to demonstrate communication and lifelong learning skills. The design of this activity was intended to address these attributes by "the development of...transferable skills, such as the ability to work with others and the development of written…communication skills" (Crowe & Pemberton, 2000, p. 1). The unit is one of the most challenging students complete in their programs as it requires critical engagement with the materials. Students are required to demonstrate their mastery of the content by developing and defending their own points of view with regard to contentious issues related to professional practice. Since there are very few 'black and white' solutions, the content is intellectually demanding.

Activity design

The activity was developed within the Wiki tool built into the LMS. This provided an asynchronous, collaborative space which displayed a structured view of postings which were utilised for further discussion surrounding the activity. As the unit enrolment was high, larger groups were necessary (n=8 to 10) but the group size was still considered small enough to assist in developing accountability as well as making the task more manageable (Harasim, Hiltz, Teles & Turoff, 1995, p. 30). As students did not have extensive experience in online studies, guidelines were provided which were intended to assist students in understanding the mechanics of the activity in terms of using the embedded Wiki tool. An example was also provided to demonstrate expectations.

The rationale for choosing this type of activity was to meet the following goals:

- Encourage students to interact more fully by developing social presence in the online unit early in the teaching period
- Engage students in the materials, by illustrating the 'real world' application of the ethical theories
- Provide an opportunity to work in groups and experience other points of view

- Provide scaffolding for the subsequent assessment tasks, especially the major assignment
- Provide the unit coordinator with an early indication of students' understanding of the foundational theories and concepts

The activity consisted of an exercise with the following steps:

1. Group members were asked to describe a workplace-related ethical situation or dilemma about which they had first-hand knowledge (due at the end of week 2)
2. Each student then analysed this situation by employing one of the core ethical theories introduced in the unit (due at the end of week 3)
3. Each student was then required to use a different theory to analyse a situation posted by another member of the group (due at the end of week 4).
4. Group members were encouraged to provide comments on others' analyses (to be concluded by the end of week 5).

Lecturer support consisted only of guidance and management of technical issues. As noted by Oliver (2002): "Effective online learning settings support knowledge construction and to do this they must provide contextually-authentic tasks as the basis of learning" (p. 3). As the ethical theories were an integral part of the unit (as noted above) in terms of the stated learning outcomes, a knowledge of the principles behind several theories and their application was required in order for students to develop a broader view of how one might act when confronted with an ethical dilemma in the workplace.

The activity was structured in a way that aimed to develop learner participation and collaboration, in line with Salmon's (2002) model which "provides an example of how participants can benefit from increasing skill and comfort in working, networking and learning online" (p. 10). It was intended that this approach would create social presence for students and encourage active dialogue. The asynchronous nature of this activity also encouraged reflection and thoughtful construction of contributions (Martyn, 2003) as well as enabling flexibility for students in participation scheduling (Smith, 2005). This was considered particularly important because the students were studying part time while juggling family and work commitments.

The structure of the activity follows Reigeluth's Elaboration Theory in terms of organisation and providing a meaningful context for students to build on knowledge. While supporting content was provided, the activity enabled a learner-centred approach by allowing students to choose the ethical situations and theories they preferred to focus on. The various steps in the activity were intended to encourage student reflection and analysis, and achievement of the learning outcomes through the alignment of instruction, online interaction and the subsequent assessment tasks. Elements of experiential learning were also present in terms of participation in the learning process and tasks based on practical problems and self-evaluation, while the design utilised aspects of constructivism and situated learning, through the presentation of authentic and knowledge building tasks. The use of personal experience supported the authentic nature of the activities as did the application of knowledge to a problem presented by another student. The activity supports learning for the future through the development of skills and approaches which will be essential to the development of active learning skills.

Conclusion

For students in this unit, most of whom were already working in the disciplinary field, this design provided an authentic and learner-centred activity which "focuses on giving the learner the ability to decide what he/she feels is important and relevant. A more dynamic design approach is more reflective of the types of challenges individuals will face when learning through experience and other informal methods" (Siemans, 2005, p. 4).

This activity addressed critical elements of successful online learning identified by Reushle, Dorman, Evans, Kirkwood, McDonald & Worden in terms of "cognitive strategies, learner-centredness, interactivity, collaborative learning and social presence" (1999, p. 1). The activity provided scaffolding for following assessment tasks in the unit, which included an online test, essay and exam.

Evaluation of this task was obtained through a student survey, unsolicited feedback from students as well as a review of students' final results. Student surveys indicated that the activity was useful preparation for further assessment tasks (very helpful: 70%; somewhat helpful: 23%). Comments from students confirmed the benefit of higher levels of interactivity in the unit and the value of seeing others' points of view. Moreover, those students who participated in the optional activity were more successful in the unit overall than those who chose not to participate. Students who did not complete this activity, but completed the unit had an average mark of

55% while students who did complete the activity and completed the unit achieved an average mark of 66%. The activity also provided the unit coordinator with an early indicator of the level of understanding of the ethical theories than has been available in previous offerings of this unit, thus providing an opportunity for additional clarification where there were misunderstandings.

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Creating a Culture for Critical and Situated Technology Use Through Effective Learning Design

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The purpose of this concise paper is to propose, with evidence gathered through a systematic evaluation of an academic development programme in the UK, that training in the use of new and emerging learning technologies should be holistically embedded in every learning and training opportunity in learning, teaching and assessment in higher education, and not only as stand-alone modules or one-off opportunities. The future of learning in higher education cannot afford to allow Universities to disregard that digital literacy is an expected professional skill for their entire staff.

Keywords: learning design, professional development, reflective practice, situated technology use

Introduction

The Postgraduate Certificate in Professional Practice in Higher Education (PGCPP) is organized through the Centre for Learning Innovation and Professional Practice at Aston University in the UK. Like other similar programmes across the UK it provides the opportunity for new academic and academic-related staff to obtain a nationally accredited award which is of value for professional development and career progression. Until the last academic year, the use of new and emerging learning technologies within the process of studying the particular programme has been somehow been limited in that it promoted the use of institutionally supported learning technologies as a mechanism to develop the necessary technical skills to operate tools such as the virtual learning environments (VLEs – also known as learning management systems in Australia) and the e-portfolio platform. However, participants did not feel particularly empowered to experiment with new technologies in their own practice as a result of their participation in the programme. This appeared to be because of few opportunities and incentives to integrate new technologies in a context where workloads are full and research productivity is the priority (Gunn, 2011). The programme team decided, therefore, to revisit and restructure aspects of the core modules for 2011-2012 delivery, while resisting the temptation to introduce a specialised module on learning technologies. The new learning design aspired to provide a variety of learning tasks and extended practice opportunities for the participants to most effectively develop as critical users of learning technologies in their own disciplines (Beetham & Sharpe, 2007). The paper presented here briefly describes the learning design and presents the preliminary findings from the first year of its implementation using evidence gathered through a systematic evaluation from two cohorts of participants.

A brief note on the underpinning learning principles

In the context of good professional practice academic and anticipating future challenges, development programmes, such as the PGCPP, should empower participants to move beyond the development of Information Literacy to the creation of Critical Digital Literacy (Wenger, White & Smith, 2009). In practice this means that teaching and support staff will be offered opportunities for personal and team activities that help them understand the affordances of learning technologies (Gibson, 1977) and translate technology-enhanced learning concepts and ideas into practical and workable solutions for use with students and staff (Gunn, 2011). It also means that participants will move from '*learning before doing'* to '*learning while doing'* with the use of technology (Cowan, 2006). This situated learning opportunity is the most effective way in which participants can achieve higher order thinking, which in turn is the differentiator for future successful organisations (Strattner & Oblinger, 2008) and sustainable futures. This latter point is an important one to keep in mind, given that many institutions often offer a one-off opportunity for training in the understanding and use of learning technologies in the form of stand-alone modules as part of a PG Certificates, PG Diplomas or MSc programmes. The importance of embedding learning technologies in an holistic way, and not as one-off modules or sessions, has attracted renewed attention by professional bodies such as the Staff and Educational Development Association and the Heads of E-learning Forum in the UK, both of which have recently (during 2011) devoted conference themes and development days on this topic. It was this idea of 'learning while doing' with the use of technology that inspired our new approach of the PGCPP.

Our PGCPP holistic learning design framework

The PGCPP programme consists of three core modules, which are delivered in a blended learning format (a combination of face-to-face taught sessions and online learning opportunities) and are assessed separately using clearly defined assessment criteria. Figure 1 below offers an overview of the modular structure of the programme and the core activities and approaches used. The use of new and emerging learning technologies is central to all modules and all activities of the programme. For example, in Module 1 participant are asked to develop critical incidents reports and make direct learning journal inputs considering their digital participation in the programme from the point of view of the student and of the learning designer and tutor. They can also choose to be observed in both face-to-face teaching settings and in virtual settings, where a member of the programme team is shadowing their online asynchronous or synchronous 'classes' and then debrief them as in normal teaching observation settings. The overall aim is to critique, evaluate and re-use ideas experienced in the PGCPP in their own disciplines. The overall expectation is that by embedding learning technologies in the course, as participants would be expected to use them in their own practice, academics would feel empowered to transfer these skills in their own learning designs. To support this expectation, participants were offered the opportunity in Module 2 to work, during full curriculum development days, towards re-structuring parts of whole modules and to consider critical and situated use of technology in their own discipline. Finally in Module 3 there were offered the opportunity to learn about specific research methods used to evaluate learning and teaching with the use of technology, carry out an original piece of research and write it up for dissemination in a conference or a journal article.

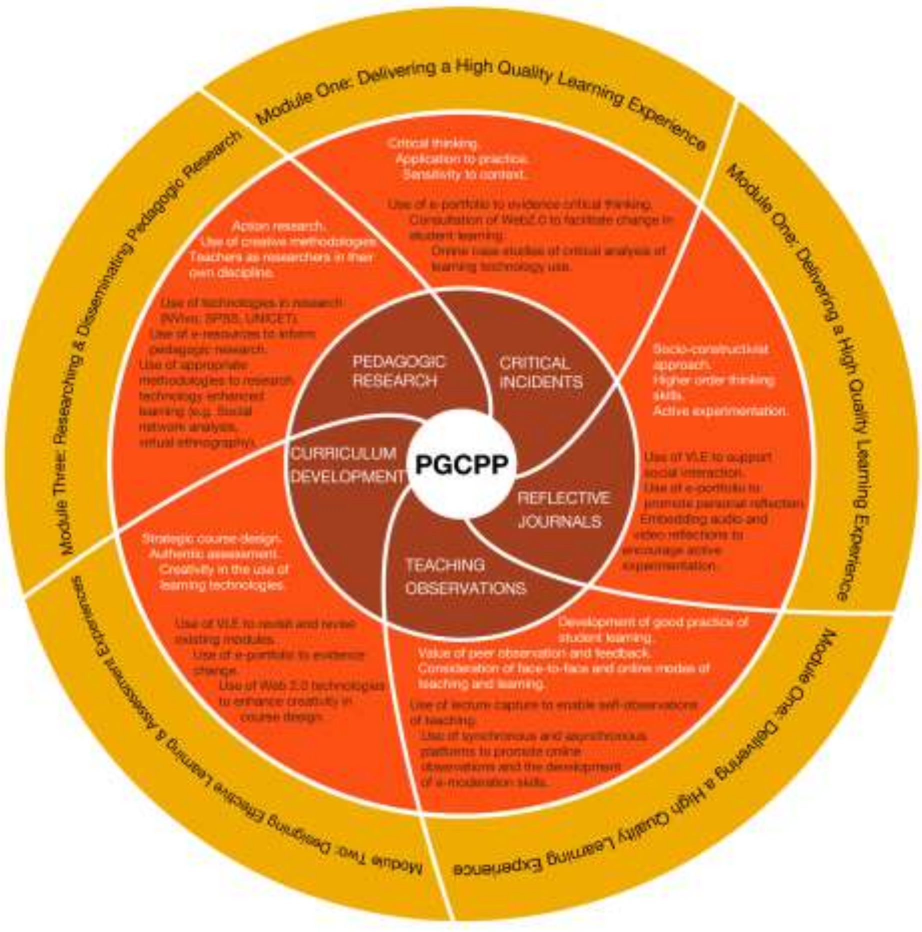

Figure 1: The PGCPP Learning Design Framework

The evaluation of the first year implementation

During the academic year 2011-2012 two cohorts of participants (No=37) commenced the PGCPP in its new structure. In order to find out how their attitude towards embedding learning technologies in their own discipline areas has changed over the duration of the programme we conducted a survey followed by a series of focus group interviews, which were transcribed and partly analysed using content analysis. The purpose of the anonymous survey and the interviews was to provide a broader data set and included a number of questions around the relationship between attitude towards discipline-based teaching and perceptions of student-centered learning. We used a revised version of the Teaching and Learning International Survey (TALIS) instrument to collect the quantitative data. There are answers to two questions that are worth summarizing for the purpose, and economy, of this paper, which were also elaborated in the interviews: 1. Considering your participation in the PGCPP, to what extent has it directly led to changes in your teaching of students with the use of new technologies in the current academic year? 2. In your opinion, how much innovative teaching and learning practices with the use of new technologies should be considered when you plan your teaching for next academic year? The findings from both questions are summarised in Figures 2 and 3 respectively.

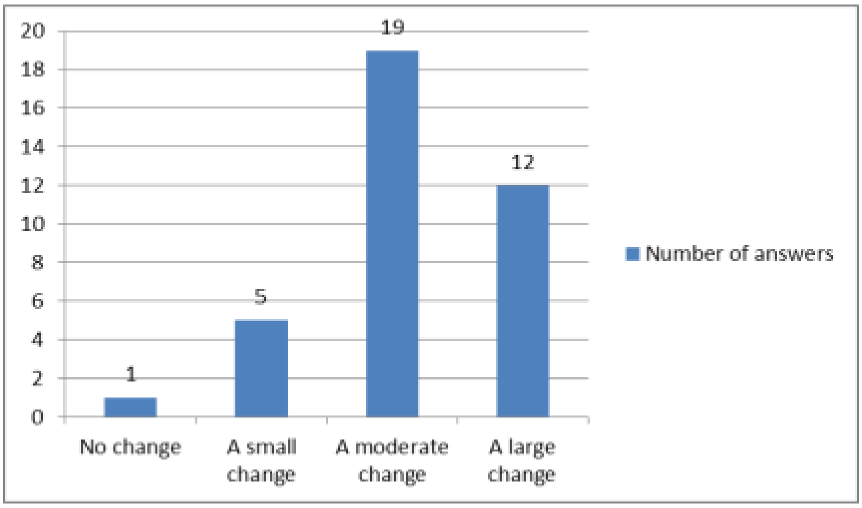

Figure 2: Your teaching of students with the use of new technologies in the current academic year

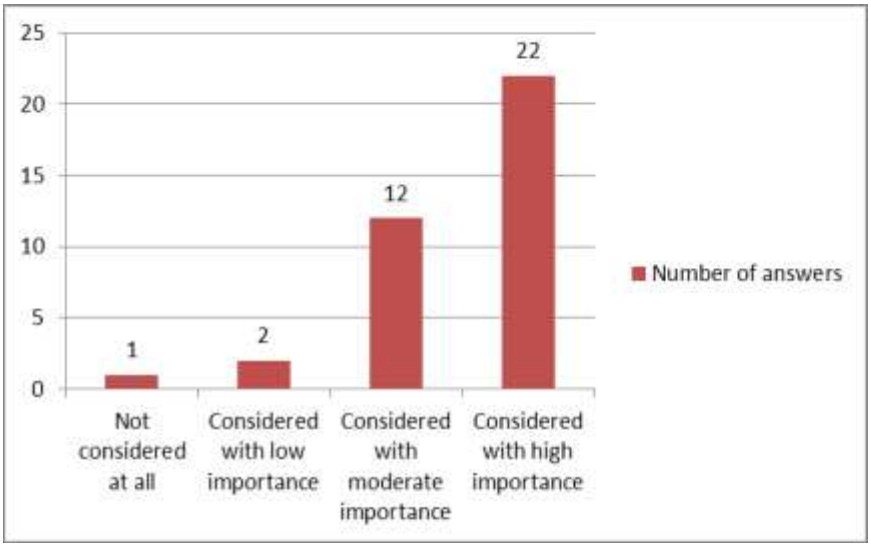

Figure 3: Your teaching of students with the use of new technologies for next academic year

So what?

The findings from the survey indicated that the majority of the academics involved in the holistic learning design framework had either already tried out (during the duration of the PGCPP) or are considering embedding learning technologies in their learning design for next academic year. It was interesting that in the question about embedding new technologies for next academic year the majority (no=22) of participants stated that they would consider it with high importance. This is a very encouraging finding especially as the majority of them, during their initial reflective entries in Module 1, expressed serious concerns regarding the 'intensive' use of technology in a course for novice academics and that they are 'being expected to run before they can walk'. Nonetheless, their reflections in module two showed a dramatic (positive) change in their attitude towards both the value of technology from the tutors' point of view and that of the learners. All of the learning designs submitted as part of their portfolios included new learning technologies to support learning and assessment of students with clear rationale for doing so. This was also the case for the few participants who are still skeptical about learning technologies, but who decided to at least consider them in their theoretical designs for next year. The difference between the submissions of these two cohorts, when compared with the submissions from cohorts in 2010-2011, is extremely high when considering both the creative use of technology that goes beyond the usual implementation of a VLE to run multiple-choice quizzes or add simple multimedia files.

Although a presentation of our qualitative findings would add significantly to the trustworthiness of our claims in this paper, the analysis is still undergoing and therefore a follow up publication of this study will summarise all the key findings. We would like to end, though, with two illustrative quotations from two of the most skeptical academics who openly in the interview characterized themselves as being technophobic:

> My approach to learning activities and use of new technologies has changed in a positive way over the last few months. Participation in the online activities and discussions has given me an insight into how I might use online discussions in my own teaching, that's something I would not consider had I not experienced this mode of learning as a participant. (Participant from the School of Life Sciences)

> a great merit of this PGCPP is my own experience of flexible learning with the use of technologies while employed and at the same intensity (60 credits in a year) as my Programme Participants will experience for 3 years! (Participant from the School of Engineering)

It became clear to us that continuity and diffusion of innovation with leaning technologies is better achieved at a programme as opposed to module level, and when supportive organizational structures are in place they empower academics to implement change. Sheward and Hamilton (2012) articulate that more participant-generated technology enhanced learning activities need to be incorporated into such programmes. We feel that, based on our research, strategically organized courses like the PGCPP are the ideal places for this diffusion to take place.

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Consulting the ‘oracle’: Using a Delphi process to facilitate change to a blended learning model for rural mental health professionals’ recruitment

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What happens when time, staffing pressures and a reduced funding base begin to impact on considerations for the future deployment of a successful university-based program promoting professional career options in rural mental health for completing students? This paper outlines the initial steps of shifting the Gippsland Mental Health Vacation School (GMHVS) from a successful week-long face-to-face program to a blended, collaborative and interactive model, distributed across space and time. Further, this blended learning approach encompassing social media opens the possibility to enable greater student numbers to participate in future GMHVS programs.

Keywords: mental health professions; rural recruitment; students; service providers; social media; blended learning

Introduction

Mental health professionals encompass a range of occupations including nurses, psychologists, social workers, and occupational therapists. Their collective involvement in the active promotion and treatment of mental health issues are important in terms of a holistic and interprofessional approach for the patient. Individually they also bring important skills according to their professional training. However, recruiting and retaining workers is a major challenge in rural and remote Australia (Sutton, Maybery & Moore, 2012). There are multiple reasons for this situation ranging from concerns that rural is ‘second best’ due to anxieties over access to services and fear of isolation (Eley, Young & Shrapnel, 2008), in addition to trepidation over such personal issues as finding a spouse, rewarding employment opportunities and quality education pathways for children (Rosenblatt et al., 2006).

The Gippsland Mental Health Vacation School (GMHVS) was developed by Monash University’s Department of Rural and Indigenous Health (MUDRIH) with the aim of attracting students studying at metropolitan tertiary institutions to working in the rural mental health field (Sutton, Maybery & Moore, 2012). The program has now run successfully over four cycles since 2010 and has received positive qualitative and quantitative feedback from both the participating students and representatives of Gippsland service providers. However the GMHVS program is now being challenged on a number of levels, including funding insecurity, time pressures and future staffing options. There is also a desire to create a more self-sustaining, less time-intensive program that can be added to rather than recreated each time that the program is offered. This paper outlines the initial steps of shifting the successful face-to-face program to a blended, interactive model, distributed across space and time. The approach is being refined via the Delphi Study outlined here.

Delphi Study

A Delphi Study is a structured process for the purpose of collecting and condensing group knowledge or feedback by means of a series of ‘rounds’. There are usually three rounds to a Delphi Study and, at the end of each round, the feedback is summarised and presented back to the participants for rating. The participants are also able to provide further comments in this procedure. Through this cyclical process of refinements, group consensus is reached. In the current Delphi Study, following ethics permissions, data has been gathered from two research cohorts as stakeholders in the program: the GMHVS 2012 students, and representatives of the participating Gippsland mental health organisations. This information will give direction and guide the structure of the future GMHVS blended program offering.

Social media

While the results of the Delphi rounds are still undergoing final analysis, a clear theme emerging from both cohorts' responses in Round 1 was the desire for the establishment of continuing contact following the end of the program. As the participants are geographically dispersed, it was felt that the creation of a virtual group via social media might be the best solution. The advantage of social media is that in breaking down access barriers it also enables "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). It serves to attract people, holds their attention, impels their contribution, and brings them back as recurring visitors (Johnson, et al., 2011, p. 12 paraphrased). To this extent, the initial step in moving to a blended GMHVS program has been the creation of a group in the social media site *Facebook* (www.facebook.com), chosen as all students had existing accounts. Of the different types of groups in *Facebook*, a 'closed' group was chosen in the first instance. In a closed group, the name and constituent members are visible to everyone, however the content is visible only to members and access to the group is moderated by the administrator of the page. Constituent group members include the GMHVS 2012 students, representatives from the Gippsland mental health service providers, plus MUDRIH staff members.

To date, from positive comments written, the GMHVS 2012 *Facebook* group has enabled the participating students to feel that they belong to a supportive collaborative geographically-dispersed, yet virtually-present professional community; that they can participate in activities promoting rural lifestyle for post-qualifications employment options; that they can respond to the reported job vacancies listed by group members; and that they can share individual updates including the attainment of rural mental health employment placement 'success stories'. As an exemplar of this, one student member wrote on the group's wall "Just thought I'd let you all know that I've been offered [a job] at [one of the Gippsland Mental Health Service providers]! Never would have happened without the vacation school, so thankyou all!"

Conclusion

Moving an educational program from place to space can be a daunting process. The first steps in the successful management of this change process has been to seek the feedback of the key stakeholders involved – the GMHVS student cohort, and representatives of the Gippsland mental health service providers – by means of a Delphi Study. A clear research finding emerging from Round 1 of the Delphi process has been the need for virtual connectivity and community following the program. The early indicators of co-opting a social media site for this purpose suggest that an exciting, dynamic blended model is in the forming, and one which involves not only stakeholder 'buy-in' but also their active participation. This is a work in progress.

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Sustainable futures for learning in a climate of change: Mobile apps, social media, and crisis informatics during emergencies and disasters

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Emergencies and disasters are different types of crisis events which can affect students and staff in their on-campus roles and off-campus activities. In such events, mobile technologies, mobile software applications (apps), and mobile social networks are becoming increasingly relied upon to communicate, to swiftly send and received information and images, to deliver learning moments, and to check the safety of colleagues and friends. This paper investigates the intersection of m-learning, mobile social media, mobile apps, and crisis informatics in times of emergencies and disasters, using the recent Gipplsand earthquake in south-eastern Australia as an exemplar. It also discusses proactive preparation for educational resilience during emergencies and disasters.

Keywords: m-learning; mobile social media; mobile applications (apps); crisis informatics; crises; disasters; emergencies; earthquakes; educational resilience; power supply

Introduction

It was the evening of Tuesday 19th June 2012 and writing was underway for an ASCILITE 2012 paper on the topic of m-learning, mobile social media, crisis informatics, and formal and informal learning in times of emergencies and disasters. At 8.53pm, Australian Eastern Standard Time (AEST), the Gippsland region of south-eastern Victoria, Australia, was rocked by what was reported to be the largest Victorian earthquake in over a century (Caldwell, 2012). At a shallow depth of 9.9 km, the earthquake registered 5.4 magnitude on the Richter scale (USGS, 2012). The epicenter of the earthquake was at -38.304 latitude and 146.200 longitude (Geoscience Australia, 2012), southeast of the township of Moe where Monash University's Department of Rural and Indigenous Health (MUDRIH) is situated. The earthquake was felt throughout the Gipplsand region. Monash University's regional Gippsland Campus is located a thirty minute drive down the road in the township of Churchill, and a number of centres belonging to Monash University's School of Rural Health are dotted throughout the region, including sites at the various district hospitals. As such, the earthquake affected students, and academic and general staff living in the area.

While no fatalities were recorded, the earthquake caused damage. Within some of the institution's departments, such as MUDRIH, plaster had fallen from ceilings, cracks were reported to have appeared in the staff accommodation centre's walls, and my office was a sea of shattered glass brought about by document frames falling from various heights, with books and other items being tossed from their positions on a bookshelf. Yet this was but a mild inconvenience compared to what our Christchurch colleagues had endured in their 2011 earthquake.

As the Gippsland earthquake struck at night, daily academic activities were not severely disrupted, even though some staff experienced disruption of workflows in the aftermath and cleanup. However, had staff or students been at their desks at the time that it struck or had the power failed during or after the event, there was the potential for the earthquake to cause greater challenges, including affecting the continuance of online courses. For example, the Gippsland region produces 80% of Victoria's power supplies. One of the region's electricity producers – the Yallourn Power Station – which was already operating at a reduced capacity at the time due to the flooding of the adjacent open cut coal mine from the Yallourn River, had one of its two remaining units 'tripped' as the result of the earthquake (Levy & Partenza, 2012). Had the earthquake struck during a peak use period, the state's power stability may have been seriously affected. Additionally, some forms of telecommunications experienced challenges during the event. Phone lines were jammed, key websites crashed due to the high volume of traffic at the time, and formal media channels lagged in providing key information to locals.

However, social media went into hyperdrive, providing a means of connectivity, crisis informatics and learning opportunities during and after the emergency event. Hagar (2010, p. 10) first coined the term crisis informatics to describe "the interconnectedness of people, organizations, information, and technology during crises". As

Palen, et al. (2010) note, citizens are naturally information-seeking and will principally rely on their social networks for information, interpretation, and guidance, during emergencies and disasters. The Channel 10 Late News reported on the day that tweets about the earthquake occurred within seconds of the earthquake commencing, and the event was the top trending topic on *Twitter* Australia-wide (Channel 10 Australia, 2012). *YouTube* also provided a means for affected individuals to upload their videos. On *Facebook*, conversations commenced with the anticipated "I felt the earth move under my feet". Factual information and safety warnings were provided through this conduit, including the embedding of hyperlinks to websites which contained up-to-date information. This was crucial in helping to quell community concern as key websites such as Geoscience Australia had crashed under the volume of traffic from concerned citizens wanting information (Levy & Partenza, 2012). Social networks were also used to provide light-hearted responses to the situation. One comical offering on *Facebook* was the posting of a photograph of collapsed shelving and extensively damaged merchandise in the supermarket 'Not Quite Right' (NQR) in the nearby township of Morwell, with the accompanying slogan: "There's something not quite right about Not Quite Right". In addition to this image going 'viral' as it was shared around the social network, the image was later picked up by the mainstream broadcast media as a visual icon of the damage from the Gippsland earthquake for its news broadcasts (ABC, 2012). Similar experiences of the key role that social media has played in times of crises have been noted by others (see Sutton, Palen & Shklovski, 2008; Willems, 2011).

How can the events of the recent Gippsland earthquake serve as a catalyst to safeguard learning and teaching for the future? This paper contributes to the theme of sustainable futures of learning and teaching in a climate of change. It explores m-learning, mobile social media and crisis informatics in times of emergencies and disasters in the backdrop of the Gippsland earthquake. It also discusses proactive preparation for educational resilience during emergencies and disasters.

Emergencies and disasters

Earthquakes are a phenomenon not usually associated with the Australian continent, yet they occur nonetheless. Historically, the strongest earthquake recorded onshore was the April 1941 Meeberrie earthquake in Western Australia which registered 7.3 magnitude on the Richter Scale. However, the December 1989 Newcastle earthquake in New South Wales, registering 5.6 magnitude, is considered to be Australia's most significant earthquake due to the associated loss of human life and the costs of damages (Seismicity in Australia, 2011).

Earthquakes are but one example of a crisis event. Crises can occur anywhere, anytime, and can affect academia in minor or major ways, from the safety of staff and students, through to disruptions of teaching and learning activities. In Australia, the term crisis is operationalised to incorporate events which result from human action or inaction, and/or due to as acts of nature such as fires, storms, floods, and cyclones (DBCDE, 2011). In addition to the type of event, the term crisis also encompasses the scale of the event. The scale of the event can be situated on a 'continuum of magnitude' (Oliver, 2010). Emergencies fall at the lower end of the spectrum as they are considered as having localised impact only. Emergencies fall in the middle of the continuum of magnitude as the resultant human, material, economic, and/or environmental losses exceed the ability of the affected community to cope in the situation (European Commission, 2008). Catastrophes have the highest magnitude of scale, with the organisational, community, and societal impact of catastrophes extending far beyond its geographical locality (UNISDR, 2009).

Future of learning in a climate of change

Hagar (2010, p. 12) notes that "the world will face far more crises and we need to be prepared for a variety of scenarios". This involves not only ensuring the physical safety of students and staff within academia, but also the continuance of academic activities. To safeguard the sustainable future of learning and teaching activities in a climate of change, crises need to be anticipated and strategically planned for in order to optimize seamless operations in a range of scenarios. For example, Kensington, Daellenbach & Davies (2012) shared their challenges in enabling the continuance of formal learning following the Christchurch earthquake in February 2011.

Online operations may be a possibility for both on-campus and off-campus students under such circumstances. However, Agnew & Hickson (2012) note that while there is a body of literature concerning delivery of formal learning in online environments during crises, they identify the paucity of literature in and around "moving to online assessment in a semester disrupted at short notice by a natural disaster" (p. 2). Thus both learning and assessment must be considerations in times of crisis. Further, as was potentially the case in the recent Gippsland earthquake, power instability can threaten any online learning that is mains-power reliant. What might the solution be?

Mobile everything

The use of handheld mobile devices for learning during disasters and emergencies, especially when these occur in and around learning institutions, may be a solution. This is especially the case as mobile devices are portable and affordable telecommunications owned by most citizens. As Educause (2010, p. 3) has noted, “handheld technology can not only accompany the learner almost anywhere but also provide a platform that is rapidly evolving and always connected to data sources”. Mobile phones are also not totally reliant on mains power supply. Although they have their own battery limitations, the addition of solar chargers or portable wind-up chargers (which connect to the phone via USB) are an essential part of any potential emergency kit when mobile technology is a consideration in times of crisis.

Apps

Learning for the future involves considerations on what educational technologies lie on the horizon. The annual Horizon Report (Johnson, Adams & Cummins, 2012) by the New Media Consortium comments on educational technologies in a ‘time-to adoption’ framework of less than or equal to one year, two to three years, and four to five years. While mobile learning has already been adopted (Johnson, Smith, Willis, Levine, & Haywood, 2011); mobile applications (‘apps’) are the new frontier for the immediate future. Apps are computing software for specific purposes such as mobile phones. Saylor (2012) refers to the Internet-connected smartphones as ‘app-phones’ and suggests that these mobile devices should be considered foremost as computing devices before they are considered as telephones.

According to the Horizon Report 2012 (Johnson et al., 2012, p. 6), apps for mobile devices “are the fastest growing dimension of the mobile space in higher education right now”. Apps however, need not be designed specifically for learning purposes in order to be used in formal learning opportunities. Educause (2010, p. 1) notes that “The software that underlies m-learning includes not only mobile applications designed specifically for learning purposes, but also those designed for other uses – such as geolocation, data access, readers, and maps – but that can be adapted for educational purposes”. Thus in relation proactive preparation for educational resilience during emergencies and disasters, mobile apps may be useful for providing seamless formal learning purposes including assessment, providing social media connectivity, and providing software to pertinent for personal safety.

In relation to the provision of seamless formal learning opportunities, purpose-built institutional apps enable access to key features of the institution’s website and learning management system (LMS). For example, the Monash University smartphone app (Monash University, 2012) enables access to such key features as email and units. Moreover, the Monash app has the Monash University maps integrated with Google Maps so that the user can not only locate themselves onsite, but also track movements towards other destinations on (or off) campus. During emergencies and disasters, this particular feature could be used as a safety device in times of power-failures or overcome potential location disorientation due to smoke inundation.

In relation to apps to enable mobile social media, such as the *Facebook* app, one tap on the smartphone icon can allow direct access to a spatially-condensed version of the Internet website. Such social networks can provide immediate responses by others in the social network including the provision of crisis informatics and detailed localised information that may not be available on main channel information sources.

Specifically in relation to smartphone apps to assist personal safety of students and academic and general staff during crises, there are a number of free and/or cheap apps which may be beneficial:

- emergency location beacon app which utilises the global positioning system (GPS) of smartphones, such as the ‘Rescue Me’ app (Edith Cowan University, 2012);
- flashlight app which is handy when power fails as it often does in emergency and disaster events;
- seismometer apps which utilise the in-built vibration sensors of the use of the smartphone; and
- cardio-pulmonary resuscitation (CPR) apps which is useful for emergency first aid including cardiac compression rates through an audio beep for adults and children.

While this list is not conclusive, it serves to prompt proactive thought over what are the essential emergency needs during, and in the resolution period after, emergencies and disasters, not simply for teaching and learning, but also for the safekeeping of students and staff during crises.

Conclusion

Emergencies and disasters are increasingly frequent scenarios. These are events which affect students and staff alike, and may disrupt teaching, learning and assessment activities. The Gippsland earthquake struck without warning, as do many emergency and disaster events. How can staff and students be prepared for such events? How can teaching, learning and assessment be sustained in a climate of change? How can educational resilience be assured when infrastructure is disrupted or jeopardised?

This paper has discussed m-learning, apps, crisis informatics and mobile social media as means to help support educational resilience both during the crisis event and in the post-crisis timeframe. Through such hardware and software, potential strategies for seamless teaching, learning and assessment may be offered. This strategy will be the basis for further research.

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Online training: Sustainability in the face of the unskilled, unsupervised, unmotivated “long tail”

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Communities of discourse and market places often follow power laws with “long tailed” distributions. The present student “voucher” system and uncapped demand in higher education leads to an analogous “long tail” in the tertiary sector. We argue that student attrition in the “long tail” is part of a natural democratic process of “churn” - legitimate peripheral participation which leads some students to the realisation that they are not sufficiently motivated or prepared for fuller participation in the academic community. We illustrate this idea with data from a task in an introductory psychology program to examine the relationship between persistence, performance, motivation and demographics. We found distinct subgroups whose performance is defined by levels of conscientiousness/motivation and initial skill. We suggest that it may be counterproductive to retain students who perform poorly or are disengaged. However, we also identified different patterns of performance and suggest that attrition can be attenuated by targeted interventions to improve initial performance of identified groups.

Keywords: online learning, long tail, motivation, mastery

Introduction

The long tail

Online social networks generate unequal distributions of audience in the face of broad availability and choice
Shirky (2008) in an influential blog entry entitled “Power laws, weblogs and inequality”, argues that internet blog audiences follow a power law rather than a normal distribution, leaving a “long tail” of blogs with low readership, due to the nature of social networks rather than the intrinsic quality of these blogs. More popular blogs by definition have more incoming links as a direct function of their popularity, and thus will become even more popular. While the internet provides a vast potential readership for online material, blogs and websites that are already popular will have a greater influence in terms of determining what else their readers engage with. Although it is possible for new blogs to make an impact in the marketplace, it will be more difficult, and irrespective of quality, there will be a good deal of churn in new blog generation and new audience due to the nature of power laws that operate within social networks. This paper argues that the student “voucher” system and uncapped demand in higher education leads to an analogous “long tail” in burgeoning student enrolments and proliferation of courses in the tertiary education sector.

Non-traditional pathways to higher education, freedom of choice and uncapped student demand generates a “long tail”
The recent Bradley review of higher education (Bradley, Noonan, Nugent, & Scales, 2008) led to a student-centered funding model which has created an ongoing challenge for smaller universities to retain student numbers in the face of uncapped places available to students at “better” universities. Many universities are forced to dip lower into the entry score pool or actively pursue non-traditional student markets to maintain their student numbers and the funding attached to teaching load. This student “voucher” system and uncapped demand strives to uphold egalitarian principles, democratising choice of higher education in the same way the

internet democratises blog readership. This leads to a "long tail" both in terms of student enrolments and the popularity of tertiary institutions, courses, and modes of study.

Online cohorts
Online students play an increasingly important role in maintaining student numbers at some institutions, but there are important lessons to be learnt from teaching online students: many are under-prepared for tertiary studies and have difficulty completing tasks without real-time supervision, creating a "long tail" in the distribution of academic performance. Over several years of teaching online cohorts of psychology students, it has been noted that there is a very high dropout rate of first year students (approximately 40% of online students enrolled in the introductory unit of psychology withdraw from the unit or do not attempt all the assessments), whereas dropout rates in later stage online units are the roughly equivalent to rates for equivalent on-campus units. These online units have no entry requirements and many of the students who drop out appear to do so because tertiary study was not what they expected either in terms of the academic content, or in terms of the skill level and time required to engage appropriately with the learning material. Although we have used a range of teaching interventions to try to retain our students (Fleckhammer & Wise, 2010, 2011, 2012), it may be that high churn and attrition are perfectly acceptable as we move away from traditional student intakes to less well-prepared cohorts with long tails. If we understand student attrition from introductory units in the context of providing the opportunity to try something unfamiliar, the *availability of choice* is of primary importance, *not* the retention or attrition of the student. However, when the student progresses beyond first year units of study *then* retention becomes a critical focus as both student and institution have made a significant investment in the shared learning venture - the long tail has been trimmed. If on-campus student numbers in smaller universities are maintained by dipping lower into the tertiary entry pool and seeking students from non-traditional pathways, we may start seeing a much longer tail in these cohorts as well. While student attrition from on-campus study has been seen as a pressing problem in the past, is this way of thinking still appropriate in the context of the long tail?

Current study

This paper argues that student attrition in the "long tail" of enrolments is part of a natural democratic process of "churn" in which legitimate peripheral participation in a community of practice (tertiary studies) leads many students to the realisation that they are underprepared for, or uninterested in, fuller participation in this community. The question we are raising is *should* we aim to retain the "long tail" of poorly performing students? Is attrition *within the tail* a natural and appropriate form of selection for cohorts increasingly made up of students from beyond the traditional school-based entry pathways? In considering this question, we are aiming to understand specific patterns of performance that might call for specific interventions. For example, students performing poorly through lack of specific skills might benefit from learning interventions targeting those skills, whereas students performing poorly through lack of sufficient academic challenge would benefit from different interventions. Students performing poorly through lack of interest in learning (for whatever reason) might be allowed to drop out until they are sufficiently motivated to return. We use data from an experimental task in an undergraduate introductory psychology program as a micro-study of this idea, examining the relationship between persistence, performance, and demographics on a task which students should be motivated to complete.

The data set comes from an experimental study aimed at testing the efficacy of a brief (90 minutes) unsupervised web-based training package for learning scanning of aircraft instruments. The data was collected from the first year cohort who had to write the assignment, Preliminary data presented at last year's Ascilite conference suggested that unsupervised psychology students can readily learn the instrument scanning task, but we noted a surprisingly low participation rate and high dropout rate during the course of the experiment, despite the fact that the data students were providing the basis of their major assignment. This paper presents a more detailed analysis of a larger data set, and focuses specifically on performance characteristics and demographic details of students who did, and did not, complete the task. We examined whether (poor) performance predicted dropout from the study, and whether students who performed poorly in early stages of the experiment but persisted with the entire task improved their performance by the end. That is, what is the nature of the tail? Who are we teaching and how does this inform pedagogy?

Method

Participants

Participants were recruited from a pool of about 600 university students enrolled in a first year psychology program who were invited to participate in an experiment to collect data for their major assignment, a research report on perceptual learning.

Materials

The instrument scanning task was based on a task described by Kellman and Kaiser (1994) and was web-delivered using Inquisit software (by Milisecond.com). The main stimuli comprised a prototype of a standard 6 instrument panel (see Figure 1, left panel). Participants were also asked to complete a questionnaire providing brief demographic information and information on previous flying experience, gaming experience, and self-reported level of hand-eye coordination.

Figure 1: Experimental stimuli. Left panel shows the six main instruments (simulated) of Cessna cockpit used as stimuli in all experimental blocks except the "transfer" block. The instrument configuration indicates a "straight and level" situation. Right panel shows the instrument variation used in the transfer task. This configuration indicates a climbing left turn.

Procedure

After obtaining informed consent, participants were given a brief description of the study, and a sequence of training pages describing the function of each instrument of the instrument panel. They were then given a series of 30 instrument clusters depicting specific aircraft situations. Nine aircraft situations were depicted in the experiment including: *1- Straight and Level* (e.g., see Figure 1 left panel), *2- Level Climb*, *3 - Level Descent*, *4 - Level Left Turn*, *5 - Level Right Turn*, *6 - Climbing Left Turn*, *7 - Climbing Right Turn*, *8 - Descending Left Turn*, and *9 - Descending Right Turn*. An additional *10 – Incongruent condition* was also included, where one of the instruments was inconsistent with the other five instruments in the display. As soon as the participant identified the aircraft situation they were asked to press the spacebar. They were then presented with a list of the 10 options to describe the aircraft situation. The time to make each response was recorded.

After completing the 30 trial *Practice block*, participants were presented with a sequence of 90 instruments clusters (*Training block*) and were asked to identify the aircraft situation as rapidly as possible. To ensure that participants were not just guessing based on using the artificial horizon, we developed *Masked Instruments block* and *Integrated Instruments block* that exposed participants to the relationship between the artificial horizon and each other instrument and to relationships among instruments other than the artificial horizon respectively. These two tasks aimed to promote more rapid and effective information extraction using all the instruments via training tasks that were not directly related to actual tasks in the flying domain and are described in more detail in McLean, Wise, and Williams (2011). After each of the Masked and Integrated Instrument sequences participants completed a block of standard trials (*Test 1 block* and *Test 2 block*, respectively) to track performance at identifying the aircraft situation. To test the perceptual versus cognitive nature of the learning achieved, participants were finally tested on a set of instrument panel clusters in which the nature of the instruments and their interaction remained consistent with previous training, however the overall position and look of the instrument panel changed substantially (*Transfer block*) as shown in Figure 1 (right panel). Finally, the participants completed the demographic survey. The whole experimental sequence for each participant required approximately 90 minutes to complete.

Participants were asked to devote their full attention to the task, and work in a quiet, distraction-free environment. The use of web-based delivery in relatively uncontrolled circumstances mimics the conditions under which web-based and mobile training operates, such that each participant sets the parameters of their own working environment. The paper presents analysis of completion rates and patterns of performance for those who did not complete the task; data on accuracy and speed of performance, and patterns of performance that may be indicative of different levels of motivation with the aim of understanding attrition rates and potential learning interventions. The analysis of data to evaluate the potential of web-delivered instrument scanning tasks as portable learning modules for aviation training is addressed elsewhere (e.g., McLean et al, 2011; McLean, Wise, & Williams, 2012 this volume).

Results and discussion

Completion rates

Results for completion rates
There were 387 distinct sets of responses from a potential pool of around 600 respondents. Only 97 contain the full set of 510 trials. Of the incomplete data sets, 140 were deliberately aborted by the participant using a special quit command. Some of these were instructors demonstrating the system, but the majority were participants looking at the program but choosing not to complete the data collection (this was inferred from special commands by users to skip to specific stimuli without collecting data). The remaining 150 incomplete sets were terminated simply by closing the web browser. The relationship between response patterns and completion rates was examined by partitioning the cohort into three groups: i) those who dropped out during or at the completion the practice block, ii) those who completed the practice block, but did not complete the whole experiment, and iii) those who completed the whole experiment.

Table 1: Trials completed, valid keystrokes, and response accuracy for participants who dropped out at different phases of the experimental task

Group	Mean # trials completed	Median # trials completed	Mean % Invalid Keys	Median % Invalid Keys	Mean % correct	Median % correct
Dropped out in Practice block	8.68 (7.49)	7.00 (9)	18.28 (27.97)	5.56 (25.00)	60.65 (32.90)	62.50 (60.00)
Dropped out after Practice	169.04 (128.92)	140.00 (163)	5.65 (15.95)	0 (2.7)	59.90 (26.93)	65.12 (40.00)
Completed whole task	510 (-)	510 (0)	0.87 (6.63)	0 (0)	75.81 (20.27)	83.53 (26.00)

Note. Parentheses show SD for means and interquartile range for medians

Table 1 shows that those who dropped out in the first block completed very few trials and made many invalid keystrokes, that is pressing keys *irrelevant* to the task not just an incorrect response option. Those who dropped out after the first block progressed about a third of the way through the task, but had a significant number of invalid keypresses. The proportion of correct responses was markedly higher for the completers, but did not differ for those who dropped out in or after the first block. Six participants had more than 2.5% invalid responses, most of which turned out to be due to the numlock key being set to the incorrect state. We excluded from further analysis in case the incorrect (and thus uninformative) feedback they would have received adversely impacted their performance. This left 93 complete cases, 91 of which had zero invalid keypresses.

Discussion of completion rates
These data suggest that most of those who did not complete the task did not learn the task adequately. Moreover, many of those who did not show adequate performance on the task within the first block but persisted with the experimental task did not improve their performance in later blocks of trials. That is to say, failure to learn the task to a high level in the early stages decreased motivation to continue. In the light of these data, it is important to understand performance patterns of students who drop out of their studies in terms of capability and motivation. Reducing attrition from a long tail of poor performance may serve merely to increase the rate of poor performance. Preliminary data from an ongoing study comparing supervised and unsupervised training environments supports this conclusion. Anecdotal evidence from supervisors supports the idea that the presence (but non-intervention) of a supervisor for students undertaking web-based experimental tasks improves completion rates but decreases the overall quality of data by retaining more students who are performing poorly as a result of obvious lack of engagement or due to lack of task-related skill. The motivation for participation (e.g., slavish completion while being watched, reward for completion of the task, reward for performance on the task, compared with intrinsic interest in the task itself) may promote different patterns of performance, different patterns of engagement and different types of interventions to improve task performance.

Screening of data prior to analysis of response time and accuracy

Preliminary screening for outliers

Means, standard deviations (SDs), medians and ranges for response time and accuracy were computed for each aircraft situation within each block. Many such block/situation combinations contained substantial outliers – for example, while the mean response time was around 10 seconds for the first block and 4 seconds for the last, there were trials lasting over a minute. This is good evidence of data being corrupted by "coffee breaks" despite the fact that participants were measuring response times and accuracy for their own major assignment! The long tail and small numbers in some crossings made it difficult to determine whether a response time of, for example 15 seconds, was an error or simply a very slow response. Similarly, there were response times of only a few tens of milliseconds which cannot be meaningful in terms of the experimental task. Removing trials based on SDs was not practical since the SDs were heavily inflated by the outliers we were trying to identify. We tested a number of different screening methods before adopting the commonly used 5% trim, removing the top and bottom 2.5% of the entire distribution before calculating any other statistics.

Further screening of outliers

Even after the preliminary screening described above, there was quite considerable variation in performance. Responses ranged from 0% correct to 100% correct in nearly every block. The average correlation of the percent correct responses across all possible (21) block pairings was .72. The lowest correlation was .46 (between the first Practice and final Transfer block – those most temporally separated), the highest was .9 (between the Test1 and Test 2 blocks – the two most similar blocks). While these correlations indicate a high level of overall performance consistency, error rates varied markedly for some individuals. Deciding whether to exclude cases based on performance is an important issue in understanding learning and performance. By design, chance performance is ~10% for the standard blocks. Every standard block had a least one case that scored 0% correct, however, the lowest scoring individual was different in each block. There seemed to be "good performers" who scored more than 50% correct on most blocks but had a "bad" block, the location of which was not predictable. Six participants stood out as aberrant cases – performing acceptably in the practice block but declining to chance or near chance levels in the remainder of the experiment - and were removed from further analysis. All 87 remaining cases were retained for further analysis.

Discussion of deletion of cases

While the 6 extreme/atypical cases were removed from the analysis to prevent bias, it must be noted that these represent real performance of participants who completed the task. We do not know their situation or motivation, but we must acknowledge that they made several hundred deliberate keypresses. We must conclude that a small percentage of participants are simply going "through the motions" (e.g., a participant with some previous flying experience scored 77% correct on practice trials but responded at chance levels for the remaining trials) learning nothing from the task. This could be put down to motivation, distraction, or difficulty using the interface. This may also be remedied by providing different kinds of incentives, feedback, or supervision the training as will be discussed below.

Accuracy and speed

Results and discussion of accuracy

As can be seen from Table 2, mean accuracy was highest in the Practice block, dropped slightly during the training block then stabilized in the two test blocks at a level comparable to the Practice block. Accuracy also dropped from the Test 2 to the Transfer block – the performance level (and size of drop) was almost identical to the drop observed in the Training block. A repeated measures ANOVA indicated that accuracy varied significantly across blocks ($F(4, 83) = 12.30$, $p < .001$ – note that to stabilize variance and avoid overdispersion problems the arcsine transform was applied to accuracy scores before conducting the ANOVA). Four contrasts comparing successive blocks showed that, apart from the two test blocks, accuracy on every successive block was statistically different from that on the previous block – that is accuracy increased at each block except for the transfer block. This indicates that genuine learning is occurring, but an analysis of the learning rates is not the focus of this paper. The medians tell a slightly different story. The overall median accuracy is markedly higher than the mean accuracy for all blocks. Median accuracy peaks in the Test 2 block rather than the Practice block. It falls in both the Training and Transfer blocks, but the fall in absolute size is not as large as that observed for means. This mean/median discrepancy is consistent with a strong skew. This is confirmed by a large negative skew statistic for the distribution of each block in conjunction with positive kurtosis. This indicates a fairly tightly packed distribution of good performances and a long tail of poor performances.

Table 2: Aggregate accuracy (mean percent correct responses) across standard experimental blocks

	Practice Block	Training Block	Test 1 Block	Test 2 Block	Transfer Block
Mean (SD)	82 (17)	76 (18)	81 (23)	81 (20)	75 (23)
Median (Min/Max)	87 (10/100)	81 (11/100)	91 (8/100)	89 (8/100)	83 (100/100)
Skewness/Kurtosis	-2.36/6.44	-1.27/1.91	-1.85/2.67	-1.78/2.93	-1.15/.59

N=87

Results and discussion of response times

The overall pattern of response time data is shown in Table 3. Means and medians are comparable indicating that response time is less dependent on a person's place in the overall distribution. The distribution is still slightly negatively skewed, but less so than proportion correct. Mean response times begin at just under 7.5 seconds and steadily decrease to just under 4.5 seconds by Test 2 block indicating an overall 40% improvement in speed. A repeated measures ANOVA indicated that mean response time differed significantly across blocks ($F(4, 83) = 85.67$, $p < .001$). A set of four contrasts comparing successive blocks showed that responses got progressively quicker across each block, except for the transfer block where, as expected, responses were slightly, but significantly slower than the Test 2 block (all contrast p's < .001).

Table 3: Aggregate data for time to identify the aircraft situation in standard blocks and to identify congruent versus incongruent in Masked and Integrated Instrument blocks

	Practice	Training	Test 1	Test2	Transfer
Mean (SD)	7399 (2819)	5374 (1938)	4219 (1707)	3585 (1456)	4440 (2021)
Mean of Individual SDs	3123	2186	1718	1514	2311
Median (Range - Min/ Max)	7382 (799/13872)	5523 (493/9752)	4296 (498/8281)	3742 (332/6739)	4678 (428/8818)
Skewness/Kurtosis	-.08/-.49	-.56/.57	-.43/.27	-.48/.03	-.24/-.36

N=87

The SDs also steadily decrease, indicating more consistency *between* participants. As with error rate, performance is worse on the Transfer task – the mean response time for the Transfer block is halfway between the Training and Test 1 block. SDs also increased in this block, indicating a wider variation in the participants' ability to transfer training to the different display. Table 3 also shows the Mean SDs of individuals' time to identify the stimulus– that is how much an individual participant's performance varied within a block. Intra-individual variability on response time declined steadily over successive the blocks to around half its initial size. Response time variability increased in the transfer block similar to the increase in mean response time, such that the value was similar to that observed in the Training block.

Aggregate scores – aircraft situation and demographic data

Results and discussion of analysis by situation type as a function of demographic data

Responses were collapsed over blocks and aggregated by situation type. Across the aggregate data, accuracy, and response times tell similar story. In every block "straight and level" was the most quickly and accurately identified situation. Straight climb and descent were slightly less accurate and somewhat slower, while turns were slower and less accurate again. The instrument conflict situation had the second fastest response time but the lowest accuracy. For the purposes of this paper, we are less interested in the aviation-related aspects of identifying aircraft situations than patterns of responses that distinguish between different levels of learning or different levels of motivation to engage with the training task. Of specific interest for this paper is the idea that different patterns of results may correlate with different demographic factors, which in turn might lead to targeted interventions to improve learning.

Cluster analysis of – different patterns of responding evidence different learning strategies

Method

To empirically assess our intuitive hypothesis that there are literally different *types* of learners in this cohort we conducted a cluster analysis on the speed and accuracy data aggregated across situations within blocks. Since speed and accuracy measures had different scales, each variable was standardised before analysis. SPSS V20 hierarchical agglomerative clustering algorithm was used, with Euclidean distance as the distance measure and Ward's method (which minimises the within cluster variance thus favouring homogeneous clusters) used as the linking function. Other distance and linking functions were also examined, and yielded results consistent with those described below.

Results and discussion of cluster analysis

The dendrogram showed two widely separated clusters, the larger of which had about seven times as many members as the smaller. The dendrogram also indicated that the larger cluster could be split cleanly into two near equal sized groups, the larger of which also showed two subtly different subgroups. Two, three, and four cluster solutions were considered. The two, three, and four cluster solutions paint a similar picture, but the three and four cluster solutions provide some interesting insights into the microstructure of the larger group. Two and four cluster solutions are presented, with the four cluster solution discussed in detail. Figure 2 provides a visual depiction of the structure of this data tagged with a summary of the make-up of each cluster, which are described in detail below.

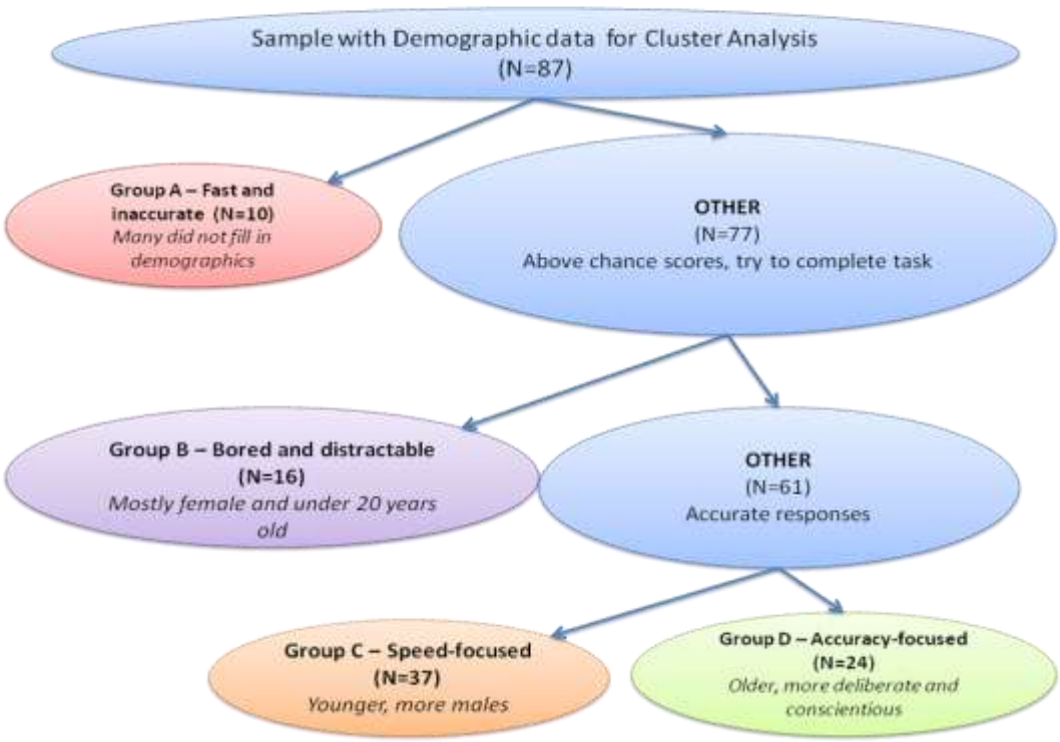

Figure 2: A visual depiction of the cluster analysis results with summaries of the demographic characteristics of each cluster.

Table 4: Two and four cluster solutions for speed and accuracy (see text for further description).

Group	Practice	Training	Test 1	Test 2	Transfer
RESPONSE TIMES (MILLISECONDS)					
A, N=10	4620	1680	783	806	1293
Other	7759	5853	4665	3946	4848
Which splits into					
B, N = 16	8563	6119	4850	3436	3577
C, N=37	6458	4908	3887	3451	4338
D, N = 24	9230	7134	5742	5048	6482
ACCURACY (PERCENT CORRECT)					
A, N=10	62	45	28	44	43
Other	85	80	88	86	79
B, N = 16	74	65	71	64	52
C, N=37	87	86	93	93	85
D, N = 24	87	81	91	91	88

As Table 4 shows, the two cluster solution can be described straightforwardly. Group A has low overall accuracy, averaging around 44%. They show the fastest initial response times and the largest speed increase, the mean response time on the Test 2 being only 17% of the practice response time. They also show the least accurate performance. These people could be described as "fast and loose" or "going through the motions", but with some sense that they should complete the task, despite low engagement. The "other" group display consistently high accuracy, and from a slower start, an overall doubling in response speed by the end of the test block, suggesting that these participants are actually engaged with the task and learning something across trials. "Other" breaks into three smaller groups. Two (labeled C and D) are superficially similar - both show high accuracy which improve marginally over the course of the task, group D, however, is about 3% better on most blocks and distinguishes itself with an outstanding performance on the transfer block. The response time of both groups have almost halved by the second test block, although group D's response time is about 40% longer than that of group C. On this basis we might call group C "speed-focused" and group D "accuracy-focused." Group B is an interesting group which lies somewhere between group A and groups C and D. Their initial speed and accuracy lie between those of A and C, but over the course of the task their accuracy falls and their responses speed up. Having begun the task reasonably well, they appear to lose interest and then try to rush through the remainder of the task and pay a steep price in terms of accuracy. On this basis we might call this group the "bored, distractable" group.

We examined the demographic data of each cluster (see Table 5). Note that the demographic data was not used to perform the cluster analysis, so some significance can be attached to these comparisons. The most significant feature of group A is that they did not provide responses for more than half their demographic questions. This profile would seem consistent with our characterisation of their style as disengaged or uninterested. Group B is almost exclusively female and mostly under 20 years of age. The majority reported playing no computer games, using a computer for non-study purposes (such as using Facebook, downloading music, doing assignments) at least five hours a week and doing little or no sport. This profile is consistent with the typical first year psychology student and their performance likely reflects little intrinsic interest in the task, but a high level of perceived conscientiousness, slavishly "finishing" all assigned tasks in the unit, despite not actually engaging in the task in any meaningful way.

Table 5: Clusters as a function of demographic variables (see text for further description). Numbers show % of cluster having that level of each attribute.

		A fast and loose	B bored, distractible	C speed focused	D accuracy focused
Age	**Under 20**	40	38	46	38
	21 - 24	10	25	24	4
	25 - 30	0	6	16	12
	31 - 35	0	13	5	17
	36 - 50	0	6	7	21
	Not given	50	12	6	8
Gender	**Female**	40	94	65	63
	Male	10	0	27	29
	Not Given	50	6	8	8
Computer Games	**1-2 hours**	0	0	3	13
	3-5 hours	10	0	8	0
	< 1 hour	20	94	84	75
	Not given	70	6	5	12
Using a Computer	**< 1 hour**	0	6	8	4
	1-2 hours	0	31	27	29
	3-5 hours	30	50	35	17
	> 5 hours	0	6	24	42
	Not given	70	6	6	8
Sport	**< 1 hour**	10	56	51	4
	1-5 hours	10	25	24	29
	11-20 hours	0	0	6	9
	6-10 hours	10	6	14	50
	Not given	70	13	5	8

The profile of groups C and D was almost identical. The main point of difference is that group D had many more older persons in it (> 31), while group C was much younger (mostly < 25). Both groups were approximately two thirds females, one third males, over-represents males compared with the gender profile of the psychology cohort. The vast majority reported playing less than 1 hour of computer games a week (although the younger group C had a small percentage playing several hours a week). Both groups used a computer for non-gaming purposes several hours a week (group D slightly more) and both groups reported doing some exercise, although group C had a large number that did only a small amount, while half of group D reported doing 6-10 hours per week. These profiles would seem stereotype-consistent with the younger group being considerably faster and slightly less accurate, and the older group being very conscientious and deliberate. It is also important to note that given the age profile of the undergraduate cohort, the older group D is heavily over-represented in our results, again speaking to maturity and conscientiousness in terms of completing work – rather than just completing the task (checking boxes), these participants engaged with the task and completed it "properly". Interestingly, when we re-ran this analysis with the six cases we had previously excluded for very poor performance included, we obtained the same cluster solutions with five of the six cases joining the "fast and loose" group, further supporting our interpretation of this data.

Concluding remarks – attrition of the long tail

Participants who dropped out of the experiment appear to be the ones who did not "get" the task in the first place, or who could do the task easily but got bored. These two groups form the long tail, but for substantively different reasons. An important finding is that if there was insufficient learning in the Practice trials, there was not much improvement irrespective of persistence at the task, suggesting that repetitive drills are not useful if the basic drill is not understood. Perhaps these participants would have benefited from more conceptual training before attempting the actual trials, or perhaps they did not have the appropriate skills for the task. Those that got bored with the task might just need clearer incentives to boost their performance, in the form of external supervision or extrinsic reward for high scores. The cluster analysis allowed a compelling narrative in terms of the long tail of performance on the instrument scanning task experiment, but also generated a compelling narrative via the demographic data in terms of stereotypical student characteristics within the cohort. Rather than attrition being a problem, it may be a natural outcome of a long tail that recruits tertiary students from a pool of people for whom tertiary education is a relatively unknown quantity – something that seems socially desirable, but about which little is known. Equal opportunity to participate in higher education is a cornerstone of social justice, but in reality, tertiary academic study is not the panacea for a better society. Should we rethink student attrition in terms of a natural process by which students without the appropriate skill level or intrinsic motivation for tertiary studies should be encouraged to follow other pathways (for example vocational pathways through TAFE)? It may not benefit students or the institution to retain them in program of academic study for which they are not well-matched. Conversely, changing programs of study to try to capture disengaged students may not serve students or the institution either. Legitimate peripheral participation in a community of practice can motivate a strong desire to become a full member of the particular community, but can equally legitimately motivate a strong aversion to further participation in the community of practice (Lave & Wenger, 1991).

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Augmenting the Design Thinking Studio

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Mobile social media can be used to augment physical learning spaces and bridge formal and informal learning contexts. This paper presents the ongoing implementation and impact of a mobile social media project, which aims to augment and enhance a Product Design programme underpinned by a Design Thinking methodology. The goal of the project is to enhance student-learning experiences, positively impact their Design Thinking expertise development, and to explore the future of Design Thinking education enhanced by mobile social media. In addition it provides an opportunity for a small university department to engage with implementing and sustaining pedagogical change enabled by technology through the establishment of communities of practice. The paper describes the underlying Design Thinking and learning and teaching frameworks, the establishment of the community of practice, comments from lecturers, and the first pilot project with students.

Keywords: Mobile Social Media, Design Thinking, Product Design, Constructivism, Heutagogy

Introduction

The Product Design programme at AUT University was developed in 2007, launched with the first intake of students in 2008 and has been implemented over the following years. In 2012, the programme has 75 undergraduate students, and 10 students at postgraduate level. The Product Design programme is underpinned by a Design Thinking innovation methodology, which emphasises empathic, human-centred research, ideation, concept development and evaluation.

The development of a new academic programme provides many organisational and operational challenges. It also presents a unique opportunity to develop new approaches to learning and teaching without the constraints of institutional history and tradition to better respond to the needs of industry, the graduates and the wider community (Withell & Reay, 2011). To support and facilitate the teaching of Design Thinking methodologies, the Product Design programme was established around a collaborative physical studio experience. This provides an excellent environment in which lecturers work closely with students to enable them to construct knowledge and develop creative skills and processes. A review of literature has indicated that there has been very little research on Design Thinking education, specifically on how to develop Design Thinking expertise, learning and teaching approaches, models and learning and teaching environments.

A call for Learning and Teaching Development Fellowships (LTDF), funded by the University's central Centre for Learning And Teaching (CFLaT), provided an opportunity and catalyst for investigating the potential to augment the physical studio environment via mobile social media. The LTDF provides funding for time release and dissemination of practice-based research. Previous research indicated that lecturer professional development is a key factor in successfully implementing and sustaining pedagogical change enabled by technology. In addition a Learning And Teaching Enabled by Technology (LATENT) grant provided funds for supplying mobile devices for the department lecturers.

The key aims of the project are:

- To develop staff and student capability in social media for Design Thinking education;
- To enhance staff and student experience, and to positively impact the students Design Thinking expertise development; and
- To implementing and sustain pedagogical change enabled by mobile technology.

Design Thinking and Mobile Social Media

The term Design Thinking describes a human-centred methodology for innovation, which has evolved from the study of the unique ways in which designers 'think', and 'practice' (Bauer & Eagen, 2008; Leavy, 2010; Martin, 2009). Research on Design Thinking includes the study of how designers approach and solve problems, the methods and processes they utilise, their styles (modes) of thinking, their knowledge, their skills, their attitudes and their values. In addition the principles of Design Thinking include the development of meta-cognitive skills; problem solving; collaboration; reflective practice; and multiple, alternative perspectives. Design Thinking is increasingly becoming recognised and utilised by range of design areas, as well as other disciplines including engineering, business, management, information technology (IT), and education. Reflecting the recognition of Design Thinking methodologies as a fundamental core for design, and the uptake of Design Thinking across a range of disciplines, many international educational institutions are incorporating the teaching of Design Thinking into curriculum and programmes.

Design Thinking is based on an iterative process that includes key stages from research, insight development, creative exploration and development through to the evaluation and testing of ideas and concepts. During the implementation of the Product Design programme at AUT, careful consideration was given to the development of excellent physical studio spaces, as essential to developing a programme culture supporting Design Thinking. Each year group is allocated a large, open plan studio space, with individual students provided with well-equipped personal workspaces (see figure 1). The programme encourages students to work as much as possible in the studio spaces, and to create an environment that is supportive while creating an atmosphere of positive critical reflection on design decisions and processes. To facilitate this students are encouraged to display their design process work, prototypes and display models throughout the design process.

While great physical studio spaces provide an excellent environment to support the formal learning and teaching of Design Thinking in such areas as group collaboration, brainstorming, drawing/ideation and 3D prototyping, studios have a danger of 'insulating' students from real-world contexts. In contrast, Design Thinking methodologies require human-centred observation, interviews and the testing of ideas and concepts in 'real-world situations. Design Thinking also requires students to collaborate, share and to reflect about their works 'on-the-fly', while mobile, and in less formal learning situations. The use of mobile social media, mobile phones and tablets, blogs, twitter and other social media tools has the potential to complement, augment and enhance great physical learning environments by providing the tools and mechanisms that encourage students to take their learning outside into the 'real world', and to work more collaboratively in new and effective ways. In essence this approach bridges the formal and informal learning contexts for Design Thinking.

Figure 1: Physical Design Thinking Studio at AUT

Pedagogical Change

The use of mobile social media to augment a physical design studio paradigm creates an ontological shift in the understanding of their roles in teaching and learning of both the lecturers and of the students. This includes not only how the physical learning space can be richly augmented, but also to enable and facilitate student-generated content and student-generated learning contexts. Chi and Hausmann (2003) describe an ontological shift as “the re-assignment or re-categorizing of an instance from one ontological category to another" (p432). This can then result in a move along what Luckin et al., (2010) describe as the Pedagogy-Andragogy-Heutagogy (PAH) continuum from Andragogy (student-centred learning) towards Heutagogy (student-directed learning), as lecturers and students collaboratively redesign learning activities and assessments (Brown, 2006).

Augmenting the Design Thinking Studio Project

In response to the key opportunities identified, the Augmenting the Design Thinking Studio was developed. The project uses a participatory action research methodology (Swantz, 2008) in which the project, and methods utilised evolve through the duration of the project in response to emerging issues and findings. A project framework was developed (see figure 2) to guide key components of the project. These include:

1. Developing staff and student capability through communities of practice (mobile devices and social media).
2. Reinventing learning and teaching processes, bridging the physical and virtual.
3. Developing Design Thinking online resources.
4. Developing ‘smart’ feedback and assessment tools.

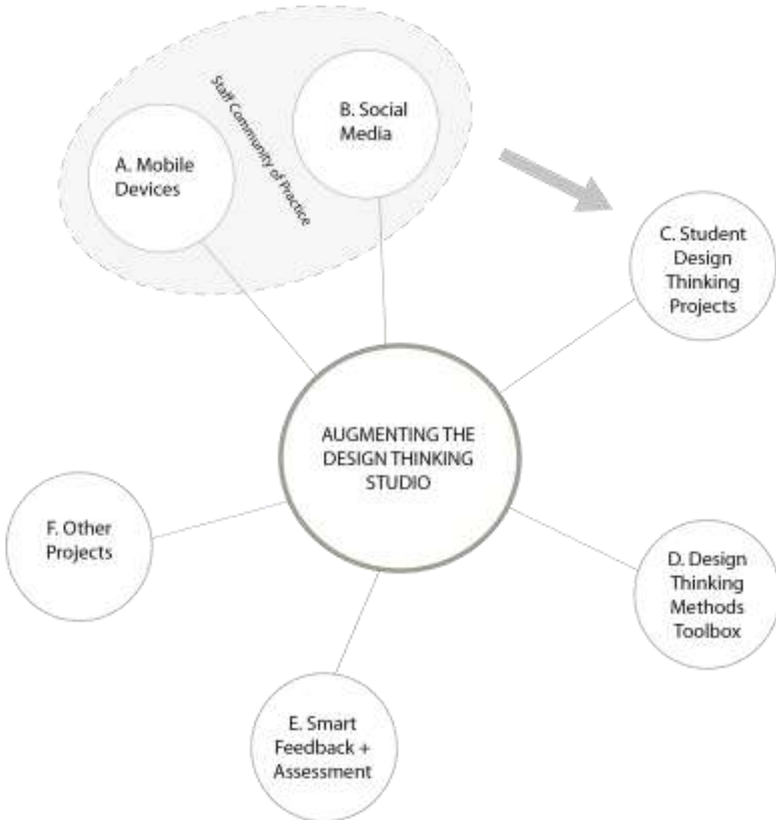

Figure 2: Key elements of the Augmented Design Thinking Studio project

Communities of Practice

To develop staff and student capability in the use of social media, a number of Communities of Practice (COP) were established within the programme. Communities of practice are based on a social learning theory (Lave & Wenger, 1991; Wenger, 1998). Wenger (2006) describes communities of practice as “people who engage in a process of collective learning in a shared domain of human endeavour" (p1). The learning communities for this project include:

- A formal lecturer community of practice;
- Each student year cohort; and
- Individual student project teams.

Lecturer COP

The establishment of the lecturer COP involved the brokering of the concept to key Product Design programme lecturers. This was approached in number ways. An interactive mind-map using http://www.mindmeister.com was created for the first lecturer COP meeting to outline and define the scope of the COP. Participating lecturers were then invited to collaborate on further development and construction of the mind-map using their mobile devices and the Mindmeister app, available for iPad, iPhone, and Android devices.

Table 1: Outline of the Product Design Lecturer COP

Steps/Topic	Pedagogical Implications
Establishing a COP	What is a COP? Expectations Ground Rules Informed by Action Research
Mobile Devices	Personal appropriation of iPhone 4S and iPad3
Creating an mPortfolio	Establishing reasons for the use of: Blogging, via Wordpress.com Twitter
Enhancing Productivity	Basic connectivity, collaboration and productivity tools: Email Google Docs Mobile Web Evernote
Managing Social Media	Establishing tools for filtering, collating, and curating mobile social media, and developing metcognitive skills as essential new digital literacies: RSS subscriptions via Google Reader Creating an interactive visual experience via Flipboard
Enhancing Pedagogy	Exploring the potential for mobile social media to enable student-generated content and student-generated contexts - designing collaborative learning experiences.
The scholarship of teaching and learning	Establishing a framework for practice-based research outputs based upon the design and implementation of mobile social media to augment the design studio experience.

Lecturer Feedback

Lecturers participating in the COP were asked to provide reflective feedback in their blog posts throughout the project. The following provide some indicative posts from Product Design staff over a number of weeks:

> Owning an iPad immediately changed a particular work habit I had: coming home and starting my laptop to work, do research, check e-mails, have Skype conversations etc. I do not feel the need of a computer anymore apart from when doing some stuff which require a bigger screen (e.g. photographic work) or using office programs… In this past month mainly passed by getting used to particular auxiliary technologies which can be used in conjunction with our mobile devices such as Apple TV, a Bluetooth speaker etc. This week happened the most exciting learning for me so far: Our technology steward introduced us to Flipboard. I have been following blogs, tweeting, reading news etc. using all separate applications. The capability of Flipboard to bring all these material together, present in an aesthetically pleasing way and enable sharing any of these collated material in any social media of my choice is fascinating. Currently I'm playing with Flipboard and trying to figure how to further refine the material delivered by it to my particular priorities. We'll see. I realise though, Flipboard (or any similar application) simplifies the hard task of keeping up with multiple streams of information flow. Discovering Flipboard has been a cornerstone for me; for the first time since the project started I

learned something new, experienced a new experience and maybe realised the scope of exciting learning's ahead. (Lecturer1 blog post, 2012)

May 17: I admit being a little sceptical of the benefits from engaging with an online community. Can't get a cup of sugar from down the road by tweeting. Unless they are tweeting back. They are not.
May 22: At today's session I made a giant step forward in grappling with managing these social platforms. Google reader is feeding flipboard. I can now cancel the herald subscription. It was full of trash anyway. Have been looking for an excuse to ditch it. Though it was Handy to light the fire.
May 30: A summary?
Dropbox. Has transformed the way I work. No files on a computer, and therefore accessible anywhere. Brilliant. Until an Internet connection is not available.
Twitter. Slowly getting to terms with the potential as a means to filter and broadcast information.
Qik. Got pretty excited about the possibility of live broadcasting a lecture across campus with the iphone. Thankfully prototyped it before the actual event - well and battery went flat. I see the potential for close up applications
Google reader. Paired with Flipboard it is opening up a vast amount of data previously not easy accessible
Flipboard. Lays it out beautifully
Pages. Great, but the keyboard is not user friendly. Needs arrow buttons to move cursor. I think.
Daily notes. A good way of recording meetings etc. I have now completely dropped visual diary. I do like a pen and paper, and can still use and photograph...
Viber. Ringtone needs some improvement. So many calls missed. iPhone 4. A ton better than the last.
iPad? Well I have to say it has been a pretty significant device. A few negatives around social interaction. In a physical sense.
Not so keen on blogging and public/private cross over. (Lecturer2 blog posts, 2012)

Analysis of the lecturer feedback indicated that the initial impact of the mlearning project was on personal productivity, but this was then followed by the experience of critical incidents where conceptual shifts in the pedagogical implications of mobile social media became apparent. The appropriation of customizable designer-friendly tools used by the lecturers in the establishment of the lecturer COP was a stark contrast to their previously limited appropriation of the institutions Learning Management System (LMS), Blackboard, that was used mainly for administrative and course information delivery duties.

Student Survey

A total of 24 Product Design students were surveyed at the beginning of the project to establish a case for the introduction of mobile social media into the programme, and to establish students' personal ownership of mobile devices, and their prior use of mobile social media. As Figure 3 shows, the majority of the students were consumers of social media rather than creators of social media content prior to the project. Additionally there was a surprisingly low level of smartphone ownership among these students, with the majority owning feature-phones with built-in cameras. Computer and Internet access were almost ubiquitous, as was the use of Facebook and YouTube viewing. There was therefore scope to expand students' prior mobile social media experience by the integration of mobile social media to augment the design studio experience.

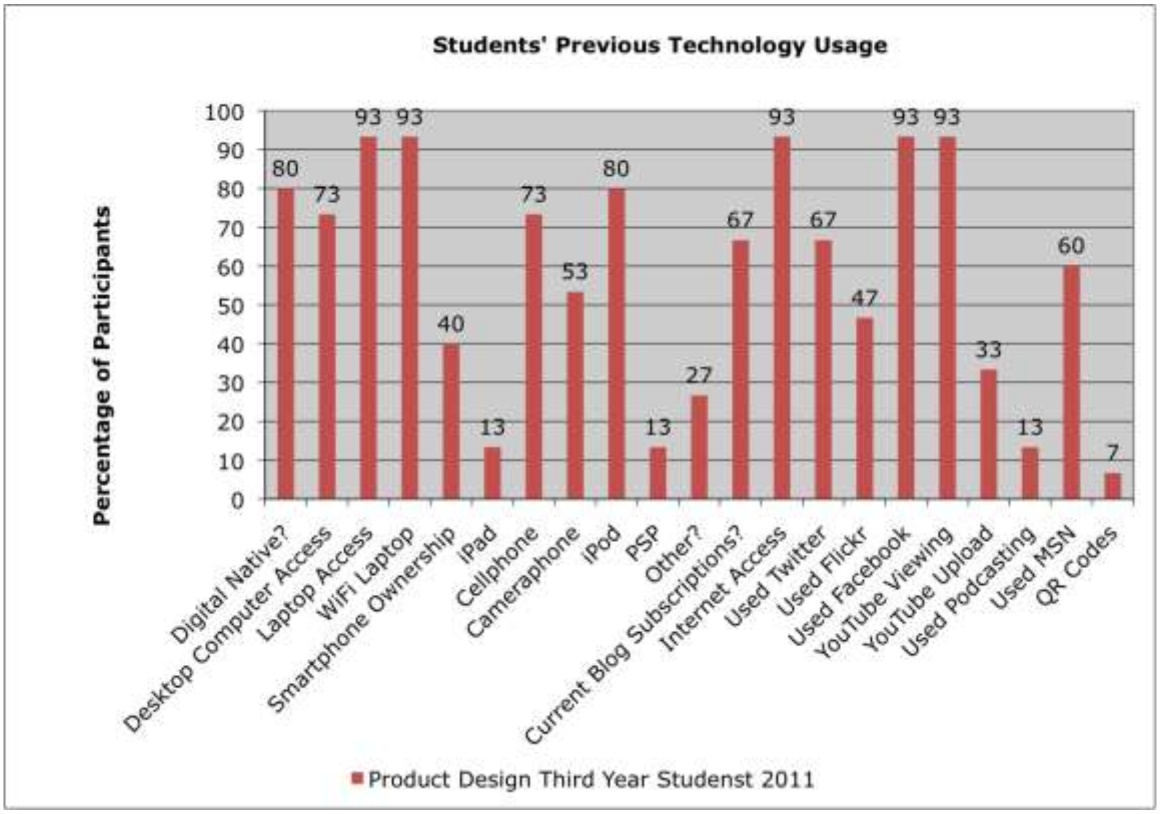

Figure 3: Product Design student previous technology experience

Students were also asked to identify the most useful functions of wireless mobile devices (WMDs). The results are shown in Figure 4.

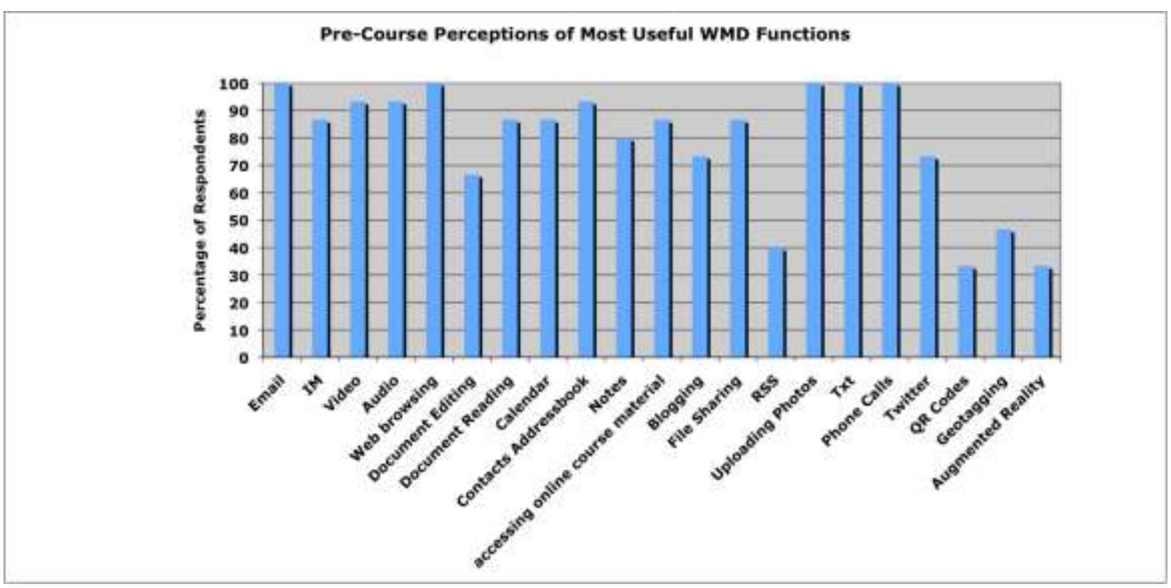

Figure 4: Product Design student perceptions of the most useful functions of WMDs.

The lowest rated functions represent the gaps in students' prior experience and use of smartphones, that is: the use of QR Codes, Geotagging (using the built-in GPS of smartphones), and augmented reality (using the built in GPS, compass, and accelerometers of smartphones). Additionally, as students social media usage was dominated by Facebook usage which does not make standard use of RSS for subscribing to social media, the students had little concept of what RSS was or its use in managing social media information. These then are the areas that can be explored for augmenting the design studio.

Previously the extent of course online activity had been the administrative use of the institutions Learning Management System (LMS) Blackboard, and an institutionally hosted installation of Mahara for student e-portfolios. In comparison to the level of student engagement and student empowerment evidenced by the previous student use of the LMS and Mahara, the level of student engagement and critical thinking as well as team work building evidenced via their use of mobile social media was revolutionary for the course and for the Product Design programme. This is evidenced by two initial, six-week student projects including a third-year Product Design studio project discussed below, and a first-year Product Design studio project introducing the Design Thinking process. Through the implementation of the project, a radical conceptual-shift in the understanding of the affordances of mobile social media to augment the traditional physical studio environment is occurring. In this case mobile social media is reassigned from the category of a purely social tool for informal use into a powerful tool for student-generated content and collaboration within student-generated learning contexts.

Pilot Student Project

The first ‘pilot’ mobile social media project undertaken with students was a third year Product Design studio project. The students, working in groups of three (reflecting small communities of practice), were asked to apply Design Thinking methodologies and processes to the in-depth research, analysis and the design of one or more 'product' interventions that clearly improve and enhance the experience of bus patrons (users) in Auckland. The project was undertaken in conjunction with Auckland Transport, a division of the Auckland Council. The Design Thinking process was underpinned by observation and role-playing research to identify poor experience ‘touch points’ in the Auckland bus journeys.

Key to the implementation of mobile social media in the project was the formation of a collaborative blogging platform using Posterous.com and the use of student-owned smartphones to augment the formal studio aspects of the Design Thinking process. Posterous was selected as a appropriate mobile blogging platform because of its clear and simple interface, ease of use, the ability to upload images and text from email, and because it had a good mobile app for smartphones and tablets. In addition to the use of blogs, students were also asked to undertake some of their research using social media platforms such as Facebook and Twitter surveys to enlist feedback on bus users experiences, and on the ideas and concepts that students generated through the Design Thinking process.

Given that this was the first implementation of mobile social media in a Design Thinking studio project, it provided a useful initial focus for engaging student feedback and for critical discussion by lecturers to identify issues and opportunities, and to help prepare for a more integrated approach in integrating mobile social media in the Product design programme. From the discussions a number of key issues emerged from the pilot. Some of these include:

- Generally many students enjoyed reflecting and writing more ‘freely’ about how they were going throughout the Design Thinking process. It is also good for students to be able to look back over the entire process at the end of the project;
- Lecturers felt that students were writing more than that had than in other projects;
- The blogs were very good for capturing and communicating the practical design work happening in the physical studio (see figure 5);
- The blogs worked better the early (research) phase of the project and blogging tapered off towards the end. Students did not do a good job of documenting the final design proposals;
- It was good for lecturers to see how the students were progressing at various points in the project, and this helped them prepare for when they met them in person (in studio) this discuss progress and ideas; and
- There was a little bit of confusion around the role of the blog in the assessment of the project.

Overall there appeared to be more cohesion in each the student groups than in previous projects, and it was good to see each group communicating, sharing and developing ideas outside of the formal studio situation. More importantly the use of social media in the project provided a platform that clearly extended the physical studio based learning environment, and demonstrated the potential of future development of the project with other student groups.

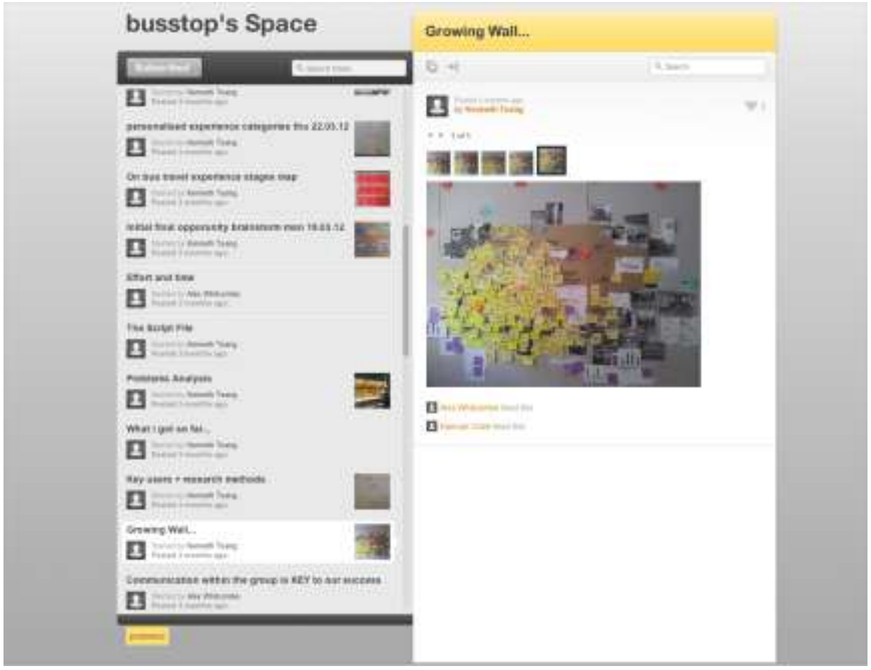

Figure 5: Example of one group's Posterous blog space capturing the work from physical studio

The results from the project were good, and feedback from the client was very positive.

> More importantly the substance, practicality and fresh thinking and concepts were outstanding. Please accept my congratulations to you and the faculty and also to the students themselves. Please encourage the students with the reassurance that their efforts will be incorporated into some of our new thinking.

Conclusions

This paper has described the ongoing implementation and impact of a mobile social media project to augment and enhance a Product Design programme underpinned by Design Thinking. A number of key themes have emerged from the research project to date:

Opportunity: Studios, while providing excellent environments for collaboration and creativity in the formal Design Thinking learning and teaching process, often insulate students from 'real-world' contexts required in Design Thinking methodologies;

Community of Practice: The establishment and nurturing of a lecturer community of practice investigating, experiencing and appropriating the use of mobile social media in the learning and teaching of Design Thinking has provided programme staff with a sound platform for engagement, discussion, and as a mechanism to develop capability and knowledge. This is the first step of what will be an ongoing process of ontological shift for the programme as the project develops;

Pilot Project: The first pilot project with students has provided both staff and students the opportunity to explore some of the key issues and opportunities for the implementation of mobile social media into the learning and teaching programme. Findings from the pilot project have indicated that mobile social media (tools and platforms) are beginning to, and have the potential to, further enhance the more formal aspects Design Thinking studio by providing opportunities for collaboration, creativity and reflection in 'real-world' contexts, and to positively impact the students learning experiences and Design Thinking expertise development; and

Pedagogical Change: Overall the exploration of the potential of mobile social media to augment a physical design studio paradigm has led to the first stages of an ontological shift in the understanding of both the lecturers and the students of not only how the physical learning space can be richly augmented, but also to enable student-generated content and student-generated learning contexts. This represents a move along the continuum from Andragogy towards Heutagogy.

The Augmenting the Design Thinking Studio project continues to evolve and develop and the findings of the first two student projects will be used to further develop future student projects.

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‘Being in the kindergarten of blended learning’: Exploring teachers’ processes for sustainable blended learning practices

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AUT University

The potential of blended learning has yet to be reached and this paper presents an alternative lens for researching teachers who work with blended learning environments. The teachers’ role in creating blended learning environments is not yet well understood. This paper proposes the Social Construction of Technology (SCOT) as a model that may be used to explore the processes that teachers engage in when creating blended learning environments. Exploring the ways in which teachers are creators of blended learning environments provides a new lens for sustainable practice. This may signify a shift away from the focus of attempting to create a perfect product to an emphasis on sharing the process development. This paper first presents an overview of the SCOT model which is followed by examples of the ways in which the SCOT model was applied in a recent research project.

Keywords: Social Construction of Technology (SCOT), blended learning environment, blended teaching, sustainable process, teachers’ perspectives.

Introduction

Current research in the field of blended learning has focused on the use of technologies for learning activities and their inclusion in curriculum design. Motivation to use blended learning is evidenced in the literature in phrases that allude to “the best of both worlds” (Gruenewald, 2003; Nielsen, 2008; Ward, 2004) and the “hope for the 21st century” (Connolly, Jones, & Jones, 2007; Daniel, 1997). Daniel (1997) indicated that ideas for the potential of blended learning have been anticipated for some time, however much of this research has had a student focus and the area of teachers (as future makers), has remained under researched. There is a scarcity of literature that looks at exactly how blended learning environments are created by teachers from the teachers perspective. However, there is an abundance of literature about advice, design, and reports on what has happened (Bonk & Graham, 2006; Littlejohn & Pegler, 2007; Stacey & Gerbic, 2009). Accounts of the ways in which teachers are transitioning to blended learning are now appearing in the literature (Samarawickrema, 2009; Wiesenberg & Stacey, 2009; Wilson, 2011) however detailed accounts of the teachers perspectives are yet to be fully explored (Gerbic, 2011).

The SCOT model is put forward in this paper as a theoretical model that may be used as a lens to view the work in which teachers are engaged. Furthermore the model provides a way to investigate the iterative processes of creating blended learning environments, which may be used to focus on sustainable development. This paper theoretically locates the SCOT model, describes the four stage model followed by suggestions to mitigate the critiques of SCOT in the context of teachers’ practice in creating blended learning environments. The paper concludes with a brief overview of the SCOT model applied to a recent research project, highlighting aspects that may support a focus on teachers as future makers and their sustainable practices.

Concepts underpinning the SCOT model

SCOT provides a theoretical perspective for understanding technological development from within the constructivist paradigm. The basic premise of the SCOT concept is that there is no one correct way for technologies to be developed and that variation in development occurs as a direct result of the different people involved and their social connections (Pinch & Bijker, 1984). Prell (2009) expands the SCOT definition stating that: “Technologies emerge from social interactions among social groups... SCOT sees no 'right' or 'wrong' technologies, as all technologies have the potential to be shaped differently” (p. 2).

Foundational to the SCOT model is that there are various ways in which technology could be developed. Oliver (2011) contends that SCOT can be used as an alternative way to conceptualise the relationship between education and technology which has often been deterministic in nature. Pinch and Bijker’s (1986) concept counters technological determinism that allows for only one right way in which technology can develop.

Therefore it is a good fit to apply the SCOT model to viewing the multifaceted field of blended learning. One of the challenges in the field of blended learning is that there is great variation between how this concept is understood and applied. Sharpe, Benfield, Roberts and Francis (2006) specifically stated that “the term blended learning is difficult to define” (p. 24). Pinch and Bijker state that there are many ways in which artefacts could be developed (‘artefact’ is the terminology used in SCOT to describe technological developments), as a result of the different people involved (which in SCOT terminology are referred to as the relevant social groups [RSG]) and the choices they make in the construction of their technology use.

The SCOT model

Pinch and Bijker (1984) developed a model comprised of four interrelated stages which are RSGs, interpretive flexibility, closure and stabilisation (Pinch & Bijker, 1986; Prell, 2009). Table 1 is an adaptation of Prell’s (2009) presentation of the model with a brief description and key concept displayed beside each of the four stages.

Table 1: SCOT four stage model adapted from Prell (2009)

Stages in the model	**Key concepts**
1. Relevant Social Groups (RSG)	May or may not be members of the same institute RSG has a shared interpretation of the artefact
2. Interpretive flexibility	Numerous interpretations of the artefact exist Each RSG has their own interpretation
3. Closure	Multiple interpretations cease to exist Interpretive flexibility diminishes and an approach is chosen
4. Stabilisation	The development of the artefact within the RSG This happens in degrees

The SCOT assumption that technologies are socially constructed and shaped by the people active in the development process is the starting point for the SCOT model. RSG is the term used to describe those involved in the process. Once the RSG is identified, the focus then moves to “interpretive flexibility” which is the beginning of the development phase where numerous possibilities and variations are explored. When the development phase becomes concentrated on one particular idea, the artefact is said to have reached “closure” where the RSG reaches agreement to develop aspects of the artefact (for example the Learning Management System [LMS]) and “stabilisation” when the actual artefact is developed. The stages of the SCOT model are expanded upon next with the connection to social constructivism highlighted.

SCOT Stage 1: RSG

Defining the different people involved and categorising them into RSGs is the first stage of the SCOT model presented in Table 1. RSGs are defined as a group that shares a common purpose or understanding of the artefact (Prell, 2009). The primary reason for identifying a RSG is to provide a useful starting point for research, however it is also noted that some researchers may find this too simplistic (Pinch & Bijker, 1986). Humphreys (2005) recognises that “the choice of relevant social groups is highly subjective and dependent upon the researcher” (p. 234) and that this is a way in which to simplify the focus that may include biases. Pinch and Bijker (1986) assert that the RSG need only be sufficiently defined for the context at hand, and that exhaustive locating of social groups was not the goal since “all groups and structures are themselves embedded within an endless web of other groups and structures” (p. 353). This approach is well aligned with social constructivism.

The term RSG indicates that there can be more than one group, and research can focus on a particular group or several RSGs, which may or may not be from the same institution. The RSG may be a group that has existing connections, or the connection may be constructed entirely for the purpose of the research where people with similar views of the technology are considered as a RSG (who may never have met or have little connection in real life).

SCOT Stage 2: Interpretive flexibility

Creating multiple interpretations for the artefact is the definition of the interpretive flexibility second stage of the SCOT model (Pinch & Bijker, 1984). This is an explorative phase during which different ways of designing and working with the artefact are explored. The theoretical position of SCOT is that all technologies could be different and the final design is dependent on the RSG (Pinch & Bijker, 1984). The malleable nature of technology is inherent in this stage of the SCOT model; it is the different interpretations of the artefact by the RSG that is explored. This is supported by Meyer and Avery (2010) who noted "studies that unearth the developmental stages of a technology and follow it through its implementation phase show that users are not passive [and] they are capable of interacting with technologies in ways the designers may not have predicted" (2010, p. 158). Humphreys (2005) contends that there can also be flexibility of structure concerning how the artefact is understood. Pinch and Bijker (1984) clarified that interpretative flexibility applied to both the way in which people thought about the artefacts and the variety of ways in which the artefact could be designed and used.

The way in which the artefact is interpreted is therefore flexible and socially constructed by the RSG. Interpretive flexibility is the stage where variations are explored by the RSG. The socially constructed ideas may be developed within and between RSGs (Pinch & Bijker, 1984) and also potentially within sub-groupings of RSGs (Humphreys, 2005). The first two stages of the SCOT model are closely connected and demonstrate the connection between social constructivism and the SCOT model.

SCOT Stage 3: Closure

Closure occurs when the RSG develops a tighter definition for the artefact and defines how the technology has become an accepted part of their practice (Pinch & Bijker, 1984). Prell (2009) describes closure as a diminishing of interpretations, and Bruun and Hukkinen (2003) identify closure as the streamlining of interpretations. To clarify the shift from interpretive flexibility to closure, the RSG moves from multiple interpretations in interpretive flexibility to a shared definition of the artefact in closure. There are several ways in which closure is reached ranging from a redefinition of the problem, rhetorical closure, or consensus of a definition by the RSG (Humphreys, 2005; Pinch & Bijker, 1984). Bruun and Hukkinen (2003) state that closure is never truly reached and that technology continues to develop. However, this is not necessarily seen as a problem because technologies are constantly evolving, which becomes part of the development cycle (Pinch & Bijker, 1986) and process of technology development (Bijker, 2010). The approach by the RSG viewing technology as a development process is the point at which SCOT may be used to explore continued and therefore sustainable practice adopted by the RSG.

SCOT Stage 4: Stabilisation

Stabilisation, the final stage in the SCOT model, occurs when the actual artefact is developed and used (Pinch & Bijker, 1984; Prell, 2009). Stabilisation may happen in degrees (Pinch & Bijker, 1984) or as a fluid process (Prell, 2009), where the refined definitions attached to the artefact are developed over time both within one RSG or across different RSGs. To expand this point further, the development of ideas across the RSG must allow time for the social interactions (social constructivisim) to take place, and the clarifying of definitions may take several such interactions. Rosen (1993) clarifies stabilisation in that "the characteristics of this artefact then come to be 'taken for granted' as the essential 'ingredients' of the technology" (p. 483). Stabilisation can therefore be described as both a social and a slow process. Humphreys (2005) identifies the major critique of stabilisation, in that Pinch and Bijker (1984; 1986) do not state what happens if stabilisation is not reached (they only go so far as to say that it happens in stages). Humphreys (2005) raises concern that this process of stabilisation happening in degrees is insufficient and suggests a more flexible approach, by focusing on the way in which the artefact is spoken about, used, and structured.

Closure and stabilisation are described as "two sides of the same coin" (Bijker, 1997, p. 85). Humphreys (2005) further characterises the distinction by stating, "the most pertinent difference between stabilisation and closure is that closure is about relevant social groups while stabilisation is about the artefact" (p. 243). These explanations provide a simple way to distinguish between the last two stages of the model.

Critiques of SCOT concept and model

There are a number of critiques of the SCOT concept, focused primarily on the RSGs and the overemphasis of their function (Jasanoff, 2004; Russell, 1986; Winner, 1993). Initially SCOT critics argued that SCOT was a form of social determinism (Hughes, 1994; Lipartito, 2003; Russell, 1986) in that although SCOT views the many possibilities for development of the artefact, the choice of and focus on RSGs that shape this development is linear and determined by the researcher who might only focus on the groups that had successful impact on the development, as opposed to groups that did not influence the development, thereby being deterministic in approach. Winner (1993) continues this line of argument by stating that SCOT research is superficially focused on the chosen RSG and does not allow for other groups to be considered.

In the context of applying SCOT as a lens to view teachers practice in blended learning, I contend that multiple RSGs can be used to focus on the different aspects of blended learning usage. Multiple views of different RSGs can be clearly explored using the SCOT model.

The next critique takes this point further by stating that SCOT excludes the RSGs who do not influence the development of the artefact (Wajcman, 1995, 2010). The idea that is of note within this critique, is that issues of social power and political standing are not addressed by SCOT (Winner, 1993). The social groups whose ideas are not considered are ignored, and even more concerning is that those without a voice are ignored completely, thus allowing for a selective view of technological development (Winner, 1993). This critique generated a subfield within SCOT research led by one of the seminal authors concentrated on ways in which users (and non users) of technology have important consequences for research (Oudshoorn & Pinch, 2003).

Variations of the SCOT model have been developed that extend the model beyond the first four stages. Most notably Bijker (1994) extended the model with a further four stages to enable research to include a focus on the issue of power relationships (which is also the model that Prell [2009] extends). Bruun and Hukkinen (2003) propose the combination of models: evolutionary economics (EE), SCOT and Actor Network Theory (ANT). Alternatively, Dayton (2006) explores the full cycle of development within a workgroup "as they collectively learn, analyse, adopt, and redefine a new information technology (IT) tool or system" (p. 355). In order to see these developments fully, Dayton combines SCOT with the adoption and diffusion theory (ADT, first put forward in 1962 by Rogers [2003]) and cultural–historical activity theory (CHAT, developed and discussed in relation to social construction by Engestrom, [2000]). Other strategies to mitigate this critique would be to select multiple RSGs to represent the different roles (users, producers, bystanders and advocates) in technology development (Humphreys, 2005) or to potentially create a new model in the application of SCOT.

Utilising SCOT to focus on the application of software is supported by the research conducted by Jump (2011) and Prell (2009). More specifically, I contend that the SCOT model can be used to research the teachers' use of software in the creation of blended learning. Van Lieshout, Egyedi, and Bijker (2001) found in relation to teaching with technology that "it depends almost solely on the intrinsic motivation of individual teachers" (p. 14), which I contend is a valid point in relation to the current technologies and investigation into the teachers' processes. Literature concerned with the application of SCOT highlights the need for research studies that focus on the actual use of technology (Bissell, 2010; Edgerton, 2004; Winner, 1993). Specifically, in the area of ICT it has been noted, "the whole area of practical use of ICT-supported learning technologies appears to be under-researched" (Bissell, 2010, p. 539). Winner (1993) critiques SCOT for ignoring the consequences of technologies after they have been developed. Therefore, it may be important to plan for research projects that follow development beyond the development phase through to the practical application of ICT in blended learning environments.

SCOT applied to a specific research project

My research project focused on applying the SCOT model to provide visibility of the ways in which teachers create blended learning environments, a necessity argued by Cornford and Pollock (2002). Researchers in blended learning have found that the role of the teacher is changing significantly (Kaleta, Skibba, & Joosten, 2007). How teachers are actually changing their work, and the approach they use when creating a blended learning environment, is the gap on which my research project focused. The project I undertook was a masters thesis investigating "Teachers' creation of blended learning environments at a campus-based university" (Wood, 2011). The project was focused on the practices within a single university in a large New Zealand city. Purposeful sampling including snowballing was used to select the six teachers from different study areas across the university. The way in which the teachers who participated in the research study were identified as an RSG stemmed from their descriptions of their role that empowered them to make changes with the LMS (specifically Blackboard™ at the case study site). Their shared belief was that they could shape the LMS to suit their own teaching practice and that this was a choice they had made at differing stages of the LMS implementation. It is important to note that the teachers in this research study were not all early adopters of the LMS technology.

Interviews were selected as the main data gathering tool to support the investigation into discovering the new invisible work that the teachers had undertaken in relation to developing blended learning environments. Specifically a two-phase semi-structured interview was the main tool used to collect data, which was supported by a demographic detail form. The data gathered from the interviews was in the first instance analysed thematically with the use of mind mapping. When it became apparent that the rigor of the case study could be improved by the application of a theoretical model, the SCOT model was applied strengthening the connection to the social constructivist case study approach. To summarise, thematic coding was the first cycle of analysis which generated broad themes. The SCOT model was the second cycle of analysis applied to the themes generated in the first cycle. The next section of this paper highlights the way in which the SCOT model was applied in my research project.

SCOT Stage 1: RSG comprised of teachers using the LMS

Pinch and Bijker (1986) stated that it is useful for researchers to identify the RSG and their shared interpretation of the artefact as a starting point. The RSG in this research study was based on identifying the teacher participants as active users of the LMS. The participants' shared interpretation of the LMS was that they each recognised a potential to improve their teaching practice through incorporating the LMS. The choice to use the LMS was made of their own free will, and while it was strongly supported by the institution, it was not a requirement. This RSG of teachers shared interpretations were founded on their willing and autonomous shaping of the LMS to develop their own blended teaching practice. The research project revealed that the teachers self-directed choice to use the LMS, and the influences that supported them, were critical to their engagement in the blended learning design process. The use of institutional support was evident in the range of grants and individual work that the participants undertook utilising a range of training options. Therefore these supporting internal and external influences may be important considerations for teachers generally when engaging with the blended learning design process. Lindsay (2003) states that users actively co-construct their identity in relation to the technology they use, these identities could then be used to develop sub groupings for future research. Meyer and Avery (2010) heralded the need to specifically focus on teachers as users of technology. These distinctions could be used in future research projects as the foundation for additional sub groupings within the RSG focusing on teachers as users of technology and the ways in which they co-construct their identities.

SCOT Stage 2: Interpretive flexibility in the teachers' exploration of the LMS potential

Interpretive flexibility in my research project was characterised by the participants' experimentation with the LMS and the range of potential they described. The data show an exploratory phase in which the participants focused on using the new tools that the LMS afforded. Exploring the use of new tools led to many interpretations of the way in which the LMS could be used. Experimentation was a pivotal aspect of interpretive flexibility. The project illustrated that in essence the teachers chose the better of the two environments (online or face-to-face) for their learning content as a result of exploring the LMS options, and decided what to put back into the face-to-face classroom. Awareness of this possibility drove the participants to experiment with the ways in which the LMS allowed them to create the best blend of both environments. The participants focused on what the addition of the LMS allowed them to then do in their face-to-face classroom, rather than just focusing on the LMS technology and what they could do online, revealing a dynamic impact between the LMS and the face-to-face settings. Interpretive flexibility made the dynamic nature of the blended learning development process apparent. Power (2008) suggested the need for investigation into how teachers plan for online teaching. An interesting way to extend Power's suggestion would be to investigate how online teaching may impact on face-to-face teaching, thereby taking a holistic view of the impact of blended teaching.

SCOT Stage 3: Closure in the teachers' approach to continued use of the LMS

The final two stages of the SCOT model are closure which focused on the people and stabilisation which focused on the technology (Humphreys, 2005). Table 2 clarifies the nuanced distinction between these phases in relation to my research project.

Table 2. The distinction between closure and stablilisation

Closure	Stabilisation
Focus is on the RSG (humans – in this case teachers) and their approach to using the LMS	Focus is on the LMS (technology) and how the technology is put to use (developed)

SCOT closure is the stage where the teachers shifted from multiple interpretations about the LMS to a focus on their practice and how they would approach using the LMS. A key idea expressed by the participants was that they were at the beginning of developing their own blended learning practice, which one participant identified as being at the kindergarten stage of blended learning. The LMS had become an accepted aspect of the teachers' practice and they could no longer imagine teaching without the LMS. The participants described their plans for using the LMS, the associated procedures and administrative tasks as well as LMS uptake by their wider team. These factors provide evidence of the LMS becoming a fixed aspect of their individual teaching practice which included an acceptance of the continual development that was required to maintain the use of the LMS. Their approach demonstrated closure in the development of their preferred teaching environment and in the commitment to the long term development processes the LMS required. As a result the teachers developed a mature and sustained understanding of the purpose of the LMS and the impact it had on changing their approach to blended teaching with the LMS technology. These descriptions may go some way towards "[taking] stock of what it is that teachers now do" (Selwyn, 2010), and illustrate the broader range of planning and procedures that teachers now need in order to become proficient in managing their teaching context. These concepts illustrate how SCOT may be used to highlight areas to focus on in the development of a sustainable approach to blended teaching practice.

SCOT Stage 4: Stabilisation of the teachers' implementation of the LMS

Stabilisation is the stage where the LMS technology was physically developed through use of the LMS by the RSG. The technology in this research study was software, therefore it was the configuration (and implemented use) of the LMS software that constituted technological development. It is important to recognise the intangible nature of the LMS software. While the participants did reach stabilisation in their application of the LMS, Prell (2009) describes the development of software as a fluid process of stabilisation. The participants view that their course with the LMS could continue without them (in case of an emergency), signaled that development had taken place, indicating achievement of Pinch and Bijker's (1984) concept of stabilisation. However, ideally the participants wanted to perfect their LMS course prior to sharing the LMS aspect of their blended environment. The participants developed a clear way of working with the LMS through their application of the software, which illustrated Rosen's (1993) view that stabilisation may be observed when the technology is perceived as essential and "taken for granted" (p. 483), a sentiment that the participants clearly expressed. Teachers thought that it would be difficult for others to pick up their course, and this indicated that although the LMS had reached a certain level of stabilisation, that stabilisation, like closure, happens in stages (Pinch & Bijker, 1984). This research study identified that the participants were focused on passing on a finalised LMS artefact rather than a descriptive exemplar of the process in which they had engaged, in regard to their work with the LMS technology and in their incorporation of the LMS into their blended learning environment. Bijker's (2010) recent call for a focus on the process of technology development may now provide a focus for both interpreting the findings and signifying areas for further research. Describing the process of blending and documenting suggestions for improvements could be one way of working with teachers to identify sustainable practices for LMS development within their blended teaching practice.

SCOT insights regarding sustainability

This paper has shown that the Social Construction of Technology (SCOT) is a model that can be used as a lens to view the process of creating a blended learning environment. The SCOT model highlighted the contradiction the teachers experienced in the last two stages of the SCOT model: The sense of still being in the kindergarten of blended learning in the closure stage yet the desire to share the perfect course in the stabilisation stage. The SCOT model highlights the complexity of the continuous process in developing blended learning. The participants hoped that synergies could be gained from their work for future users of the LMS. In essence the teachers' hoped that their work was both transferable to other future makers and sustainable, they wanted to share their experiences across the university when their courses were perfected.

Laurillard (2008) cautions that education has been on the brink of transformation for some time, necessitating a focus on teachers' practices, supporting the use of the SCOT model to focus on the process of creating blended learning environments. Bijker (2010) emphasises the benefit of applying SCOT as a tool to investigate the process of technology development. Rather than waiting for the perfect blended course to be created, it is imperative to focus on the process of creating the blend, due to long development cycles in education and the fast changing nature of technology developments. Therefore the findings from the research study indicate that it may be appropriate to focus on creating exemplars that highlight the process of blended learning, and that also are developed during the development process rather than at the conclusion of the teachers perfected blended learning creation. This view is supported in the research by Hallas (2005) and Moron-Garcia (2006) who recommend the sharing of exemplars within the institution, providing insight into how the LMS is currently used and how it could be applied by future users. Bates and Sangra (2011) also suggest that effectiveness is increased when localised projects are connected to the wider context and strategy of the institution. Cornford and Pollock (2002) call for visibility into how teachers create the blended environment, to which providing such exemplars focused on the process could be one part of the solution. A focus on the process could entail the participants sharing of how they first learnt about and then explored the multiple possibilities of LMS, which they then refined through reaching closure and stabilisation (in essence each stage of the SCOT model).

Conclusion

This paper has outlined the SCOT model and a potential way in which this model may be applied to research to gain insights into opportunities for sustainable practice. One of the key findings highlighted by the application of the SCOT model to a small scale case study research project was that a contradiction was revealed between the teachers approach and development of blended learning environments. In their professional development the teachers expressed that they were at the beginning of learning about blended teaching which was likened to being in the 'kindergarten' of blended learning also suggesting long term and iterative development cycles. This contrasted with their desire to prepare for succession and develop the perfect course for dissemination. Perhaps the potential for blended learning has not been reached because the participants were not ready to let go of their creations; they wanted to perfect their work first before handing it on, which may be an unobtainable ideal. The foremost recommendation from the research study this paper was based on was "to focus on the way in which teachers navigate the process of shaping their blended practice" (Wood, 2011). Furthermore I contend that the focus on how teachers navigate the process of blending may lead to the development of sustainable models and capture the kindergarten like enthusiasm for the creation of blended learning during the early development stage.

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Treading carefully in Stalk Space: Social Media and Risk

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Universities are enthused by the capacity of social media to engage students, encourage creativity, support collaboration and connect students, teaching staff and industry globally. Without dismissing the very real capacity for social media to contribute to a connected, informed, critical digital citizenry, it is timely to consider some of the risks that social media in a university setting brings. It is a commonplace assumption that, not only are all students ‘on’ Facebook, but that universities must also engage with students there. This paper does not consider whether to use social media or not for teaching; rather, this paper introduces some legal and ethical themes about the use of external social media for the formal teaching of enrolled students.

Keywords: social media; university; risk.

Introduction

This paper draws on draft guidelines developed to provide general advice about legal risks and teaching with social media. While it was unclear how many staff in the Faculty of Business and Law at Victoria University (VU) use social media in formal teaching, it was clear that staff were devising their own rules: some think it is fine to be ‘friends’ on Facebook with current students, some think it is only alright to be ‘friends’ with Alumni. Some staff have Facebook sites to provide a social support space for students. Some staff do not use Facebook at all. Students also have diverse views about using Facebook for formal study: some students use Facebook for team work as well as extracurricular information; other students are frustrated by the fact that Facebook seems to be the only place where their questions are answered. A recent survey indicates that students are polarised about using Facebook for teaching with some describing it as ‘brilliant’ and others simply as ‘a bad idea’ (Woodley, Meredith and Murray, 2012). With mixed attitudes to social media from staff and students as well as eclectic teaching using social media, draft guidelines were developed to raise awareness about legal risks connected with social media.

Part of the ambiguity about using Facebook for teaching comes from a lack of clarity in the purpose of using social network technology in the educational context. In universities, social networks often take the place of previous media to send messages, distribute content, facilitate discussion or post calendar events, which are all features of online learning systems. Teaching staff need to consider the question: why use an external social media site if internal tools can achieve the same results? While some university-supported learning management systems (LMS) have social media capacity with wikis, blogs and networking functions, this paper concerns social media that is *not* supported by the university, does *not* require a university-issued password to access, which requires a student to register with an external company and which could be open to the public. LMS 'safe havens’ are not the focus.

Background

A range of VU university policies and state and federal legislation is examined in this social media discussion. In this discussion, we do not conflate the terms social media, Web 2.0 and user-generated content; rather, Web 2.0 is “the platform for the evolution of Social Media”; social media “is a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0”; social media allows for the creation and exchange of User Generated Content” (Kaplan & Haenlein, 2011: 61).

The need for existing policies and laws to be reasserted as a part of social media discussion is highlighted by eminent cases in mainstream media. Stalking and harassment laws have particular relevance online. More parochially, the popularity of a student-supported Facebook site called VU Stalk Space creates a cause for concern. While technology is ahead of the law in respect of social media, technological newness “does not compel new laws, but it does mean existing laws need to be applied” (Short, 2012).

While most Australian universities are associated with unofficial Facebook sites that follow the ‘Stalker Space’ model, the culture and tone of each site can be drastically different. 'Stalker Spaces' are student-run Facebook groups where students share unofficial information. The whole social gamut of student-to-student interactions is publicly visible: from swapping books through to harassment and bullying. Stalker Space sites are associated with official universities through the appropriation of the university logo or a parody thereof, references to university clubs, campus references and campus photos and student activities. The extent to which a university can control activity on a Stalk Space is interesting: too aggressive an attempt at control would create a social media back lash; whereas ignoring the space might amount to a dereliction of duty. Buchanan (2011) labelled Australian universities’ Stalker Space Facebook sites as sinister, citing the ANU site’s motto: "Stalk, prey, love"’ as evidence enough (Buchanan, 2011). It seems that universities have some duty of care to both its students and staff who could be described, named or threatened on these sites.

General participation on social media sites can expose staff, students and the university to a range of legal risks but using social media for teaching raises specific risks. In flagging risks, the benefits of using social media might be more apparent and the risks reduced. Teaching staff must be supported to better manage social media risks and to prepare students to be digital citizens. In developing students’ Web 2.0 literacies, teachers must also understand their own duty of care. Recent legal decisions have seen “that website owners can owe a duty of care to their users… profile pages of individuals can be used as evidence…and that …legal risk is growing just as fast as the ever emerging technology” (Dundas Lawyers, 2011). Users need some guidance to consider the risks of using social media.

Web 2.0 technologies

The appeal of social media to educators is obvious. Students Facebook through tutorials, Tweet through lectures or blog an assessment task. Student propensity for social media usage, however, does not of itself make a pedagogical case for using social media. Various research has demonstrated social media’s capacity for peer supported learning (Dabbagh & Reo, 2010), support for students in transition (Woodley & Meredith, 2012), enhanced internationalised curriculum and increased avenues for communication, connection and learning. The possibilities of social media and collaborative learning are considerable (Minocha et al, 2009). What is known about considered use of social media for teaching and learning is invariably encouraging. However, teaching staff also need to be aware of the legal context of their practice and that ill-considered social media usage could put themselves, their students and the university at risk.

Externally hosted social media networks

University-supported social media has several advantages over externally hosted sites both legally speaking and as far as support is concerned. Information Technologies Services (ITS) can assist with support issues, students can be enrolled and passwords issued from central student administration, the university can control the longevity of the site and, importantly as far as the *Privacy Act* is concerned, sites are password protected. Password-protected sites do not guarantee students’ privacy as that depends on what material other online participants make available. However, the password-protected status of university-supported sites should be emulated in using social media for teaching as public learning can be a daunting prospect.

It is the public – or potentially public – nature of social media that creates concern. Arguably, students should not have to participate, be assessed or be identified in any way on a publicly visible site in order to undertake a subject. Students might have the option of making their work public after the assessment is complete – but assessment or learning activities should not become public beyond the community of learners in the class. Before adopting a social media product for a particular teaching and learning approach, it is advisable to check whether the institutional Learning Management System or other supported platforms such as PebblePad can provide those Web 2.0 tools that meet particular teaching needs.

Social media encourages interactive communication, enables posting of messages through a simple interface and allows the sharing of messages across a broad network of contacts. Online messages can open up discussions with other contacts and other private networks. A piece of media can spread from private network to private network and take on a public character. This allows messages to be spread virally. The speed and ease at which content can be disseminated creates risk if user-generated comments are offensive, discriminatory, incorrect or violate Copyright, Privacy or Intellectual Property legislation. The ephemera of the class room discussion are replaced by texts with a different legal status and those texts can be easily distributed. This can be positive and negative but the negative possibilities create real and actual legal risk.

Public, Private and Confidential

If an institution expects enrolled students to register with Facebook or other products, then everyone involved must understand the Privacy implications of that product. This is an educative step that demands more of participants than a clicked agreement on a screen. While some platforms allow a degree of control over privacy settings, it is by no means assured that students know how to do this. Privacy settings must be explicitly worked through with students. Developing students' understanding of privacy will help to mitigate risk that can arise from the deceptively social nature of social media: social situations can be private but the media permits the accidental creation of a posting that can become a global publication.

The confidential qualities of class discussion can also become public posts that are easily distributed to an online global audience. The private student can find themselves under very public scrutiny. Confidentiality and a sense of privacy are crucial for some learners. While teaching has public aspects and sometimes requires public learning activities, the relationship between teacher and student is a private one based on confidentiality and trust. Learning might have public aspects but assessment of learning and feedback on learning are essentially private undertakings. The privacy inherent in feedback on learning is supported by VU's Student Assessment and Progress Policy and by the *Privacy Act* which regulates the way in which organisations (such as a university) can use private information of individuals, here meaning students and staff and others who might be involved in university activities.

As well as university-supported sites, students may have multiple sites of social media engagement. This raises the issue of security. If students must register with an external social media platform, teaching staff need to consider not only how many passwords students might have in the course of their study but also the fact that students will often use the same password across platforms. This can create a potential security hazard as if one platform is breached, they could all be breached. A whole-of-course approach to social media usage might limit on the number of passwords a student should have and students should be encouraged to have different passwords for different platforms.

It is important to distinguish between open and closed networks. Open networks like Facebook have a mass audience and anyone can join. There are also closed networks which are limited to members chosen by an administrator. Closed networks help maintain the confidential learner/teacher environment, open networks allow more interaction with the outside world and allow networks to be persistent over time and to extend beyond the life of a class. Closed networks typically depend on a single group of students during a certain semester and have a limited life. For this reason, some educators prefer a platform that allows a whole-of-course approach to learning activities, communication and presentation such as PebblePad. Armatas et al (2012) highlight that PebblePad provides students with a flexible, safe system to upload their own content and provides them with a means of interacting safely with industry experts.

Other Relevant Policies

Whatever the teaching mode, teaching in Australian universities operates in a highly regulated legal and policy context. Workplaces provide complex legal contexts and social media is a somewhat uncharted workplace territory. Social media postings could lead to cases of wrongful dismissal, the exposure of confidential information or reputational risk. Legal risks include legislation and common law concerns such as trade mark infringement, defamation or negligent misstatements (Dundas Lawyers, 2012). Social media sites are regulated by anti-discrimination laws, the *Privacy Act 1988* and the *Copyright Act 1968* (Cth). Duty of care, negligence and the *Occupational Health and Safety Act 2004* are all relevant to staff and student behaviour on social media sites: from students taking photographs of themselves 'planking' on campus to students unwittingly letting predators know that they are alone in the university library at night.

Current VU policies need to be applied to a social media context. The Privacy Policy already makes it clear that student information needs to be kept private. The Academic Honesty and Preventing Plagiarism Policy applies equally to an online medium. The Equity and Diversity Policy for Staff might become relevant if staff were friends only with some students online. Similarly, the Discrimination, Harassment and Bullying Policies and State and Commonwealth Anti-Discrimination Legislation apply to online activity. The recent amendment to the *Victoria Crimes Act 1958*, with the introduction of the Crimes Amendment (Bullying) Bill 2011, extends the existing offence of stalking to cover '*serious bullying*', including online bullying. VU's Staff Code of Conduct applies to the online behaviour of staff just as VU's Student Charter applies to students' behaviour online. It is really a matter of staff understanding the social media context, the university taking responsibility for not only what students do on VU-controlled social media sites but sites associated with the university. Universities must educate students about responsible use of social media.

Conclusion

Social media highlights the need for a different set of knowledge and skills in the employability debate. Students need both legal literacy and media literacy. They need an awareness of the legal obligations, rights, systems and the legal discourse inherent in everyday contexts in online environments. These literacy skills are important in terms of employability, citizenship and being online. Some universities embed Web 2.0 media literacy skills in subjects or resources on line. Put simply, "University courses need to take more responsibility in facilitating citizen 2.0 competencies" (Alam & McLoughlin, 2010).

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Continuance theory and teacher education

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Continuance theory is usually related to the regular use of technology in the business/industry area. It attempts to explain why people either continue to use specific technologies in their work, or not. Essentially, it links to the perceived value to individuals' ability to work effectively, however that is understood in their workplace. In the profession of education, particularly schools and teacher education, the perceived value of continued use is not about individuals and their work, but about individuals' work with groups of students and what happens to learning when these digital technologies are used. Continued use is contingent on their students' positive responses to these technologies supporting learning. I examine, in the light of continuance theory, what happens when student teachers in an initial secondary teacher education programme report on including digital technologies on practicum. This includes reporting on the effect students' responses have on their subsequent attitudes and practices regarding digital technologies in learning contexts.

Keywords: continuance theory, digital technologies, initial teacher education, learning

Introduction

Continuance theory is usually related to the regular use of technology in the business/industry area. It attempts to explain why people either continue to use specific technologies in their work, or not. The technology acceptance model/continuance theory that Bhattacherjee (2001) reported on, for example, centred on business customers of a bank's online banking system. The bank designed an online banking system that customers used remotely. The bank then wanted to know how likely it was that these customers would continue using it. Was the tool easy to use, and did it support positive bank/customer relations? Continuance theory was used to describe the phenomenon of why the banks customers continued to use the technological solution.

In educational contexts, there is a growing awareness that 'customers' of the educational business – students – are quite ready and able to use systems and technologies and/or affordances as tools in their learning. Teachers can also be considered as 'customers' of the educational complex, but their use – and continued use - of technological tools in classrooms contexts is not clear-cut. Their behaviours, attitudes and perceptions range from enthusiasm to resistance, self-efficacy to aversion. These behaviours and attitudes persist even in the face of a plethora of technologies or affordances available, according to elements such as context, topic, concept, student group, level and access. With the advent of ultrafast broadband being rolled out to schools, this availability is growing, as is the expectation of use as part of learning. While this variety of provision and greater potential openness differs from the singular approach or system a bank is most likely to create for customers, it can exacerbate teachers' approaches to using digital technologies because of the potential for failure - of the technology itself, of the school's ability to supply appropriate infrastructure (robust broadband/wifi, technical support), and of the perceived threats to their preferred pedagogical approaches (Wright, 2010a, 2010b).

The variety and openness of the affordances and potential of digital tools for learning purposes, links to Pachler et al's (2010) socio- cultural analysis vis a vis young people's continued, and sometimes continuous, use of digital technologies. These researchers suggested that young people appropriate the tools for their own cultural, identity and meaning-making practices in daily life and treat them as normal accessories for living. This is not necessarily true for many teachers, whose own backgrounds may not have included similar technological tools, given the average age of about 44, of the teaching population in New Zealand (Engler, 2008). While students entering schools (whether primary or secondary) have mostly grown up in a world infused with digital and mobile technologies, teachers have not, and so are often learning from scratch what the potential is for these devices and affordances. Continuing to use tools that have not formed a natural part of one's pedagogical toolbox is therefore, for many teachers, a challenge. However, given that teachers will often experiment with how they provide learning, it is likely that they will develop regular digital technology use in classrooms if students' learning responses are positive. When teachers see their students concentrating on and completing tasks to a higher level than they might otherwise, they are likely to repeat using such approaches, resources, tools, even when they may be fully aware that trying out new things may be risky (Wright, 2010b). This paper identifies some emerging ideas about these points that may support teachers to develop their experimentation with, and continued use of, technological tools in classrooms.

Context and study design

The data generated from which the emerging findings arise, consist of initial teacher education (ITE) students' Moodle postings about their secondary school practicum experiences in which they used some kind of ICT (information communication technology) tool as part of a lesson. This lesson required students to plan a teaching as inquiry question to link to this ICT use, incorporating some means by which they gauged students' responses to this intervention, and sought to find out how well students retained learning from that lesson in subsequent ones. Because the past some ITE students were reticent about asking students for their feedback, some examples of how this gathering of feedback could take place were provided. These examples ranged from suggesting giving students Post-It notes to write response on (then attach to a large sheet of paper with the relevant question at the top as they left the room), to students working in small groups to make feedback notes, to individual questionnaires, or posting blog/discussion thread notes as appropriate. Some methods were thus more formal than others. All meant that the ITE student was in a position to gather in and review the responses and draw some conclusions from. They were also expected to note their associate teacher's response to this lesson.

Preceding this practicum task, students participated in three four-hour workshops in which the teaching as inquiry as a process was outlined. Other topics in the workshops included a focus on critical thinking and the web, ways of helping students to express divergent and opposing points of view through technological tools, Twitter as feedback tool, and how GoogleDocs can be used for collaborative purposes. These workshop experiences were designed to demonstrate possibilities for students to adapt for their own pedagogical purposes while on practicum, linking directly to their assessment task.

Ethical clearance was gained via the formal faculty committee process, and all students indicated either their agreement or refusal for me to use their practicum posts as research data. It was made clear that this data would not be used before their work had been assessed. Even though one of the 80 students refused granting permission, the participant cohort is large enough to draw themes from. Thematic analysis of the data continues, whereby I note repeated occurrences, particularly about ITE students' own responses regarding their level of confidence in using technological tools for learning. What they say about their own knowledge and experience while using these tools, and what they say about repeating or developing such uses, is also of interest.

What follows is a snapshot of emerging findings, focusing on four areas of interest: ICT tools (also described as digital tools or digital technologies), pedagogy, ITE student teachers' self-evaluations, and issues of continuance.

Emerging findings

ICT tools

Schools are not equal in their provision, thinking, dispositions towards, and access to, digital tools and devices. Some schools for instance, do not yet provide wireless access for either staff or students. Some also house desktop computers in dedicated rooms, accessed via booking systems. Other schools have COWs (computers on wheels) to avoid classes having to change rooms. This also makes access more nimble, although booking procedures also exist. Some departments within schools have access to different tools. For example, some departments might use digital cameras and may desktop computers in their classrooms or close by. Others might have access to mobile tools, or expect students to bring their own devices (BYOD). Some classrooms include television screens and/or data projector facilities and are wifi-enabled.

Some schools engage in the laptops for teachers scheme (Cowie et al., 2008) and provide an adequate technological and organisational infrastructure. However, even in schools where technological provisions are up to date, it was not unusual for the ITE students to report that the most common use of laptops and data projection facilities was the repeated use of presentation software – mainly by teachers.

They also reported on the obstructions to using technological tools. For example, student feedback often complained of slow internet speeds, or broken equipment, or unreliable wifi, or issues with logging on to computers. These are likely to affect teachers' willingness to continue using digital technologies as a part of learning. They dislike wasting learning time fiddling with equipment to get it to work.

Pedagogy

Essentially, when teachers used presentation tools on a daily basis, they have not changed the learning dynamics – the teacher is still up the front, and communication is principally channelled through the teacher. Students are powered down (Gee, 2003) and possibly turned off. The ITE students noticed that they often replicated their associate teacher's technologies and pedagogical practices, partly because it felt safe and located control and management with them. On the other hand, when ITE students introduced something else (such as inviting students to use their own devices, or using moving image tools like YouTube or Xtranormal), the learning environment took on a whole new flavour, with students responding differently.

Perhaps the different responses reflected the novelty factor. Students, the ITE students reported, were often excited by the activity/tools being something else. What we cannot gauge is the extent to which the Hawthorne Effect was operating. Mitchell, Bailey and Monroe (2007) for example, note that, "Initial student excitement, if any, at an innovative technological approach may quickly fade when technology is the expected "normal use" from their [the students'] perspective" (p. 78). In other words, was the heightened student interest and focus because it was something different, rather than their learning being enhanced? Was the newness and novelty why students engaged more deeply or readily, or was it because they had a greater part to play in the learning complex? Without the ability to test this over time, we cannot answer that. However, it is worth noting Wright's (2010) point when she says "if the new tools simply replace an old one (such as presentation software instead of overhead transparencies) with little else changing, then student engagement and interest will quickly revert to previous levels because nothing has essentially changed *for the learners*" (p. 11). In such cases, if student interest and engagement wanes and they become restless, then teachers may get disheartened and attribute this to the technology, rather than the sameness and predictability of the learning process. The more passive students are in a classroom, the more disengagement is likely to increase, and the more teachers may revert to known and safe practices and resources.

ITE student teachers' self-evaluations

A key requirement of the students' postings was having to evaluate their students' feedback against their own experience of the lesson and the technology. Many commented on their apprehension about seeking student feedback on the lesson, but were affirmed by many students' positive responses to their questions. A key component of this was not only how they asked for feedback, but also what their questions were like. Some ITE students asked for feedback on levels of enjoyment (even though this was warned against) and therefore gained little of use that could help them rethink the lesson. Those who asked targeted questions about some aspect of learning, had a lot more to reflect on and analyse. As a consequence, those students learned more from the feedback experience.

One student for example, used an online concept map tool for her students to learn about the links between photosynthesis and cellular respiration. She then asked them the question "Are concept maps useful for your learning?" On response showed a good understanding of the students' own ways of learning by saying "Yes, they helped me get a better understanding. It is easier because I am a visual learner". Another said they were a "good way to remember what you have learned without looking at notes". The ITE student was then able to decide on the value of such a task, and also learned how to improve for subsequent classes. This sort of feedback, where students had specific and useful comments to make, assisted the ITE students to be prepared to use such tools/affordances again on other occasions. This process of gaining student feedback may assist teachers in developing a continuance habit.

Issues of continuance

For teachers to continue to use technological tools as integral components of teaching and learning, reliable tools are key. ITE student teachers reported feedback similar to: "better computers/internet", "have the Internet actually work", or 'the laptops not always cooperating". Student teacher and school student frustration was noticeable across a broad range of contexts and lessons. Schools' firewalls that blocked access to sites such as YouTube also frustrated the student teachers. It was not uncommon for them to report that lessons planned around YouTube clips had to be abandoned because they hadn't known that the site was blocked, and they didn't have the forethought to use a clip downloader in advance. Alternatively, the Internet speed was slow, affecting lesson timing and the ability to show the clip.

If teachers have to continually second-guess how to access sites, or cannot rely on Internet speeds, they are less likely to continue planning Internet-based lessons or using other digital tools. Other organisational factors can interfere with teachers' desire to use these tools and affordances. For example, many schools ban mobile devices on campus. This precludes students using tools they already have and are used to using. This ban also means that it is difficult for student teachers to try out using mobile devices as learning tools without contravening school policies, and difficult for teachers in these schools to individually try out the potential of these devices.

Conclusion

As alluded to above, some tentative patterns are emerging about what continuance might look like in a school. Key factors affecting teachers' use of technological tools as integral to learning include: unreliable Internet provision, outdated hardware, access to tools (for example, having to book dedicated rooms with fixed equipment), firewalls, overlaying digital tool use over unchanged pedagogy. Bhattacherjee (2001) attempted to explain links between expectation and confirmation in continued use behaviours in bank customers. Teachers are entitled to expect that tools and resources will work as they are supposed to. When positive student learning confirms this, they are more likely to repeat and refine further use.

So, if it is possible to extrapolate from student teachers' experiences of using technological tools while on practicum to teachers' technologically enabled or disabled school environments, then some considerations linking to supporting teachers to develop habits of continuance with digital tools for learning purposes are pertinent. These might include thinking about the critical provision of robust and powerful broadband/wifi, allowing BYOD, and in-class access to the Internet and digital tools for everyone. If the infrastructure in a school is enabling, then it is probable that teachers are more likely to trust it.

Another critical layer is an extensive review of pedagogical practices that complement *students*' use of the tools, rather than being vested only in the teacher. The recognition that pedagogies which allow students to collaborate, meaning-make, concentrate on tasks and risk-take when learning with digital tools is important to address for teachers. Not knowing beforehand that the dynamics of classrooms may change can adversely affect teachers' sense of control and authority, possibly leading to an aversion to risk-taking and trials with unfamiliar tools, resources and practices. If teachers fully understand those factors, we may be in a position to predict that they will continue to use and integrate digital technologies as part of learning, particularly if they can expect that the tools are reliable, and that students' learning would be enhanced as a result.

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Chapter 4 – Open, social and participatory media

Introduction

The emergence of open, social and participatory media in recent years is changing the landscape of technology practices. They are changing the ways in which users interact, communicate and participate with technologies. These technologies include social networking sites such as Facebook,[1] LinkedIn,[2] and Myspace,[3] blogs and wikis and microblogging sites such as Twitter.[4] They are being used for a mixture of social and professional activities. This chapter considers the impact of such Web 2.0 technologies on education and in particular how these new technologies are changing learning and teaching practices. It will consider their fundamental characteristics and look at the implications for learners, teachers and institutions. It argues that the impact on practice can be both positive and negative and that as a consequence educational institutions need to develop new policies and strategies to take account of these.

This chapter will consider the new forms of user behaviour that are resulting and provide examples of ways in which they are being used to support learning and teaching. The central focus is a critique of the impact of new technologies on education, which raises a number of key questions. What new digital literacy skills are needed? What does it mean to be a learner or teacher in this new environment? What are the implications for organisational structures and processes? What new learning spaces need to be developed to harness the potential of new technologies? Building on this chapter, Chapter 14 considers the new forms of online communities and interactions that are emerging in these online spaces. Chapter 15 looks at a social networking site, Cloudworks,[5] which has been developed to support the discussion and sharing of learning and teaching ideas.

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[1] htpp://facebook.com
[2] http://www.linkedin.com
[3] http://www.myspace.com/
[4] http://twitter.com
[5] http://cloudworks.ac.uk

The changing digital landscape of education

There can be little doubt that digital technologies now infiltrate all aspects of our lives; electronic plane tickets, ubiquitous wifi, mobile technologies and technologies such as smart phones and tablets are becoming necessities rather than luxuries for many. Certainly, within the developed world, most of us have an expectation of a certain level of digital connectivity; and indeed rely on it, feeling cheated or that we are working below par without it. The pace of change is unlikely to slow down, and arguably there are more fundamental changes coming as the true impact of embracing cloud computing in education becomes evident (Dong et al., 2009; Katz, 2008).

New technologies provide a plethora of routes for finding and using information and for communication and collaboration. Alongside the established communication channels of the telephone, email, forums and texting, the emergence of Web 2.0 technologies in recent years has added blogging (and microblogging), wikis, social networking sites, virtual worlds and Internet-based Voice Over Internet Protocol (VOIP) and in particular popular tools such as Skype which enable virtually free, Internet-based communication. Similarly information can now be distributed in multiple locations, and packaged and presented using a range of different multimedia and visual representations. Sophisticated repositories now exist for everything from shopping online to repositories of good practice and free resources. RSS feeds and email alerts enable users to filter and personalise the information they receive. Social bookmarking and tagging means that collective value can be added to digital objects; concept and mind mapping, tag clouds and data-derived maps are only some of the ways in which information can be presented in rich and multifaceted ways. Within this context we are seeing a number of trends:

- A shift from the Web as a content repository and information mechanism to a Web that enables more social mediation and user generation of content.
- New practices of sharing (such as the use of Flickr for images,[6] YouTube for videos,[7] and SlideShare for presentations)[8] and mechanisms for content production, communication and collaboration (through blogs, wikis and micro-blogging services such as Twitter). Social networking sites provide a mechanism for connecting people and supporting different communities of practice (such as Facebook, Elgg[9] and Ning).[10]
- A scale or ‘network effect’ is emerging as a result of the quantity of information available on the Web; he multiplicity of connectivity and the scale of user participation, and as a result new possibilities for sharing and harnessing these 'network effects' is occurring.

These trends point to new ways in which users are behaving in online spaces. They provide a range of opportunities for supporting learning and teaching practices. The Web

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[6] http://flickr.com
[7] http://youtube.com
[8] http://slideshare.com
[9] http://elgg.org
[10] http://www.ning.com

is now more participatory, supporting more open practices. The nature of openness is discussed in more detail in Chapter 11.

A review of new technologies

O'Reilly introduced the term Web 2.0 technologies to describe the emergence of new open, social and participatory technologies (O'Reilly, 2004; 2005). In particular, the term emphasised a shift from a static Web 1.0 to a Web 2.0 environment that was characterised by user participation. He defined Web 2.0 as a set of principles and practices. The term 'open, social and participatory media' has also been used, emphasising the core characteristics of these new technologies. These characteristics include: users as publishers, harnessing distributed collective intelligence (Lévy, 1997), user-evolving folksonomies (Mathes, 2004; Nozuri, 2006), peer production and critique, the wisdom of the crowds (Surowiecki, 2004), the architecture of participation (O'Reilly, 2004), the notion of the perpetual beta, free tools and resources, and the notion of openness.[11]

The characteristics of new technologies

The characteristics of these new technologies include the following:

- Peer critiquing – the ability to openingly comment on other people's work. This has become standard practice within the blogosphere and is being used in general society. For example a growing number of authors and journalists are now active bloggers and traditional book writing is being supplemented by writers keeping a blog and inviting readers to comment on the evolving plot, by academics (through self-reflective blogs on digital scholarship and research ideas) and by learners (in terms of keeping their own reflective blogs or contributing to a collective cohort blog).
- User-generated content – there are now many different tools for creating content (ranging from those which are primarily text-based, through to rich multimedia and interactive tools), meaning that the Web is no longer a passive media for consumption, but an active, participatory, productive media. Sites such as YouTube,[12] Flickr[13] and Slideshare[14] facilitate sharing of user-generated content and the embedded code functionality means that content can be simultaneously distributed via a range of communication channels.
- Collective aggregation - hierarchy and controlled structures make little sense in an environment that consists of a constantly expanding body of content that can be connected in a multitude of ways. Collective aggregation refers both to the ways in which individuals can collate and order content to suit their individual needs and personal preferences, as well as the ways individual content can be enriched collectively by the wider community (via tagging, multiple distribution, etc.). Social bookmarking, tag clouds and associated visualisation tools, tagging, RSS feeds and embedding code all enable collective aggregation to occur.

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[11] The notion of openness is discussed in more detail in Chapter 11
[12] youtube.com
[13] http://www.flickr.com/
[14] http://www.slideshare.net/

- Community formation – clearly the connectivity and rich communicative channels now available on the Web provides an environment for supporting a rich diversity of digital communities. Boundaries of professional and personal identity are eroding and the notion of tightly knit Communities of Practice (Wenger, 1998) are giving way to a spectrum of communities from individualistic spaces through loosely bound and often transitory collectives, through to more established and clearly defined communities. See Dron and Anderson (2007) for a more specific discussion of collectives, networks and groups in social networking for e-learning. I will return to the forms of new online communities and interactions in Chapter 14.
- Digital personas – individuals need to define their digital identity and how they 'present' themselves across these spaces (Solove, 2004). The avatars we choose to represent ourselves, the style of language we use and the degree to which we are open (both professionally and personally) within these spaces, give a collective picture of how we are viewed by others.

The impact of Web 2.0 technologies

There is now a growing body of empirical evidence on the impact of Web 2.0 technologies on education; see for example a review of learning 2.0 by Redecker et al. (2009), the use of Web 2.0 in schools (Crook et al., 2008), the NSF task force on Cyberlearning (Borgeman et al., 2008), the most recent Horizon report on future technological trends (NMC, 2011) and the OECD report on 'new millennial learners' (OECD, 2007).

More specifically a number of articles consider the use of these technologies in an educational context (Anderson, 2007; Downes, 2005; Ebner, 2007). Downes describes the change as a shift from the Web being a medium in which information is passively consumed, to a platform, where content is created, shared, remixed and repurposed by users (Downes, 2005). He describes the way blogs and wikis have emerged as a new medium for expression and the development of online communities. Application of these tools, he argues, means that e-learning content is created and distributed in a variety of different ways, enabling more learner-centred approaches. Anderson (2007) considers the implications of these technologies for Higher Education. He argues that Web 2.0 is more than a set of cool technologies, and that they are changing the ways in which people interact. Whilst Ebner (2007) considers the reality behind the hype around Web 2.0 technologies and in particular their advantages and disadvantages.

De Frietas and Conole (2010) also argue that there has been a shift in the use of tools, which emphasises the more participatory and communicative capabilities of new technologies. These enable content and information to be distributed in a variety of different ways and hence the nature of content, both in terms of production and distribution, has shifted with greater control for the individual as producer and user. So whereas initial use of the Web was essentially fairly static with hyperlinked information pages displaying information, Web 2.0 shifts towards a more active and distributed network with user-generated content and a much richer, inter-connected network of communicative channels. They further refine this shift as being about: a shift from information being a scarce, expensive commodity to an abundance of information, challenging traditional notions of authority, and finally that content can be distributed and rendered in multiple ways. They list a number of ways in which these technologies can be aligned with modern thinking about adopting more constructivist and situative learning approaches. Web 2.0 practices enable the shifting of learning from a focus on individual to social learning. Location-aware technologies can enable contextualised and situated learning. The adaptable functionality of Web 2.0 tools means that learners can personalise their learning. Virtual worlds can be used to support experiential and authentic learning, whilst search engines like Google can support inquiry- and resource-based learning. User generated content has resulted in a plethora of Open Educational Resources (OER) now being freely available. And finally tools such as blogs, e-portfolios and online games such as WorldofWarCraft[15] are being used to support peer learning and reflection.

Redecker et al. (2009, p. 19) undertook a review of the use of Web 2.0 technologies in education. They define Web 2.0 as: "the range of digital applications that enable interaction, collaboration and sharing between users". These tools include blogs, wikis, social bookmarking and tagging, media sharing services, podcasts and virtual worlds. Effective use of these tools requires learners and teachers to develop new skills, not only to manage the abundance of information, but also to participate in distributed networks, and to develop critical communicative, collaborative and creative skills.

These tools enable pedagogical innovation through promoting personalisation and collaborative learning and are resulting in a change in the roles of learners and teachers. Redecker et al. (2009) also argue that the lack of widespread take up of these tools can be attributed to a number of barriers, such as: a lack of access to ICT, learners and teachers lacking the necessary digital literacy skills to make effective use of these technologies, a lack of the pedagogical skills needed to design effective learning interventions utilising the affordances[16] of these technologies, as well as concerns over security and privacy.

The use of Web 2.0 technologies in education

Table 1 provides some examples of how Web 2.0 tools are being used in education, including a description, in each case, of the potential impact on education. These indicate that these tools can result in pedagogical innovation in a number of ways. Firstly, by providing new ways of collaborative creation and exchange of learning content. Secondly, by providing new forms of communication amongst learners and teachers. Thirdly, by providing more personalised and learner-centred environments. Fourthly, these are resulting in new forms of blended learning contexts emerging. Fifthly, they are motivational in terms of providing active, discovery-based learning approaches and a sense of learner ownership.

Table 1: Examples of how Web 2.0 tools are being used in education

Theme area	**Case study**	**Brief description of case study**	**Potential impact upon education**

[15] http://us.battle.net/en/

[16] This is discussed in Chapter 6

Scaffolded	VEOU (Wills et al., 2004)	Virtual Continuing Professional Development (CPD) and scaffolded support for publication.	Potential to change the ways in which professional CPD is delivered, offering more tailored, personalised and just-in-time training.
Open	E-Bank – towards truly "Open research", (Coles et al., 2006) MIT OpenCourseWare (http://ocw.mit.edu/)	Access to open learning materials designed to support both learners and teachers.	Democratisation of education in terms of content production and delivery. Wider access to materials for casual learners and to support informal learning as a 'taster' for formal learning qualifications.
Cumulative	CCK09 (Siemens, 2009) - A free online course	An experimental course in which both the content and expertise is free. This kind of course is commonly referred to as a Massive Online Open Course (MOOC).	What is the role of traditional educational institutions in a world in which content and expertise is increasingly free?
Social	Cloudworks (Conole and Culver, 2009, 2010)	Social networking for an educational context.	Social networking applied to education has the potential to change the ways in which teachers exchange information; with the potential to lead to proactive sharing and reuse of educational resources.
Authentic environments	WISE project – (SecondReiff Aachen School of Architecture); Stanford Medical School simulations using the Olive platform (cited in Ala-Mutka et al. 2009)	Authentic real-time modelling environment in Second Life for Architecture and medical students.	Scope for training in new and realistic environments. Pedagogical models include exploratory learning (ELM), inquiry learning and problem-based learning approaches.
Fostering inquiry learning	The Personal Inquiry Project (Sharples and Scanlon (Eds), 2011)	Development of inquiry-based learning skills for students to enhanced their understanding of science.	Through independent learning approaches, peer learning is encouraged and analytical skills may be fostered.

Enhancing life experiences	Mundo des estrellas (cited in Ala-Mutka et al. 2009) JISC MyPlan project, http://www.jisc.ac.uk/whatwedo/programmes/elearningcapitcal/xinstit1/myplan.aspx	Young people in hospitals, interactive gaming, life swapping and sharing of experience. The MyPlan project provided tools for lifelong career decisions and educational choices using visualisation of learners' timelines www.lkl.ac.uk/research/myplan.	The potential for these tools to support lifelong learning opportunities and enhance life experiences.
Broadening access	Notschool and Schome projects (cited in Ala-Mutka et al. 2009)	Notschool for virtual home schooling for disaffected children and Schome project for gifted and talented kids.	The impact of this includes outreach to children and excluded, talented learners. Using familiar media-based metaphor,s rather than traditional school-based metaphors, new learners may be reached.
New forms of collaboration	CSCL (Computer Supported Collaborative Learning) pedagogical patterns (Hernández et al., 2011)	Structured pedagogical patterns to support different forms of collaborative activities.	Broader application of pedagogical patterns and other scaffolded forms of pedagogy have the potential to transfer good practice from research into practice in an effective way. Automation of such patterns can be embedded in pedagogy tools.
Co-construction of understanding	Wlker's Wikinomics (cited in Ala-Mutka et al. 2009), The Decameron Web ((http://www.brown.edu/Departments/Italian_Studies/dWeb/dWeb.shtml)	Collaborative co-construction of understanding of Economics. An interactive online text.	Blurring research and teaching: examples of how the Web can provide access to scholarly materials and give students the opportunity to observe and emulate scholars at work.
Aggregating and sharing content	Wikipedia	Co-construction of knowledge through collaboration and iterative development.	New tools provided for learners at all stages, and interaction between learners and publication of shared knowledge.

The examples cited in Table 1 demonstrate the rich ways in which technologies can be used to support learning; in terms of enabling new forms of communication, collaboration and co-construction of knowledge, aggregation of resources, supporting different forms of pedagogy, and providing authentic environments for role-based learning.

Impact on practice

Conole (2009) synthesises some of the characteristics that define these new technologies and lists their impact on practice (both positive and negative). These include: the impact of free tools, resources and services, ubiquitous access, multiple communication and distributions channels, media rich representations, user-generated content and social profiling. This section will describe each of these in turn. Table 2 summarises the characteristics of new technologies and their potential positive and negative impact.

The Internet has enabled access to a vast amount of information and with the growth of the Open Educational Resource movement (Atkins et al., 2007), access to free resources. However finding appropriate resources and knowing how to use them is a specialised skill. Many learners, despite being competent technology users, lack the appropriate academic literacy skills to appropriate these free resources for their learning (Jenkins et al., 2006; Jenkins, 2009; Lankshear and Knobel, 2006). McAndrew et al. (2008) considered Web 2.0 characteristics and compared them against the way in which Open Educational Resources (OER) are developed and used, drawing on evaluation data on the use of the Openlearn site.[17] For example, they argue that such sites align well with the long-tail phenomenon (Anderson, 2004) by providing access to specialist subjects. Similarly, the social tools associated with the site enable users to contribute ideas and adapt content providing an example of the Web 2.0 user-generated content and the broader notion of users adding value within a Web 2.0 context. The availability of free tools means that students can appropriate and personalise these for their individual learning needs. However there is a tension between these tools and those under institutional control. If students are able to use free email tools, wikis, blogs, etc – what is the function of an institutional Learning Management System (LMS) and what, if any, tools and services should institutions be providing? See Al-Zoube (2009) for a discussion of e-learning in the cloud.

Web 2.0 practices relie on scale; both in terms of access to a vast array of user-generated content and through harnessing the power of the collective - the so called notion of ‘the wisdom of the crowds’ (Surowiecki, 2004). Such scale requires easy access and in this respect, in the development world at least, we are approaching a state of near ubiquitous

[17] http://openlearn.open.ac.uk

access, with wifi almost universally available, the percentage of those online is approaching 100% in most developing countries, however the digital divide is still evident – narrower but deeper (Warschauer, 2004). Warschauer critiques the relationship between access to information and communication technologies and social inclusion. He argues that: “the ability to access, adapt and create new knowledge using new information and communication technologies is critical to social inclusion in today’s era” (Warschauer, 2004, pg. 9).

The variety of communicative channels and multiple distribution mechanisms for retrieving and aggregating information means that there are a multitude of opportunities for finding resources and communicating with peers or experts. However, this has also led to a ‘fragmentation of voice’ – there is no longer one definitive source of knowledge, no one ‘expert’. Learners need to develop strategies for finding and validating appropriate resources. Learners and teachers have a variety of communicating channels (email, chat, blogs, audio and video conferences, social networking sites, etc.), there is no single communicative channel. This multiplicity can be confusing and disorientating for both learners and teachers.

The richness of the new media means it is possible for new forms of representation, providing new opportunities in terms of sense-making (Okada et al., 2008), but raises issues in terms of whether students and teachers have the appropriate digital literacy skills to utilise these representations (Seely Brown, 2006).

The user participation and social practices of Web 2.0 technologies clearly provide immense opportunities in terms of fostering collaboration and for co-construction and sharing of knowledge, but raise a number of issues about quality, copyright and privacy. Table 2 summarises the positive and negative impacts of the different characteristics of these new social and participatory technologies.

Change	**Positive impact**	**Negative impact**
Free tools, resources and services	Specialised niche use, access and personalisation	Inappropriate academic literacy skills. Lack of institutional control
Ubiquitous access	Technology as a core tool for learning	Narrower, but deeper digital divide
Multiple communication and distribution channels	Increased opportunity for peer and tutor dialogue. Information repurposed to meet different needs	Fragmentation of voice. No centralised repository of knowledge
Media rich representations	New forms of sense-making	Lack of new forms of digital literacy
User-generated content and social profiling	Variety and acknowledging individual contributions. Knowledge sharing and community build	Quality assurance issues. Inappropriate descriptions and use of personal information for other purposes

Table 2: Characteristics of new technologies and impact on practice

A review of Web 2.0 tools and practice

Conole and Alevizou (2010) undertook a review of the use of Web 2.0 technologies in education, building on the review by Redecker et al. (2009). They focussed in particular on the use of these tools in Higher Education. They adapted a taxonomy of types of the types of Web 2.0 tools developed by Crook et al. (2008) based on the functionality of different tools:

- Media sharing – creation and exchange of media with peers.
- Media manipulation and data/Web mash ups[18] – tools to design and edit digital media files and combine data from multiple sources to create a new application, tool or service.
- Instant messaging, chat and conversational areas – to enable one-to-one or one-many conversations.
- Online games and virtual worlds – rule-governed games or themed environments.
- Social networking – enabling social interactions between friends and peers.
- Blogging – where users can post text that others can comment on.
- Social bookmarking – aggregation and tagging of Web resources.
- Recommender systems – that aggregate and tag user preferences and make recommendations.
- Wikis and collaborative editing tools – where users can collaboratively create, edit and link pages.
- Syndication – where users can subscribe to RSS feed-enabled Websites.

Jenkins et al. (Jenkins, et al., 2006; Jenkins, 2009) argue that a new set of digital literacies are needed for learners and teachers to be part of what they describe as this new ‘participatory culture’. These are: play, performance, simulation, appropriation, multi-tasking, distributed cognition, collective intelligence, judgement, transmedia navigation, networking, negotiation and visualisation. Similarly, Beetham et al. (2009) provide a comprehensive framework of new literacies relating to social and situated practice. These include: meaning making and situated knowledge, technological and media literacies, and scaffolded and metacognitive literacies. They argue that today’s learners need to develop the following capabilities: managing work/life balance, social entrepreneurialism, development and projection of identities, communicating and collaborating across national and international boundaries, contributing to knowledge and understanding in hybrid networks of people and non-human cognitive agents, managing career and

[18] A mashup is a Web pageor application that uses and combines data, presentation or functionality from two or more sources to create new services.

learning paths, exercising judgement, acting ethically, reflecting/planning/seeking support from others, assessing and addressing threats, and exercising multiple modes of meaning making.

Conole and Alevizou provide a description of the ways in which Web 2.0 technologies are being used to support learning and teaching and how these relate to different pedagogical approaches. An adapted version of this is shown in Table 3. What is evident is that the characteristics of Web 2.0 technologies appear to align well with modern pedagogical good practice in terms of promoting constructivist and situative approaches to learning. De Freitas and Conole (2010, p. 19) argue that:

> The description above paints a picture of a rich and exciting technological environment to support learning; with a multitude of mechanisms for: rendering content, distributing information and communicating. There seems to be a tantalising alignment between many of the social capabilities of the tools and practices evident with new technologies and what has emerged as 'good' pedagogy in recent years.

Table 3: Mapping of Web 2.0 tools to different pedagogical approaches

Pedagogical approaches	Web 2.0 tools and approaches	Examples
Personal learning	The ability to adapt, customised and personalise, use of RSS feeds, mash ups and APIs	The digital learning communities project (http://www.thedlc.org/).
Situated learning, experiential learning, problem-based learning, scenario-based learning, role play	Use of location-aware functionality, immersive 3D-worlds, use of search engines and other online resources as sources of evidence, connection with peers and experts via social networking tools, scenario-based and authentic tasks in virtual worlds, application of gaming technologies for educational purposes	The iCamp project, use of SecondLife to support different disciplines (http://www.icamp.eu/) Cyberone law role-play (Rooney, 2007)
Inquiry-based learning, resource-based learning	Tools to support user-generated content and facilitating easy sharing and discussion, media repositories (Flickr, YouTube, and SlideShare), social bookmarking sites (Delicious), digital repositories and tools for content generation, use of search engines, participation in distributed virtual communities, use of folksonomies and social book marking as mechanisms for finding and organising resources	The Open Educational Resource movement and associated tools and repositories, like OpenLearn.

Reflective and dialogic learning, peer learning	Tools for fostering peer reflection such as blogs and e-portfolios, commenting on other learners' blog posts, co-creation of learning artefacts in wikis	Digital learning communities (http://www.thedlc.org/) The peer-to-peer mentoring framework
Communities of Practice	Use of social networking tools to participate in communities of learning and/or teaching	Application of tools such as Facebook, Ning and ELGG to support informal social interactions between learners and as spaces for reflection on professional practice around shared interests, for example the ELESIG community in Ning (http://elesig.ning.com)
Scholarly practice and the sharing of designs and good practice	Use of Web 2.0 technologies to participate in a distributed network of educators and researchers. Use of blogs, Twitter and wikis to co-create knowledge and understanding, to critique practice, and to share professional practice and resources	Edublogs (http://edublogs.org/), LeMill (http://lemill.net/), Cloudworks (http://cloudworks.ac.uk)

Learning spaces

A number of researchers are now exploring what new forms of learning spaces might be needed to effectively use new technologies in a blended learning context. For example, the Spaces for Knowledge Generation (SKG) project,[19] which aimed to inform, guide and support sustainable development of learning and teaching spaces and practices. It was influenced by constructivist approaches and aimed to design new learning spaces and use of technologies that fostered more learner-centred approaches to learning. In contrast, Cummings (2011), focussed on the kinds of the learning spaces that might be needed to promote experiential learning.

Boys (2010), looks at how learning spaces can be used to foster creativity. She argues that we need to rethink the architecture of educational spaces and that this will challenge some of the perceived wisdom of existing learning spaces. See also the 'spaces for learning in art and design' blog,[20] which is a collective set of resources on learning spaces.

[19] http://www.skgproject.com/
[20] http://www.spacesforlearning.blogspot.com/

In the UK, the Joint Information Systems Committee (JISC) undertook a programme of work around learning spaces (JISC, 2006). In the introduction to the report it is argued that:

> Learning is changing in the 21st century. Technologies used in learning, such as interactive whiteboards, personal learning environments, wireless networks and mobile devices, plus the internet and high-quality digital learning resources – and the ability to access many of these from home and the workplace – are altering the experiences and aspirations of learners

The focus of the report is the need for more cost effective use of spaces and the creation of technologically rich learning spaces. Factors of importance included: motivating learners, encouraging collaboration, supporting personalisation and inclusion, and enabling flexibility. The report reviews different examples of learning spaces, to support formal, informal and non-formal learning. These include: effective use of entrances, teaching spaces, learning centres and social spaces.

Conclusion

As the examples in this chapter demonstrate, Web 2.0 tools have much to offer for learning and teaching and can be used in different ways to support a wide range of pedagogical practices. However, despite pockets of good practice, on the whole Web 2.0 technologies have not being taken up extensively in learning and teaching. Therefore a number of challenges remain in terms of their use. These include the changing nature of learning and teaching in such spaces, the new media, information and networked literacies needed, the need for a better connection between research on the use of these tools and associated policy and practice, and the challenges with trying to change existing practice, to get learners and teachers to adopt more open approaches.

Conole and Alevizou (2010) argue that effective use of new technologies requires a radical rethink of the core learning and teaching processes; a shift from design as an internalised, implicit and individually crafted process to one that is externalised and shareable with others. They argue that change in practice may indeed involve the use of revised materials, new teaching strategies and beliefs – all in relation to education innovation.

The use of these technologies has significant implications for learners, teachers and educational institutions. Sharpe et al. (2010) provide a summary of recent research looking at the ways in which learners are using and perceiving new technologies. The research indicates that learners are changing, in terms of how they interact with technologies and how they are using them to support their learning. Learners are adopting more social, participatory and just-in-time learning practices; using search engines to find relevant resources and communicating and collaborating though a variety of mechanisms. Much of the research suggests that they are adopting more problem-based and experiential learning. However a note of caution is also needed; although good learners are using these tools effectively, weaker learners struggle to make sense of the vast array of tools and resources at their disposal. Arguably they need guided learning pathways and support to use these effectively to support their learning.

Despite significant investment in promoting the use of technologies in education, use by teachers is far from ubiquitous. Certainly teacher roles are changing as a consequence of the introduction of new technologies and arguably the boundaries between teachers and learners is blurring. However there are a number of barriers to the increased uptake of technologies. Firstly, teachers lack the necessary skills to design and support learning with new technologies. Secondly, there is a tension between their role as researcher and their role as teacher, with research more often than not being privileged over teaching. Finally, they also cite a lack of time and support as barriers to experimenting with new technologies.

Finally, the increased use of technologies has a number of implications for institutions. Firstly, in terms of the types of support needed to enable learners and teachers to use new technologies. Secondly, most institutions are working with legacy systems, which are fundamentally at odds with these new approaches. There is a tension between in-house systems and Learning Management Systems (LMS) and freely available Web 2.0 tools and services (Craig, 2007; Sigala, 2007). The nature and structure of educational institutions is also under threat. In a world where tools and resources are increasingly free, what is the role of a traditional institution?

Despite the hype and rhetoric, Web 2.0, and more specifically learning 2.0, has not yet penetrated mainstream education. Nonetheless the affordances[21] of Web 2.0 technologies and analysis of how they are beginning to be adopted in educational contexts, suggest they could have a profound impact in the near future and that there are a number of potential side effects of the increased use of Web 2.0 technologies, which we need to be aware of. For example, as discussed in this chapter, there are issues in terms of equity of access and the new digital literacy skills needed to make sense of these new digital spaces.

This chapter has considered the characteristics of new technologies and their impact on both organisations and individuals within an educational context. It has argued that there are significant implications for both learners and teachers. At the institutional level, there is little evidence that there is a corporate understanding of these tools either and there is the lack of vision for how social computing can be used. Policies on the use of Web 2.0 technologies are generally inadequate and there is a lack of appropriate training and support to migrate towards greater usage of these tools.

What is evident is that uncertainty and change are the norm; it is clear that we are now working in an environment of constant flux, where the future is unpredictable and where changes appear to be ever more rapid and fundamentally radical in terms of their implications. No one individual can be an expert in all the tools and the potential ways in which they can be used; the approach needs to shift to harnessing the networked aspects of new technologies, so that individuals foster their own set of meaningful connections to support their practice; whether this is a teacher in terms of connections to support them to develop and deliver their teaching or a learner in terms of connections to support and evidence their learning.

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[21] The concept of affordances is discussed in Chapter 6

The implications of these new technologies for learning and teaching are profound. Unintended consequences (Beck, 1992) of use will arise, misuse and abuses of the system will happen, the digital divide is still present; those not engaging with technologies are getting left further and further behind. Virilio (1998) goes further and suggests that we are utterly dependent on technologies and when (not if) technologies fail it will have a catastrophic effect.

This chapter has argued that a range of new skills are needed; for learners, teachers, support staff and policy makers. Skills to enable them to navigate through and make sense of these new digital spaces, skills to cope with change and the exponential development of new tools, skills to deal with new notions of space, time and boundaries, and skills to cope with a multi-faceted and fast moving environment. We have to accept that it is impossible to keep up with all the changes, so we need to develop coping strategies which enable individuals to create their own personal digital environment of supporting tools and networks to facilitate access to and use of relevant information for their needs. These skills are needed across the range of stakeholders involved in education from students to senior managers; not just a selective minority. The ultimate goal has to remain harnessing the potential of these technologies to provide better and more engaging learning environments and opportunities for learners.

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Chapter 5 – Mediating Artefacts

Introduction

This chapter will introduce the concept of Mediating Artefacts, which is one of the key principles underpinning the Open Learning Design Methodology described in this book. It will outline the background to the concept and give examples of the ways in which it can be used to understand the characteristics of technologies. It will describe how the origins of the concept are grounded in a socio-cultural perspective and will discuss how it is used specifically in the area of learning design. Illustrative examples will be provided of the different Mediating Artefacts practitioners use to guide their design process.

The origins of the concept of Mediating Artefacts

The concept of Mediating Artefacts is very much grounded in a socio-cultural perspective, linking back to the work of Vygostky (1962; 1978) and Leontiev and Luria (Leontiev, 1978, 1989; Luria, 1976) and more recently the body of knowledge about

Activity Theory (Cole et al.., 1997; Daniels et al., 2007; Engeström, 2001; Engeström et al., 1999).

Central to Vygotsky's ideas is the notion that social interactions play a fundamental role in the process of cognitive development. Vygotsky argued that what distinguishes humans from other animals is their use of speech in relation to practical activity (Vygotsky, 1978). He argued that words can shape an activity into structure. He described the analogy of signs as tools. Signs can be used as a means of solving a given psychological problem (to remember, compare, report, choose, etc.) and he argued this is analogous to the use of tools. Therefore, signs act as an instrument of psychological activity in a manner analogous to the role of a tool in labour. He referred to this as sub-categories of Mediating Artefacts (Figure 1). He argued that a tool's function is to serve as a conductor of human influence on the object of activity; i.e. it is externally orientated. Whereas a sign changes nothing in the object of psychological operation, it is internally orientated. Therefore humans use tools that are developed from a culture, such as speech and writing, to mediate their social environment.

Figure 1 shows the two types of Mediating Artefacts, namely tools and signs. A fundamental premise of Vygotsky's theory is that tools and signs are first and foremost shared between individuals in society and only then can they be internalised by individuals. Vygotsky argues that:

> Every function in the child's cultural development appears twice: first, on the social level, and later, on the individual level; first, between people (interpsychological) and then inside the child (intrapsychological). This applies equally to voluntary attention, to logical memory, and to the formation of concepts. All the higher functions originate as actual relationships between individuals (Vygotsky, 1978, p. 57).

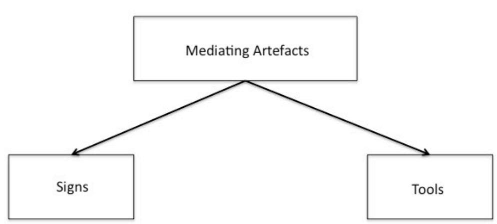

Figure 1: Signs and tools as Mediating Artefacts

Building on this he introduced the concept of the 'Zone of Proximal Development (ZPD)' which he defined as:

> We propose that an essential feature of learning is that it creates the zone of proximal development; that is, learning awakens a variety of internal development processes that are able to operate only when the child is interacting with people in his environment and in cooperation with his peers. Once these processes are internalised, they become part of the child's independent developmental achievement (Vygotsky, 1978, p. 90).

In other words, the Zone of Proximal Development is the difference between what a learner can do without help and what they can do with help from others. The concept of scaffolding (Wood at al., 1976) builds on this idea and relates to the idea of the teacher providing scaffolding to the learner's ZPD, which is then faded over time as the learner becomes more competent.

Capturing and representing practice

Conole (2008) describes how the concept of Mediating Artefacts can be adapted and used in a learning design context. An important aspect of learning design is the process of eliciting a design describing the essence of a learning activity that can then be reused in the development of a new learning activity. Central to this is the fact that we want to abstract the essential and transferable properties of learning activities, i.e. we want to abstract and describe those properties that are effective, but that can also be applied to other contexts, those properties that are not context bound to a particular instance of activity.

Learning activities can be 'codified' into a number of different representations; each one foregrounds different aspects of the learning activity and provides a means of illustrating the inherent design underpinning the learning activity. These forms of representation are defined here as Mediating Artefacts because this emphasises their mediating role in terms of how they are used to mediate design activities. Course designers use a range of Mediating Artefacts (MAs) to support and guide decision making; ranging from rich contextually located examples of good practice (case studies, guidelines, etc.), to more abstract forms of representation which distill out the 'essences' of good practice (models or patterns). In the context discussed here, I argue that Mediating Artefacts can be derived from existing learning activities by a process of abstraction (Figure 2). The same Learning Activity (LA) can result in a range of abstractions:

- Textually based narrative case studies, describing the key features of the Learning Activity and perhaps barriers and enablers to its implementation.
- More formal narratives, against a specified formal methodology such as a pedagogical patterns (Goodyear, 2005; Goodyear and Retalis, 2010).
- Visual representations, such as a mind map or formalised UML[1] use case diagram.
- Vocabularies (Currier et al., 2005), such as taxonomies, ontologies or folksonomies.
- Models (Conole, 2010; Mayes and De Freitas, 2004), foregrounding a particular pedagogical approach (such as instructivism, problem-based learning or an emphasis on

[1] http://www.uml.org/

a dialogic or reflective approach).

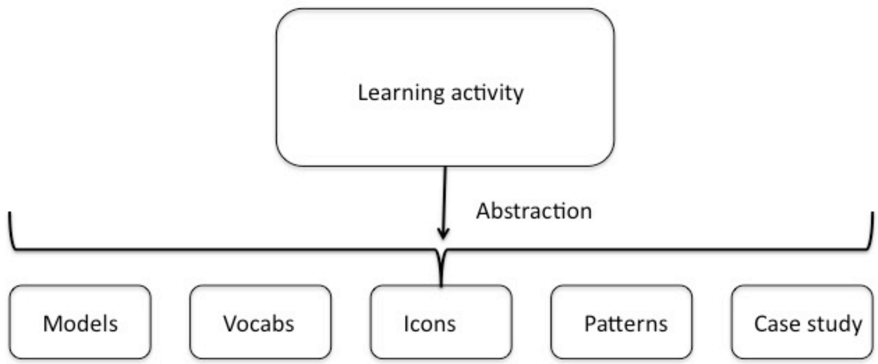

Figure 2: The range of Mediating Artefacts that can be derived from a learning activity

Mediating Artefacts help practitioners to make informed decisions and choices in order to undertake specific learning and teaching activities. They differ in a number of respects: i) their format of presentation (textual, visual, auditory or multimedia), ii) their degree of contextualisation (ranging from abstract to fully contexualised), iii) the level of granularity (i.e. the amount of details available within the MA about the learning activity), and iv) the degree of structure (flat vocabularies verses typologies).

Examples of Mediating Artefacts

Narratives or case studies provide rich contextually located MAs, which are valuable in that they describe the details of a particular pedagogical intervention. The drawback is that because they are so contextually located they may be difficult to adapt or repurpose. Pedagogical patterns provide a specifically structured means of describing practice, building on the work of the architect Alexander (Alexander, 1977; Alexander et al., 1977), by presenting the LA in terms of a problem to be solved, see for example Goodyear (2005) and Goodyear and Retalis (2010) and the Pedagogical Patterns project.[2]

Vocabularies represent a more ‘atomistic’, text-based form of representation by describing the components involved in learning activities. Currier et al. (2005) provide a review of educational vocabularies to describe practice and curriculum design which goes beyond the description of resources, focusing at the level of learning activities. They

[2] http://www.pedagogicalpatterns.org/

consider the range of vocabularies that have been developed to describe practice, including an inventory of existing pedagogical vocabularies, such as flat lists, taxonomies, thesauri, ontologies and classification schemes. Conole (2008) articulates the components of a learning activity. These include the context within which the activity occurs (subject, level, etc.), intended learning outcomes associated with the activity mapped to Bloom's taxonomy (Anderson and Krathwohl, 2001; Bloom, 1956), the pedagogical approaches, the tasks the learners are required to do in order to achieve the learning outcomes, and any associated assets and outputs (tools, resources, support or outputs). This has been adapted from a taxonomy developed in previous work (Conole, 2007). Table 1 shows the components of the learning activity taxonomy. This includes a list of possible pedagogies, including approaches and techniques, as well as the tasks, tools, resources, support and outputs. This can be used as a checklist in the design process helping to identify and consider each of the components involved in a learning activity and serves to illustrate the variety of factors which constitute a learning activity, further demonstrating the complexities involved in the design process.

Context	Learning outcome, subject, discipline, level, learner characteristics, pre-requisites, time to complete					
Pedagogy		**Tasks and supporting assets and outputs**				
Approaches	**Techniques**	**Tasks**	**Tools**	**Resources**	**Support**	**Outputs**

Action research Active learning Case study Collaborative Conceptual Constructivist Dialogic Enquiry-led Experiment Field trip Goal-based scenario Problem-based Procedural Project-based Reflective practitioner Resource-based Role play Vicarious learning	Buzz words Crosswords Drill and practice Exercise Experiment Fishbowl Game Ice breaker Journaling Pair dialogues Panel discussion Peer exchange Puzzles Question/answer Rounds Scavenger hunt Snowball Structured debate Tutorial Web search	Analyse Apply Argue Brainstorm Calculate Classify Compare Construct Create Criticise Critique Debate Decide Define Demonstrate Describe Design Differentiate Discover Discuss Draw Evaluate Experience Explain Explore Gather Generalise Hypothesize Identify Illustrate Infer Interpret Interview Investigate Judge Justify	List Listen Manipulate Model Negotiate Observe Order Organise Practice Predict Prepare Present Produce Question React Read Recite Refine Reflect Report Research Resolve Review Search Select Simulate Solve Specify State Summarise Synthesise Test Translate View Vote Write	Bibliographic software Blogs CAA tools CD/DVD Chat Concordancer Database Digital audio Digital video Discussion board Electronic library Email Graphic package Instant messaging iPOD/MP3 player Image software Memory stick Mind map Modelling NVIVO Online assessment Podcast	Powerpoint Project manager Search engine Simulation software Spreadsheet Statistical software Text image audio or video viewer Video conferencing VLE/LMS Virtual worlds Voice over IP Voting system Wikis Word processor	Annotated bibliography Content in blogs Content in wikis Course information Course reading materials Discussion forum content FAQs Interactive CD ROM MCQ Previous cohort resources Schedule/course calendar Peer-generated resource Peer-recommended sites Subject-based web sites Template Research journal articles Grey literature	Buddying Coach Diagnostic test Explanation Facilitation Formative Feedback Induction Instructions Intervention Monitoring Orientation session Peer collaboration Peer reflection Scaffolding Set up Surgery	Artefact Assignment Book report Concept map Dissertation Essay Paper Performance Portfolio Presentation Product Report Review

Table 1: The learning activity taxonomy

Diagrammatic or iconic presentations are important as they give a quick overview of the key features of an activity. They are valuable in that they can emphasise different connections between aspects of the activity, give an indication of structure and a sense of flow or movement. Learning activities can be represented visually adopting a particular iconic representation (Botturi et al., 2006; Botturi and Stubbs, 2008). Examples of these include the formal visual presentations used for Unified Modeling Language (UML)[3] use cases (see for example Van Ed and Koper (2006)) or the approach adopted by the AUTC Learning Design project (Agostinho, 2006; Agostinho et al., 2002). In the AUTC learning design representation, learning activities are broken down into a series of tasks which learners undertake, alongside these associated resources and support are illustrated. In addition to this visual 'temporal sequences' for each learning activity there is a rich range of additional information about the design process. As described in Chapter 8, we have developed a particular iconic representation that adopts a similar approach to these (Conole, 2007; Conole et al., 2008) focusing on a set of tasks adopted by each 'role' in the learning activity and an associated set of resources and tools. Tools, resources and outputs associated with each task are shown alongside, with arrows indicating connections.

Models provide more abstract forms of representation. Simplistically, a model is an abstract representation that helps us understand something we cannot see or experience directly. Beetham considers a model to be 'a representation with a purpose' with an intended user, and distinguishes five usages of the word: 'practice models or approaches', 'theoretical models', 'technical models', 'models for organisational change', and 'students' models' (Beetham, 2004). Models are usually aligned to a particular pedagogical approach. Examples of learning models frequently used in e-learning include: Kolb's learning cycle (Kolb, 1984), Laurillard's conversational framework (Laurillard, 2002), Salmon's e-moderating framework (Salmon, 2003) and Wenger's Community of Practice model (Wenger, 1998). See Chapter 14 and Conole (2010) for more details on these. Each emphasises different aspects of learning. Kolb presents an action-based or 'learning by doing' model through a four-stage cycle (experience, reflection, abstraction and experimentation). Laurillard describes the stages involved in the dialogic interaction between a learner and teacher, demonstrating the way in which concepts are internalised and adapted by each in the process. Salmon's five-stage framework for supporting effective e-moderating in discussion forums, emphasising the dialogic aspects of socially situated theoretical perspectives. Finally, although not originally developed for a learning context but now widely used in e-learning, Wenger's theory of Communities of Practice is valuable as it considers the ways in which Communities of Practice are formed, developed and fostered. He sees four main aspects: learning as community; learning as identity; learning as meaning; and learning as practice. Therefore each is valuable in that it helps to foreground particular aspects of learning, which can then be used to provide guidance.

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[3] See http://www.objectmentor.com/resources/articles/usecases.pdf for more on UML case studies

Understanding learning activities through Mediating Artefacts

Using the concept of Mediating Artefacts enables us to foreground the different aspects of a learning activity that a particular representation highlights. MAs have different strengths, weakness and purposes, depending on the context of use and the configurations of their affordances[4] and their constraints. For example, narratives and case studies provide rich contextually located Mediating Artefacts that are valuable in that they describe the details of a particular pedagogical intervention. The drawback is that because they are so contextually located they may be difficult to adapt or repurpose. Models and patterns provide more abstract forms of representation. However, because by their nature they are abstractions, practitioners may misunderstand how to effectively apply a model or pattern and hence as a result adopt a surface application of the model to their practice. Patterns are narratives, but are grounded in a particular way of thinking which emphasises a problem-based approach to design.

Agostinho rightly notes that there is currently no consistent notation system for learning design (Agostinho, 2006). The Mod4L project[5] identified a range of representations that practitioners use to represent practice (Falconer and Littlejohn, 2006), including: taxonomies and matrices, visual presentations (flow diagrams, mind maps), case studies and lesson plans. The project used these with practitioners in a series of workshops to identify their usage and perceived value. They concluded that use is complex and contextualised and that no one presentation is adequate. This aligns with the arguments being made here; by identifying and labelling Mediating Artefacts we are able to understand how learning activities are being represented and how these artefacts might be then used in a mediation role to guide new design.

Meta-Mediating Artefacts

Figure 3 shows how existing learning activities can be repurposed to create a new learning activity. The essence of a LA is abstracted into a MA; different MAs highlight or foreground different aspects of the LA. Mediating Artefacts can also be aggregated to provide more structured or scaffolded support, for example in the form of interactive toolkits, planners or repositories (for example a library of cases studies). So, for example, a model, case study or pattern can become part of a repository, which may consist of similar examples or might be a mixture of models, case studies and patterns. Case studies and models might be combined with some supporting text to form a pedagogical planner or an interactive toolkit. Video clips, case studies, models and patterns might be reviewed and key points synthesised and put into a set of tips and hints or guidelines. Lever (2006) discusses a range of different meta-Mediating Artefacts and compares seven examples, which he terms ‘educational galleries’: Contemporary Online Teaching Cases (COTC),[6] Designing Electronic Learning and Teaching Approaches (DELTA),[7]

[4] The concept of affordances is described in Chapter 6
[5] http://www.academy.gcal.ac.uk/mod4l/
[6] http://www.deakin.edu.au/itl/teach-learn/cases/
[7] http://Webct.med.monash.edu.au/muso.html

DesignShop (DS),[8] DialogPlus Toolkit (DPT),[9] Learning Designs (LD),[10] Teach with Technology (TwT)[11] and UMUC-Verizon Virtual resource site for teaching with technology (UMUC).[12] Figure 3 illustrates the role of Mediating Artefacts and Meta-Mediating Artefacts in the design of a new learning activity. It shows how a new LA can be constructed either from an individual Mediating Artefacts (such as a case study, model or iconic representation) or from a Meta-Mediating Artefact (such as a toolkit). The figure illustrates the process of abstracting learning activities into Mediating Artefacts that can then be used in the construction of a new learning activity.

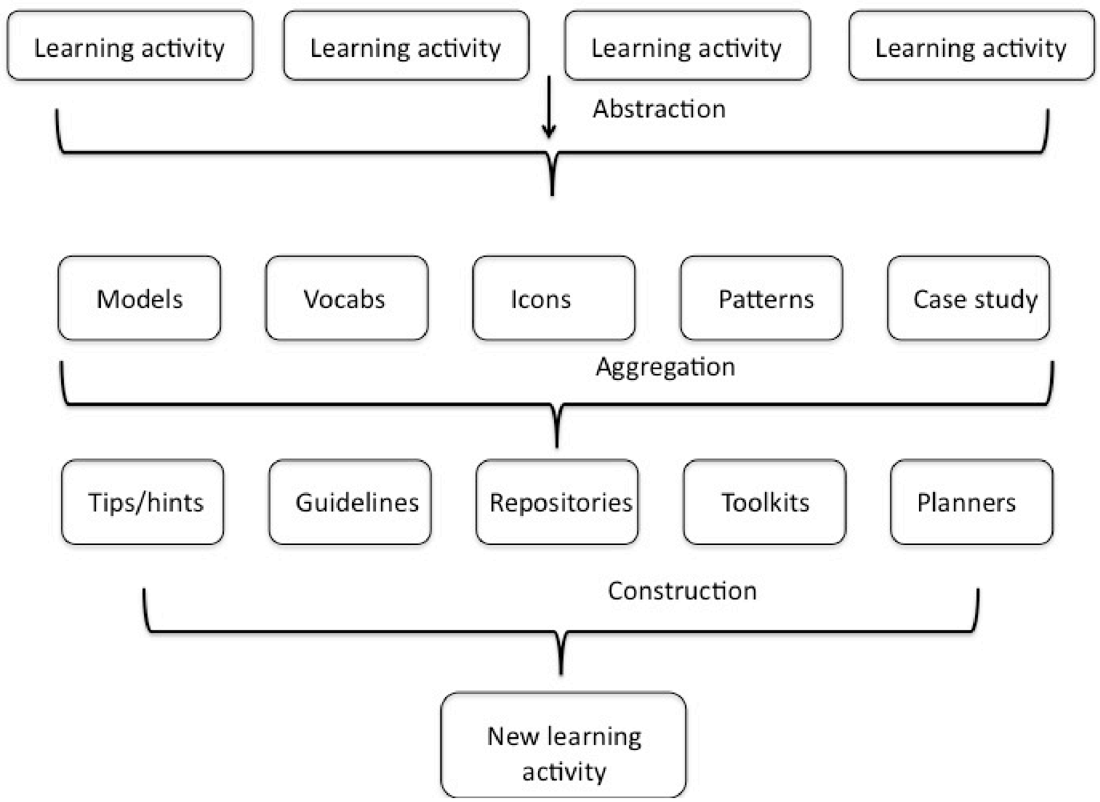

Figure 3: Mediating Artefacts, Meta-Mediating Artefacts - abstraction, aggregation and construction

Therefore, Mediating Artefacts can be aggregated into meta-Mediating Artefacts of three main kinds:

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[8] http://www.edtech.vt.edu/edtech/id/index.html
[9] http://www.nettle.soton.ac.uk/toolkit/
[10] http://learningdesigns.uow.edu.au/
[11] http://dmc.umn.edu/teach.shtml
[12] http://www.umuc.edu/virtualteaching/

- Aggregates**.** The first type consists of aggregates of example MAs, for example repositories of case studies, patterns or models or a combined repository containing a mixture of all three.
- Scaffolds**.** The second type consists of scaffolds of some kind, that synthesise key points and issues, for example tips and hints or guidelines.
- Mixed**.** The third type consists of a mixture of example MAs and scaffolds or supporting text, such as toolkits and pedagogical planners (as discussed in Chapter 10).

Examples of meta-Mediating Artefacts associated with learning activities and learning design include the:

- OTIS repository of case studies[13]
- e-learning centre library of case studies[14]
- series of effective practice guides and case studies produced by JISC,[15] which synthesise key features across their development programmes
- AUTC learning design Website[16]
- MERLOT database of resources and associated support[17]

This section has argued that by defining forms of representation which aim to describe aspects of a learning activity as Mediating Artefacts this helps to: foreground what each MA offers, ground this in a socio-cultural perspective emphasising the mediational role of such artefacts in the design process and contextualising this alongside other aspects involved, and enables us to see the full cycle of abstraction and construction of learning activities and how Mediating Artefacts are used in the process.

Activity Theory

The concept of Mediating Artefacts as described in this chapter derives from a socio-cultural perspective. This perspective recognises that learning activities are contextually bound. Use of an Activity Theory lens is valuable as it helps to highlight the relationship between the different components involved in the design process, as well as the context within which it takes place.

Kaptelinin and Nardi provide a comprehensive overview of Activity Theory and its origins (Kaptelinin and Nardi, 2006). Also see (Cole and Engeström, 1993; Daniels, et al., 2007; Engeström, 2001; Engeström, et al., 1999; Kuutti, 1996; Nardi, 1995). A key idea in Cultural Historical Activity Theory (CHAT) is the notion of mediation by artefacts (Kuutti, 1996), which are broadly defined to include instruments, signs, language, and machines (Nardi, 1995).

[13] http://otis.scotcit.ac.uk/
[14] http://www.e-learningcentre.co.uk/eclipse/Resources/casestudies.htm
[15] http://www.jisc.ac.uk/whatwedo/programmes/elearning_pedagogy/elp_practice.aspx
[16] http://www.learningdesigns.uow.edu.au/
[17] http://www.merlot.org

Mediating Artefacts can support learners and teachers in making the best use of tools and resources. They mediate between the user and the end goal, as illustrated in Figure 4. They enable the user to elicit and represent the inherent designs associated with a particular learning activity or resource. The vision is that if these designs can be abstracted and represented in a meaningful and understandable way, there is a greater chance of them being picked up, used and adapted by others, which, in turn, over time, is likely to lead to an evolving understanding of how new tools and resources can be used.

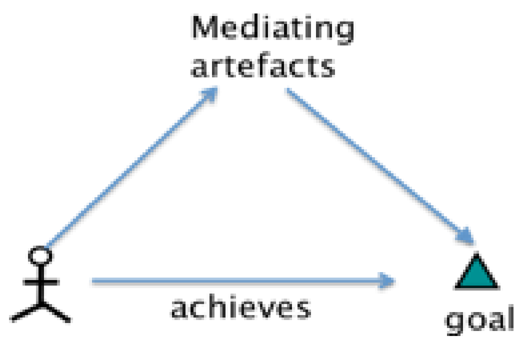

Figure 4: Representation of the relationship betweeen Mediating Artefacts, the use and the intended goal

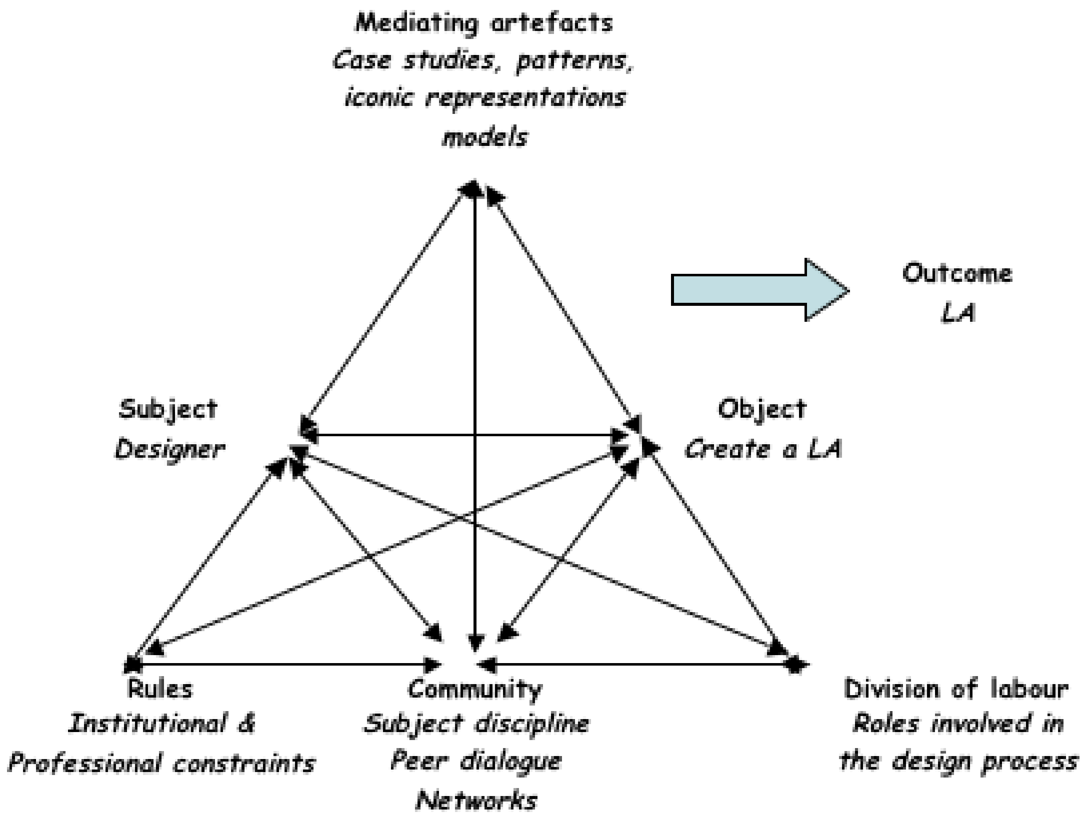

Figure 5: An Activity Theory representation of the learning design process

Figure 5 locates a Mediating Artefact within a CHAT framework. The subject is the designer involved in creating a learning activity. The object therefore is the motivation to design a learning activity and the outcome is the designed learning activity. The process can be mediated by a range of Mediating Artefacts as described earlier. The use of CHAT enables us to describe the context within which this process occurs. The design process will involve a number of roles (division of labour). At the simplest level, this may consist of an individual teacher working alone to create a learning activity. However, the design process may be team-based, in which case different individuals might adopt different roles (e-learning advisor, facilitator, evaluator, etc.) or it might be a teacher working in conjunction with an educational developer or an instructional designer. The rules help to contextualise the creation of the learning activity. They include rules and constraints that bound the design process – for example the institutional context, professional constraints and requirements, local practices and processes. Finally, the community node helps to identify the range of dialogic mechanisms that are used in the design process. These are important because they provide the designer with flexibility as they provide an opportunity to clarify and discuss issues around the creation of a learning activity in further detail. In a series of interviews with course designers, this dialogic process was cited as one of the most important mechanisms for guiding practice. See Cross et al. (2008) and Wilson (2007) for a description of these case studies.

The learning activity produced as a result of this process can then be represented in a number of different forms of representations that can in turn act as Mediating Artefacts in the creation of new learning activities (Figure 6). The CHAT triangle on the left illustrates the creation of a learning activity LA_1 using a Mediating Artefact MA_1. The Learning Activity, LA_1 can then be represented in a number of forms of representation (MA_2, MA_3 and MA_4 – which might be narrative cases studies, an iconic representation, a video clip or a schematic model), which are in turn used as starting points in the creation of new learning activities (LA_2, LA_3 and LA_4).

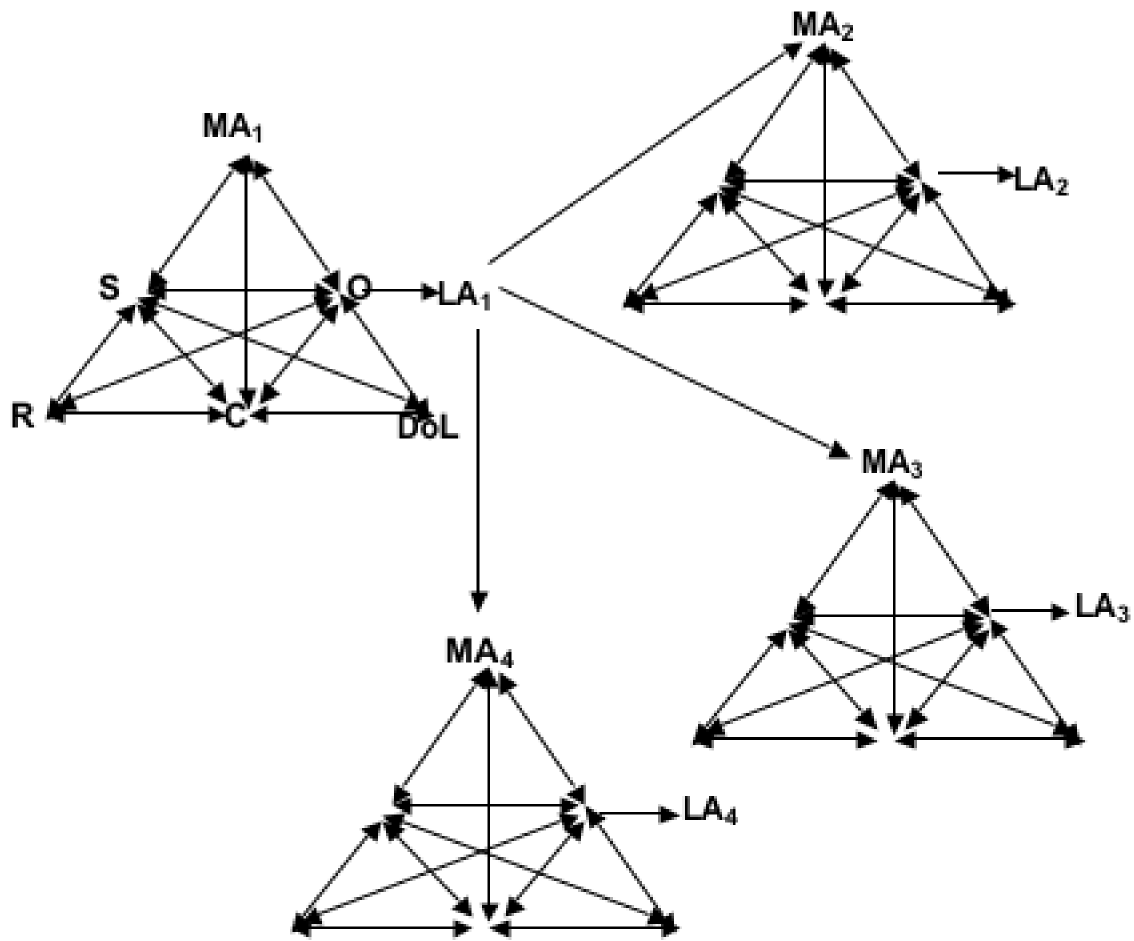

Figure 6: Repurposing a learning activity via a range of Mediating Artefacts

An illustrative example of the application of this approach

This section will show how learning design, pedagogical patterns and Open Educational Resources can be used together in the deconstruction and reconstruction of a resource. There are essentially four different types of Mediating Artefacts: learning design visualisation tools, learning design methods, pedagogical patterns and Web 2.0 sharing and discussion tools (Figure 7).

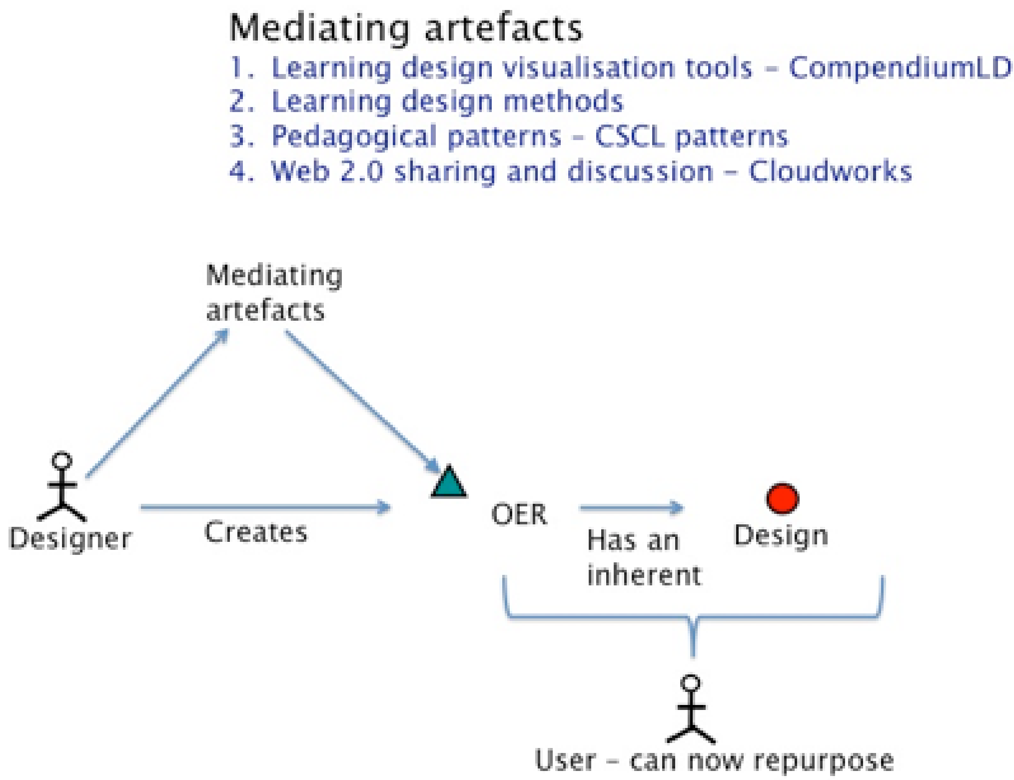

Figure 7: Types of Mediating Artefacts

The following scenario provides an example of how this might work in practice (Figure 8). It describes the creation of an OER and an associated design for the OER and shows how this can be repurposed in three different ways. Tools and resources from OER, learning design and pedagogical patterns research are used to help design the original OER and then to share and repurpose it.

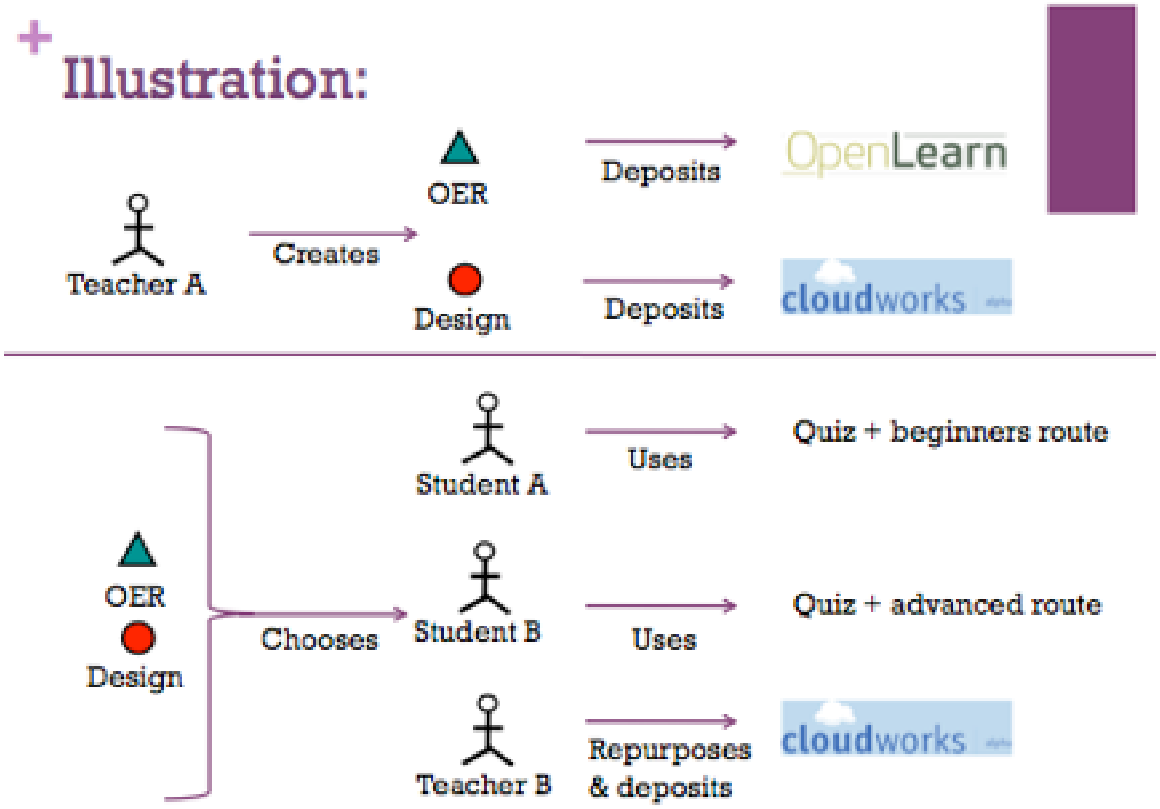

Figure 8: A lifecycle showing the design and reuse of an OER

Teacher A: The design phase

The scenario begins with Teacher A. The context is that Teacher A is putting together their beginners' level Spanish material for the OU course, Portales, L194. They make the material available as an OER online in the Openlearn repository.[18] They use the CompendiumLD tool for visualisation to articulate different ways in which they think the materials can be used. Chapter 9 discusses CompendiumLD in more detail. Figure 9 shows part of the visual design, including the branching sequence to enable a beginner and more advanced route through the learning materials. In particular they are interested in showing how the materials can be used as both a revision exercise for an individual learner and at a more advanced level for a group of learners working collaboratively. Whilst developing their design in CompendiumLD, teacher A had access to ideas and tips and hints from the Cloudworks[19] social networking site for learning and teaching, as well as from a range of OER and Pedagogical Pattern repositories. Chapter 15 discusses Cloudworks in more detail. These help them to refine their design thinking, to get ideas about how to structure activities in the sequences and suggestions of tools that be used for example for supporting a diagnostic e-assessment test or to enable students to communicate synchronously.

[18] http://openlearn.open.ac.uk/course/view.php?id=2439
[19] http://cloudworks.ac.uk

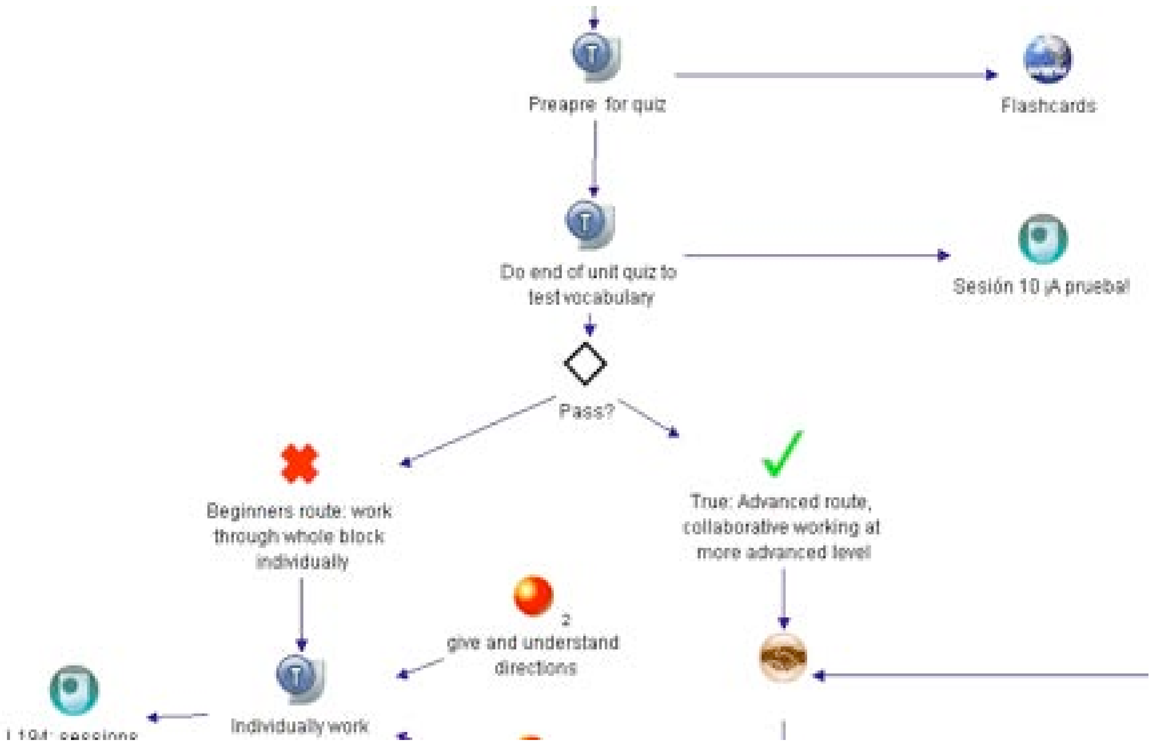

Figure 9: Part of the design sequence created using CompendiumLD

Learner A: Use Scenario 1 – beginners' route

Learner A is studying Spanish. They are a few weeks into an beginner level Spanish course. The topic they is currently working on is 'describing places', they are looking for freely available tools or resources that might help; they are also interested in finding study buddies to work with, who are at a similar level.

1. They explore the OpenLearn site.
2. They find the set of OERs for a beginners' Spanish course – L194 – Portales[20] from the Open University, UK, developed by Teacher A.
3. They find, alongside these resources, the visual design – which provides an example of how these resources might be used. The design consists of the following aspects:
   a) A diagnostic e-assessment test to assess their level of understanding of the topics covered in the course.
   b) Two potential pathways: i) a beginners' route where the learner works individually through the L194 OER material, ii) an advanced route where the learner is assigned to a study group to work collaboratively around one aspect of the L194 OER material, Activity 2.1. In this advanced route, the existing activity (categorise three pictures of buildings as Latin American or Spanish) is replaced with one where the learner has to describe and compare the buildings, working collaboratively with other students and interrogating an expert for information. The activity exploits the jigsaw pedagogical pattern (Hernández-Leo et al., 2006)

[20] http://openlearn.open.ac.uk/course/view.php?id=2439

and also uses a free video conferencing tool to enable the study group to speak with a Spanish cultural expert.

4. They take the diagnostic tests and the advice is that they should take the beginners' route and complete the L194 OER material.

Learner B: Use Scenario 2 – advanced route

Learner B is a student a few weeks into an intermediate level Spanish course. They work through a similar set of activities to Learner A, but in this case after taking the diagnostic test the advice is that they take the advanced route and to focus on the adapted activity 2.1 as a collaborative exercise with other students.

Teacher B: Use Scenario 3 – repurposes

Teacher B is an Associate Lecturer teaching on the intermediate level Spanish course at the Open University, En Rumbo – L140, preparing for a face-to-face tutorial with their students. The topic is describing places. They find the design described above and adapt it to produce two new variants of the design. 1. A classroom-based activity, where the students describe the pictures using the Think-Pair-Share pedagogical pattern (Hernández-Leo et al., 2006). 2. A similar exercise in terms of comparing three buildings, but the students are asked to describe buildings from their town and then talk online with an expert (a student in Spain), who describes their home town. The activity is set as a precursor to the first assignment exercise for the course.

Figure 10 provides a conceptual overview and generalisation of this scenario – showing how an initial design can query existing resources such as Cloudworks, pedagogical pattern repositories and OER repositories, such as Openlearn, use these to help create and populate an OER, along with an associated design, which can then be deposited back into sites such as Cloudworks and OpenLearn for reuse.

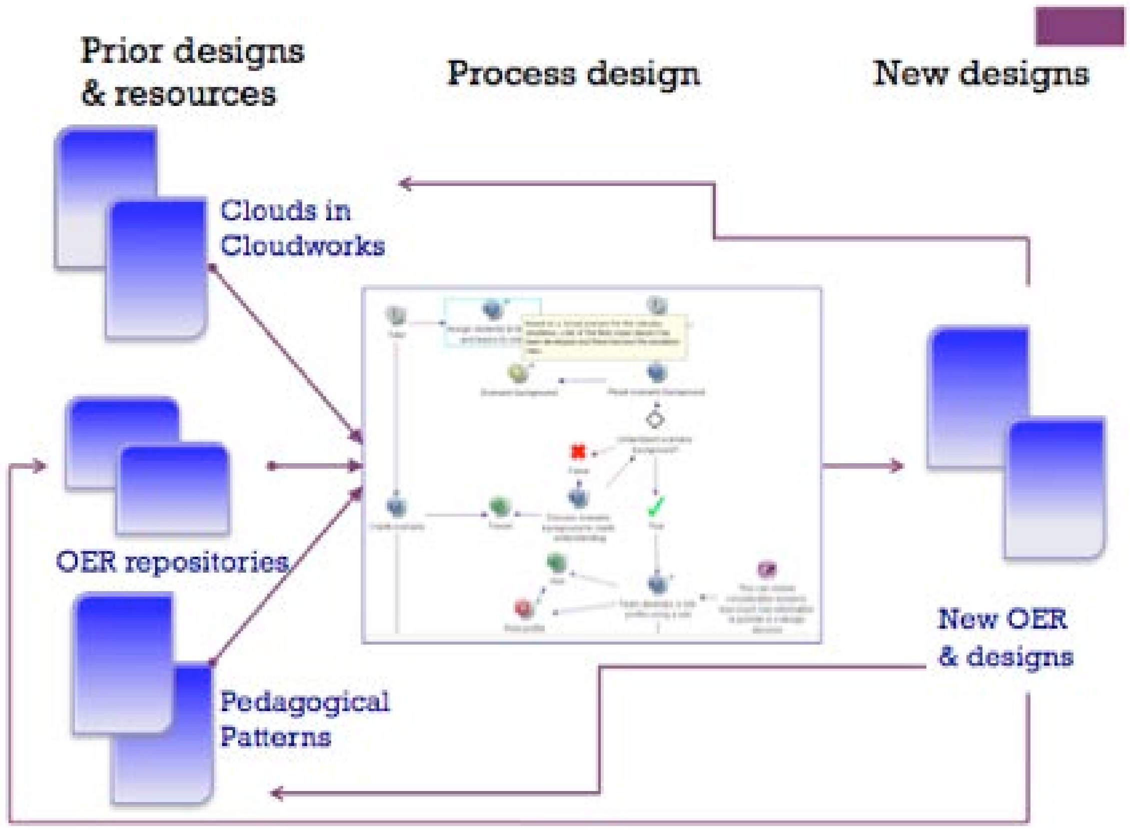

Figure 10: The OER design cycle

In order to test our approach, a number of workshops were held between May and June 2009. Evaluation of these indicated that while determining the pattern of an OER by considering the end product is difficult, the adoption of these collaborative patterns is relatively simple and leads to new views on how OER content can be used. Typically this extends the likely effort of the user and increases the potential for learning from the content without rewriting the core material. This chapter has shown how design presentations, along with a a small number of collaborative patterns, can be used to guide rethinking how an OER works and help repurpose the OER to incorporate more collaboration and adaptability. Further aspects of evaluation of these workshops and analyse of the results is reported elsewhere (Conole et al., 2010; Dimitriadiset al., 2009).

Conclusion

As discussed at the start of this book, the mismatch between the potential of technologies and actual use in practice is one of the most important key challenges facing modern education. Focusing on improving design practices is likely to be one of the most effective ways of bridging this gap.

This chapter has described how the concept of Mediating Artefacts, derived from CHAT, can be applied to a learning design context. It has shown how this theoretical framework can be used to understand the different ways in which learning activities can be represented and the ways in which Mediating Artefacts can be used to support the design process. The chapter argues that articulating the nature of different Mediating Artefacts helps clarify the ways in which each represents different aspects of learning activities. The chapter has described the range of Mediating Artefacts that are commonly used by practitioners, highlighting their different uses. The difficulty of accurately capturing and rarefying practice in this way has been discussed. Overall the chapter has attempted to demonstrate the complexity behind the deceptively simple questions: How can practitioners capture and represent learning activities? How can we provide scaffolding to support the design process? It offers a theoretical framework for addresses these questions using the concept of Mediating Artefacts as the conduit for both abstracting practice from existing learning activities and constructing new learning activities.

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Chapter 6 - Affordances

Introduction

This chapter will define the term affordance, starting from its original use in an ecological context, through to its use in Human Computer Interactions (HCI). It will then consider how the term can be used to describe the characteristics of technologies, along with illustrative examples. Although the term is contested,[1] I will argue that it is valuable in that it describes the ways in which the inherent characteristics of different technologies can be instantiated in different contexts, and through the different preferences of individuals and how they interact with technologies. The chapter will describe how the term affordances can be used to help develop a better understanding of the characteristics of different technologies and inform design decisions.

Definitions of the term

Gibson (1977, 1979) defined the term affordances, in an ecological context, in relation to visual perception. He argued that affordances in an environment always lead to some course of action. Affordances are perceived by an individual and are culturally based. Gaver (1991) argues that the actual perception of affordances will be in part determined by the observer's culture, social setting,

[1] See later discussions referencing Boyle and Cook, Gaver, Norman and McGrenere and Ho in this chapter

experience and intentions. For example a button has an affordance of pushing, a knob is for turning and handles are for pushing. Gibson (1977) defined affordances as:

> All "action possibilities" latent in the environment, objectively measurable and independent of the individual's ability to recognize them, but always in relation to the actor and therefore dependent on their capabilities (Gibson, 1977, pg. 67-82).

For example, a tall tree has the affordance of food for a giraffe because it has a long neck, but not for a sheep, or a set of stairs has an affordance of climbing for a walking adult, but not for a crawling infant. Therefore affordances are always in relation to individuals and their capabilities; this includes the individual's past experience, values, beliefs, skills and perceptions. Therefore a button may not have the affordance of pushing if an individual has no cultural context or understanding of the notion of buttons or related objects and what they are for. Gibson also argued that:

The affordances of the environment are what it offers the animal, what it provides or furnishes, either for good or ill (Gibson, 1979, p. 127).

He goes on to argue that it implies a complementarity between the animal and the environment. Salomon describes Gibson's concept of affordances as follows:

'Affordance' refers to the perceived and actual properties of a thing, primarily those functional properties that determine just how the thing could possibly be used. (Salomon, 1993, p. 51).

Therefore affordances are properties of the world that are compatible with and relevant for people's actions (Gaver, 1991). Weiser and Seely Brown (1995) offer the following definition:

An affordance is a relationship between an object in the world and the intentions, perceptions, and capabilities of a person. The side of a door that only pushes out affords this action by offering a flat pushplate. The idea of affordance, powerful as it is, tends to describe the surface of a design. For us the term 'affordance' does not reach far enough into the periphery where a design must be attuned to but not attended to.

McGrenere and Ho identify three properties of affordances (McGrenere and Ho, 2000):
1. An affordance exists relative to the action capabilities of a particular actor.
2. The existence of an affordance is independent of the actor's ability to perceive it.
3. An affordance does not change as the needs and goals of the actor change.

The term was adapted by Norman (1988a, 1988b) for use in an HCI context. His interest was in how the affordances of everyday objects could either enhance or restrict their accessibility. He was interested in using the concept to support the better design of objects to accomplish particular functions. Norman (1988a) said:

When used in this sense, the term affordance refers to the perceived and actual properties of the thing, primarily those fundamental properties that determine just how the thing could possibly be used. A chair affords ("is for") support, and, therefore, affords sitting.

Norman was interested in design and in particular with making affordances salient so that users could easily perceive them. McGrenere and Ho (2000) distinguish between the utility of an object (i.e. the actions it affords for the user), from the usability of the object (i.e. the perceptual information that signals its affordances). Norman considers both perceived and actual properties and implies that a perceived property may or may not be an actual property, but regardless, it is an affordance. Thus, he deviates from Gibson in that perception by an individual may be involved in characterising the existence of the affordance.

Gaver (1991) identifies three types of affordances: perceptible, hidden and false. Perceptible affordances are those where there is perceptual information for the affordance. Hidden affordances are those where there is no information for the affordance (for example a hidden door in a panel). Finally, false affordances are those which can result in a false action.

For Gibson, affordances are binary, they either exist or they don't. In contrast, McGrenere and Ho (2000) consider affordances in terms of two dimensions, i) the ease with which an affordance can be undertaken and ii) the clarity of the information that describes the existing affordance; each being a continuum. They state that the goal of design is to first maximise the necessary affordances and then maximum each of these dimensions (Figure 1).

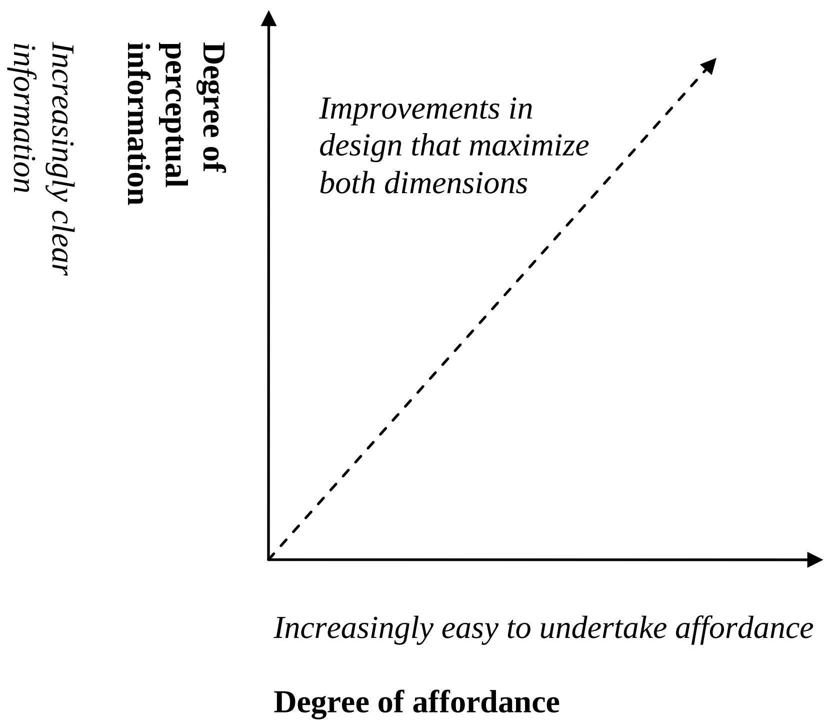

Figure 1: McGrenere and Ho's digram representing the affordance and the information that specifies the affordance as a continuum

McGrenere and Ho's article (McGrenere and Ho, 2000) goes some way towards articulating the different uses of the term by Gibson and Norman. Table 1 summarises the main differences they identified. Boyle and Cook (2004) responding to Conole and Dyke's (2004a) use of the term affordances in a technological context, argue that although the term affordances is potentially rich, it is also contested. Drawing on McGrenere and Ho (2000), they argue that there is considerable ambiguity and confusion in the use of the term. Conole and Dyke (2004b) provide a justification for their use of the term and whilst I agree there is ambiguity, I would argue that the use of affordances as a means of describing the relationship between technologies and users and in particular resultant actions is useful.

Gibson’s affordances	**Norman’s affordances**
Action possibilities in the environment in relation to the action capabilities of an actor	Perceived properties that may not actually exist
Independent of the actor’s experience, knowledge, culture or ability to perceive	Suggestions or clues as to how to use the properties
Existence is binary - an affordance exists or it does not exist	Can be dependent on the experience, knowledge or culture of the actor
	Can make an action difficult or easy

Table 1: McGrenere and Ho’s distinction between Gibson’s and Norman’s use of the term affordances

Drawing on this work, Soegaard (2010) argues that clarifying:

> The distinction between Gibson’s and Norman’s sense of affordances allows us to distinguish between the utility/usefulness and the usability of an object. We both design for usefulness by creating affordances (the possibilities for action in the design) that match the goals of the user (the relativity of the affordance vis-à-vis the user) and we improve the usability by designing the information that specifies the affordances (perceptual information as shadows on buttons to afford clickability etc.).

The next section will consider the types of affordances of technologies and provide examples of how they can be used as a means of guiding the design of a learning intervention.

ICT affordances

Edelson et al., (1999) cite Blumenfeld et al. (1991), who identified six contributions that technology can make to the learning process: i) enhancing interest and motivation, ii) providing access to information, iii) allowing active manipulable representations, iv) structuring the process with tactical and strategic support, v) diagnosing and correcting errors, and vi) managing complexity and aiding production. Technologies provide a mechanism for storing and manipulating large quantities of information, presenting information in a variety of ways, allowing users to interact with materials, and enabling learners to communicate with others to develop their understanding.

Specifically, in relation to Information and Communities Technologies (ICT), Conole and Dyke (2004a) propose the following types of ICT affordances: accessibility, speed of change, diversity, communication and collaboration, reflection, multi-model and non-linear, risk, fragility and uncertainty, immediacy, monopolisation and surveillance. They argue that the taxonomy has a number of uses. Firstly, that establishing a clearer understanding of the affordances should help to inform practitioners in their use of technologies to achieve particular goals. Secondly, that it can also help to identify potential limitations and inappropriate uses of the technologies. Thirdly, by making the inherent affordances of technologies explicit, the taxonomy can act as a discussion point for critique and further refinement. Fourthly, it can be used as a checklist to help practitioners understand the advantages and disadvantages of different technologies. Fifthly, it can be used as a mechanism for staff development and improving practice – for example, by providing a checklist of potential benefits and drawbacks of different technologies which can be used to inform choice and the ways that practitioners might choose to use them. Similarly, Gaver (1991) argues that affordances can be used as a way of focussing on the strengths and weaknesses of technologies with respect to the possibilities they offer the people that might use them.

Conole and Dyke (2004a) were interested in exploring the relationship between the infrastructure of information and communication technologies and people's use of those technologies. In particular, what uses do technologies invite and facilitate, and in which ways can they be used to promote particular types of learning? They were interested in exploring the creative and innovative ways in which people respond to technologies.

Whilst Conole and Dyke's classification is useful in terms of describing ICT and how they can be used, on reflection I now feel that not all of them are affordances in the Gibsonian sense. More recently I have identified a set of positive affordances, specifically in relation to the use of technologies in the design of learning interventions, as well as a list of constraints. Positive affordances include: collaboration, reflection, interaction, dialogue, creativity, organisation, inquiry and authenticity. Constraints include: time consuming (in terms of development), time consuming (in terms of support), difficult to use, costly to produce, assessment issues, lack of interactivity, and difficult to navigate. I will now go on to describe each of positive affordances in turn and give examples of technologies that support them, and will then briefly discuss the pragmatic constraints that need to be addressed.

Identification of the positive affordances of technologies and any associated constraints, can then be used as a means of making informed design decisions in terms of using a particular technology in a specific learning context. For example, to promote student reflection, the affordances checklist can be used in terms of considering the extent to which different tools might promote this. So for example a wiki in this context has the following positive affordance: reflection (to an extent), however arguably a blog has a stronger affordance of reflection and is also better in terms of organisation and dialogue (as if the blog is public others are able to comment on posts). In terms of constraints a wiki is arguably somewhat difficult to use, for some learners anyway. Therefore the checklist might result in the teacher deciding to use a blog, rather than a wiki in this context.

At part of the OULDI work, we have developed an activity based around affordances, which we have used in a number of our learning design workshops.[2] Participants are given the list of positive affordances and constraints and asked to map these to a number of tools for use in a particular learning context. Participants found focusing on the affordances of the different tools a useful way of thinking about their advantages and disadvantages. It helped them focus on the actual use of a tool in a particular context rather than the tool *per se*. They reported that it helped guide their decision making choices in terms of comparing the characteristics of different tools.

The co-evolution of tools and users

Tools and users are not static. Of course technologies are continually developed and upgraded, but more importantly users adapt and change their behaviour and the nature of the way in which they interact with tools over time, as they: i) become more proficient and confident at using the tools, ii) begin to appropriate and personalise use, and iii) see new ways in which the tool can replace

[2] http://cloudworks.ac.uk/cloud/view/4042

previous patterns of behaviour. This section will argue that users evolve their practice as they continue to embed their use of tools. Think for example of the way tools like Microsoft Word and email have become more and more ingrained in everyday practice since their original introduction. This shift is both at an individual and an organisational level. For example, using the Internet to find information is now ubiquitous across education, memos have been replaced by email communication and secretaries no longer laboriously type up hand written letters (Conole, White, and Oliver, 2007).

Pea and Wallis (cited in Borgeman et al., 2008, pg. 11) argue that there is a co-evolution of tools and users over time; interactions and patterns of user behaviour are not static. This co-evolution depends on both the inherent affordances of the tools and the characteristics of the users (i.e. their skills base, personal preferences and beliefs, and the context and culture within which they are interacting with the technologies). While this has always been the case, arguably the pace of change/co-evolution has increased dramatically in recent years, particularly around the use of Web 2.0 tools. There has been a shift from a static-content Web to one that is more interactive; peer critiquing, user-generated content, sharing, personalisation, adaptation, and remixing, are the kinds of user behaviours that characterise these new tools.

Pea and Wallis classify technologies into five phases: early communication mechanisms, symbolic representations such as language and mathematical notation, the first wave of technological media (radio, television, telephone, etc.), the emergence of networked and Internet-based technologies and finally, they argue, we are now in a fifth phases which they term ‘cyberinfrastructure’, which refers to the distributed, global nature of today’s technologies, such as grid and cloud computing. Hence it is evident that there is a co-evolution of tools and users and that this co-evolution depends on both the inherent ‘affordances’ of the tools and the characteristics of the users (i.e. their skills base, personal preferences and beliefs and the context within which they are interacting with the technologies) (Figure 2).

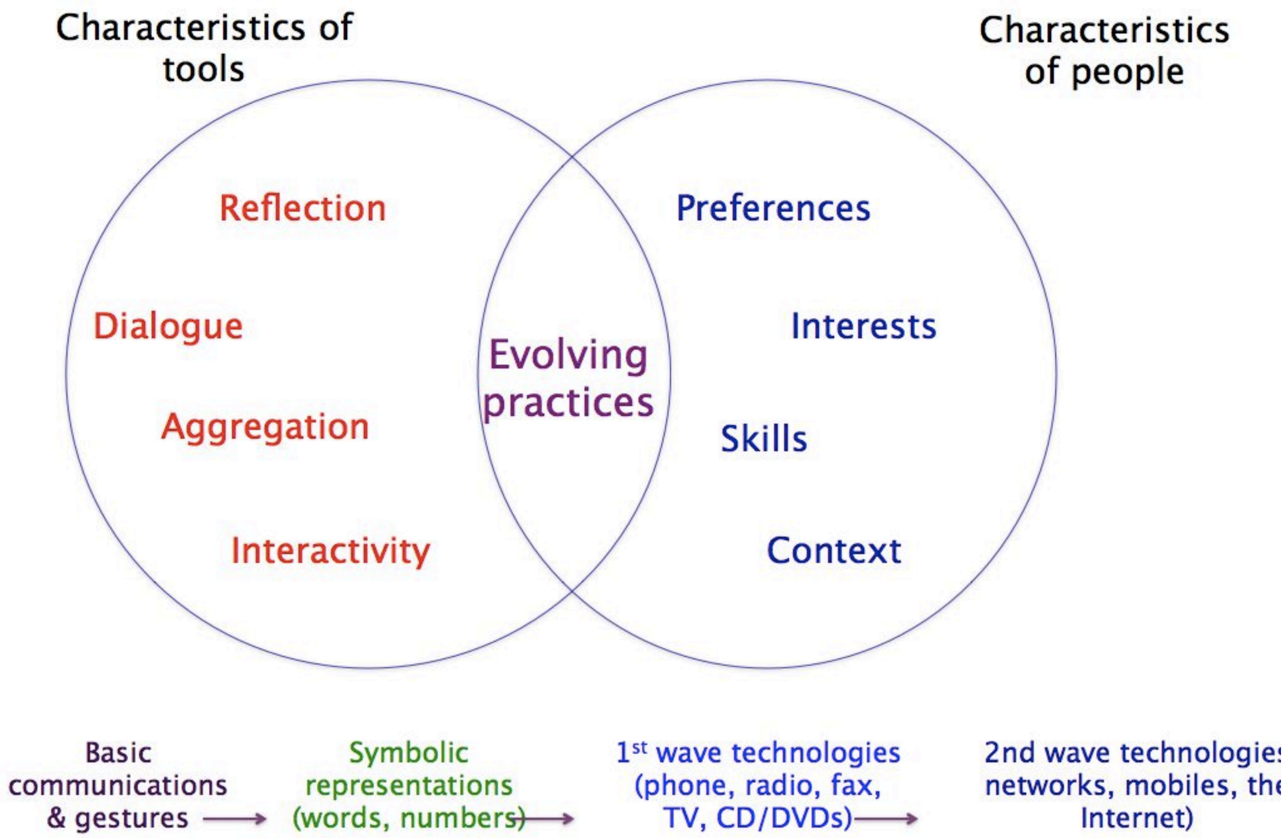

Figure 2: The relationship between the affordances of technologies and user characteristics

I will now discuss each of the positive affordances listed earlier in more detail.

Collaboration

Collaborative learning is an important aspect of socially situated learning. Inherent is the notion that learning with and through others is an important and valuable form of learning, particularly in today's educational context, where the focus is on knowledge co-construction rather than information recall. New technologies have opened up the possibility of new forms of dialogue and communication. ICT offers the potential to develop new forms of online communities and new means of communicating and sharing information, from signing up to specialised mailing lists through to involvement in specialised discussion forums and chat rooms.

It is important to distinguish between collaboration and cooperation. Jones et al. (2007) consider the two terms as follows. They cite Topping's definition of cooperation as:

> CO- means together in company, jointly, in common, equally, mutually, reciprocally, while - OPERATE means to work, act, influence, effect, accomplish, cause or carry out(Topping, 1992, p. 151).

In terms of collaboration, they reference Kaye, who defined collaboration as:

> Etymologically, to collaborate (co-labore) means work together, which implies a concept of shared goals, and an explicit attempt to 'add value' - to create something new or different through the collaboration as opposed to simply exchanging information or passing instructions. (Kaye, 1992, p. 2)

Dillenbourg (1999) defined collaborative learning as:

> A *situation* in which *two or more* people *learn* or attempt to learn something *together*. (Dillenbourg 1999, p2; emphasis in original).

Jones et al. (2007) see co-operation as been applied more to a division of labour in which individuals achieve their aims by mutual assistance, whereas collaboration implies a stronger commitment to joint aims, as well as mutual assistance.

Collaboration can be promoted through a range of technologies. For example action learning sets[3] can be set up in a discussion forum, where the students work together on a shared project, using the space to share and discuss ideas. Similarly a wiki can be used as a space to support joint project writing. Social bookmarking sites can be used by a cohort as a means of aggregating a shared set of resources.

Reflection

The importance of reflection can be traced back to the work of Dewey (1916; 1933; 1938; 1949). Dyke et al. (2007) reference Dewey's definition of the term. They argue that Dewey contrasts reflective thought with reliance on instruction and the mere transmission of received wisdoms and defines reflection as:

> [A] better way of thinking that … is called reflective thinking: the kind of thinking that consists of turning a subject over in the mind and giving it serious and consecutive thought. Dewey 1938, p. 113).

Dewey also stated that:

> The function of reflective thought is therefore to transform a situation in which there is experienced obscurity, doubt, conflict, disturbance of some sort, into a situation that is clear, coherent, settled, harmonious (Dewey 1933, p. 195).

Asynchronous communication tools, such as forums, have long been considered to offer opportunities to support student reflection (Garrison, 2002: Lyons, 2010; Mason and Kaye, 1989). Forums can be used in a semi-structured and moderated way or more openly as a space for students to share and discuss ideas. They provide a space for students to reflect and critique, where students can engage in discussion over a longer timeframe than is possible with face-to-face discussions. They can be used to augment face-to-face discussion providing a space for students to reflect on in-classroom debates.

Blogs can be used very effectively as a means of promoting reflection (Kerawalla et al., 2008; Yang, 2009). For example students can be asked to keep a reflective blog, which can be shared with the teacher, other students or more broadly. This is particularly useful in professional courses, where it is important for students to gain a clearer understanding of the theory they are learning and its relationship to professional practice. For example when trainee teachers are on placement in schools keeping a reflective blog of their experience and its relation to educational theory can be very effective. Finally, e-portfolio can also be a good way of promoting reflection, as well as providing a mechanism for learners to aggregate and evidence their learning (Buzzetto-More, 2010; Jafari and Kaufman, 2006; Stefani et al., 2007).[4]

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[3] See http://www.foodsec.org/fileadmin/user_upload/eufao-fsi4dm/docs/PG_ALSets.pdf for a description of action learning sets

[4] See also the JISC 'Effective practice with e-portfolios' guide, http://www.jisc.ac.uk/publications/programmerelated/2008/effectivepracticeeportfolios.aspx

Interaction
One of the often cited benefits of new technologies is the way in which it can promote a range of interactions. The nature of interaction in online spaces is discussed in more detail in Chapter 14, where I separate out community (between learners and peers), from interaction (with technologies). I am using the term interaction here in terms of the interaction between users and technologies. It is concerned with the extent to which the user can manipulate their environment. Wagner defines interaction as follows:

> Interactions occur when these objects and events mutually influence one another. An instructional interaction is 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).

Siemens (2005) argues that interaction is essential for effective learning. Similarly Dyke et al. (2007) see interaction as one of the key aspects of effective learning, along with learning through thinking and reflection, from experience and activity, and through conversation.

Dyke et al. (2007) suggest that the non-linearity of the Web leads to the potential for different routes through tools and resources and different forms of learning. They argue that ICT enables the learner to move beyond linear pathways of learning, characteristic of, but not exclusive to, behaviourist approaches, and to adopt more individualised strategies and pathways.

Another aspect of the interaction affordance of ICT is the potential for multi-modal and non-linear approaches to learning. Multimedia tools provide a way of giving learners not just access to materials, but also a means of interacting with the materials. Examples include virtual simulations, where learners can change variables and see the effect on a model of say an ecological system. E-assessment tools can allow students to test out their understanding of a topic through a range of different types of online assessment questions types. The system can then provide either instant feedback or forward the results for a teacher to provide feedback later. Clearly publishing tools such as blogs and wikis provide the user with the ability to produce user-generated content. In addition there are now a range of tools that can allow users to mix and match different functionality, such as mash up tools. Gaming environments and virtual worlds allow the user to interact in digitally authentic, specialised spaces. User actions in games for example will result in particular paths through the gaming material to be taken. In virtual worlds it is also possible for users to acquire or even build new objects and personalities.

Dialogue
Learning through discussion with others is an important and well recognised aspect of learning, going back to Vygotsky's work (Vygotsky, 1962; 1978).

New technologies have opened up the possibility of new forms of dialogue and communication. ICT offers the potential to develop new forms of online communities and new means of communicating and sharing information; from signing up to particular mailing lists through to involvement in specialised discussion forums and chat rooms. New technologies provide a plethora of ways in which learners can communicate with their peers, their teachers and others beyond the course cohort. Tools such as Twitter provide learners potentially with access to an international community of others with shared interests, providing the opportunity for just-in-time learning. As a learner of Spanish I have used Twitter extensively in this respect. If I posted a tweet on something I didn't understand (for example the use of the verbs ser and estar in a particular context) I would invariably get a near instant response from a number of people, providing me with different explanations of which term should be used and when.

Similarly peer critiquing via blogs provides a mechanism for others to comment on thoughts and ideas. Indeed this is a technique I have used in the process of writing this book, in that I have posted draft chapters on which others have then provided comments.

Synchronous communication tools, such as chat tools, and audio and video conferencing provide a different forum for debate and discussion and can be used in a variety of ways, to come to an agreed consensus on something, to discuss issues, to brainstorm ideas or as a backchannel to support events. In Chapter 15, I describe the way in which the conferencing tool, Elluminate, was used in conjunction with the social networking site, Cloudworks, to provide a rich interactive environment for discussion and debate.

Creativity

In a call for a special issue of the journal, EURODL,[5] Sorenson et al. (2010) argue that creativity is a key digital literacy skill that learners need to develop. They cite Runco (1996) who argues that:

> Creative thinking reflects the original interpretation of experience (Runco, 1996). Each of us has the capacity to construct original interpretations, and if it is a useful and original interpretation, it qualifies as "creative." That is how creativity is typically defined, as both useful and original (Barron, 1955; Runco, 1988).

Runco (2008) also argued that creative potential should be a primary concern for educators and that educators need to recognise that creativity is widely distributed, virtually every individual has the mental capacity to construct the personal interpretations that are involved.

The term creativity is derived from the latin term 'creo' meaning to create or make.[6] It is about making something new (either a physical artefact or a concept) that is novel and valuable. It is about the ability to transcend traditional ideas, rules, partners, relationships and create meaningful new ideas, forms, methods and interpretations. It is important because it is an essential skill, needed to deal with today's complex, fast changing society. Furthermore, it is evident that it can be promoted through discourse and collaboration that are mediated through a range of social and participatory media.

Wallas (1926) identified the following five stages of creativity:

- Preparation - identifying the problem.
- Incubation - internalising of the problem.
- Intimation - getting a feeling for a solution.
- Illumination - creativity bursts forth.
- Verification - the idea is consciously verified, elaborated and applied.

Therefore, according the Wallis, the creative process moved through the initial identification and focus on a particular problem, through a moment of enlightenment and finally to validation through sharing with others.

Technologies can be used in a variety of ways to support creativity. They can promote creativity in new and innovation ways. They can enable new forms of discourse, collaboration and cooperation. They can provide users with access to knowledge, that can be repurposed or represented via different forms of representation. New social and participatory media, in particular, enable the aggregation and scaling of information; distributed and collective.

[5] http://olnet.org/sites/default/files/OPEN-CALL-CreativityOER.pdf

[6] http://en.wikipedia.org/wiki/Creativity

Sorenson et al.'s special issue of EURODL is exploring the ways in which creativity can be promoted through the use of OER. In the call for papers they argue:

> In this special issue we are interested in exploring in more depth the nature of *creativity* and how this might be understood and used to better harness the potential of OER. In related work we have explored how alternative theoretical perspectives such as drama might influence our imagination in relation to how we use OER (Sorensen 2010), and how the use of collaborative pedagogical patterns might be used to support use of OER in collaborative learning contexts (Conole et al. 2010).

Other social and participatory media can also be used to promote creativity by representing knowledge in different ways, enabling learners to connect with others globally, and by providing multiple, often serendipitous, routes through information.

Organisation
Being able to organise information is an important skill and an important part of the learning process. Learners need to be able to find and organise relevant information for their learning, so that it can be archived and easily retrieved. Learners need to be able to combine different sources of information to construct new understanding and meaning in relation to a particular topic. Arguably the way information is organised forms a kind of mental schema, which in itself can act as a learning aid.

Asynchronous tools, like discussion forums, can be used by students to access and build up an archive of material relevant to their course. More generally there are now a range of tools that students can use to aggregate resources, such as social booking sites. Referencing tools are useful as a means of organising research papers, and can be used not only to compile references, but also as a means of building up an annotated bibliography. Recommender sites can also be useful in terms of suggested related items of interest to a user, and RSS feeds mean that information can be filtered and pushed to the end user according to their own learning preferences.

Inquiry
Inquiry-based learning has long been recognised as one aspect of constructivism. The Personal Inquiry (PI) project (Sharples and Scanlon, 2011) for example developed an inquiry-based learning model (NQuire),[7] which was used as the basis for an online toolkit to promote inquiry-based learning in the development of scientific understanding in school children. Edelson et al. (1999) argue that inquiry-based learning is particularly important in a science context because science is essentially a question-driven, open-ended process and therefore students need to have personal experiences with scientific inquiry to understand this. They go on to suggest that inquiry activities provide a valuable context for learners to acquire, clarify and apply an understanding of science concepts.

Effective use of search engines can be used to foster inquiry-based learning, although it is important to note that learners need to acquire the necessary critical literacy skills in order to evaluate the relevance of the resources they find.

Authenticity
Learning-by-doing is another effective way to learn. Authentic learning is important in a rapidly changing world where the volume of information is ever expanding and where learners are likely to have multiple careers. Therefore the development of expert thinking and complex communication are key skills for learners to develop. Lombardi (2007) argues that:

[7] http://www.nquire.org.uk/

The Internet and a variety of emerging communication, visualization, and simulation technologies now make it possible to offer students authentic learning experiences ranging from experimentation to real-world problem solving.

She goes on to state that learners often express a preference for learning by doing, and that they are motivated by real-life problems. Technologies provide a variety of mechanism for offering students authentic learning experiences based on experimentation and action. Furthermore providing students with access to online research communities, enables them to develop a deeper sense of the disciplinary culture.

Authentic learning focuses on real-world problems and can be promoted through role-play, problem-based learning, case studies and participation in virtual communities. Technologies can provide learners with access to real research data and researchers. Visualisation tools and haptic technologies can provide students with authentic experiences, closely mimicking real world contexts. One example is the HapTEL project,[8] which has developed a virtual learning system that includes haptic and synthetic devices for use by trainee dentists.

Technologies can also enable students to cohabit persistent simulations or metaverses, allowing them to role-play, look at multiple perspectives to the same set of issues and adapt to a dynamically changing situation. Conole and Dyke (2004a) argue that:

Information technologies provide a means by which people can be exposed to experiences very different to their own and extend their experience beyond their own communities. Experience of the ‘other’ through technology raises issues around authenticity and power in the “virtual reality” that can be accessed. For example, there may be disjuncture between the mediated ‘reported’ experience and the reality of lived experience. It raises questions about how one distinguishes between what is real and what is rendered real via the technology.

Constraints

In addition to considering how different technologies can be used to support different forms of pedagogy through the affordances outlined above, there are also a number of constraints, which the designer needs to consider. Firstly, a particular technology may be time consuming in terms of the development of it to support a particular learning intervention. Secondly, it may be time consuming in terms of the amount of support that the teacher needs to give to the learners in using the technology. For example, forums can require an significant amount of moderating. Thirdly, the technology may be difficult to use. For example, for some wikis are difficult to get used to. Virtual worlds, like SecondLife, take time to adjust to and learners may need considerable support when they first use these tools. Fourthly, tools may be costly to produce, for example rich multimedia resources not only take time, but resources to be developed. However, with the advent of the many free tools that are now available for producing content, arguably this is becoming less of an issue. Fifthly, there may be assessment issues with use of particular tools, for example what is the most appropriate way to assess group work using a wiki? Sixthly, tools may lack interactivity, for example static Web pages, leading to potential student disengagement. Finally, use of online social and participatory media can result in learner confusion and can be difficult to navigate, hence clearly signposted learning pathways might be needed.

Conclusion

This chapter has defined the notion of affordances and discussed it in relation to the affordances of different technologies. It has argued that the term is valuable in that it describes the way in which there is a complex and dynamic co-evolving relationship between technologies and users. By

[8] http://www.haptel.kcl.ac.uk/

considering first the positive affordances and then the constraints of different technologies in a particular learning context, practitioners can make more informed design decisions.

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Chapter 7 – Design languages and learning design

Introduction

This chapter provides a definition for the term 'design language' and provides examples of how it is used in a number of professional domains. It summarises the research on design languages and considers how this relates to the notion of a learning design language. It provides a useful contextual background to the discussions in later chapters on the design visual representations and associated visualisation tools, such as the CompendiumLD tool[1] developed as part of the OULDI work. The chapter draws in particular on Botturi and Stubbs (2008), who provide an authoritative account of design language research.

Design is a key feature of many professions, the chapter considers design practices in three disciplines: music, architecture and chemistry and describes how design approaches have been developed in each of these. I then summarise some of the key characteristics of

[1] http://compendiumld.open.ac.uk/

design practice and explore the implications of these in terms of the application of design principles to an educational context.

The challenges of designing for learning

Falconer and Littlejohn (2008, p. 20) argue that there are three challenges facing teachers: i) the increasing size and diversity of the student body, ii) the increasing requirement for quality assurance, and iii) the rapid pace of technological change. Conole (2004) has argued that there is a gap between the promise and reality of the use of technology in education and that there is little evidence that education has changed fundamentally as a result of the use of technologies. Much use of technology appears to simply replicate bad classroom practice resulting in simple Web page turning (Oliver, 2000). Similarly Masterman (2008a, p.210) argues that the lack of uptake of technologies is due to a number of factors: lack of awareness of the possibilities, technophobia, lack of time to explore the use of technologies, aversion to the risks inherent in experimentation and fear of being supplanted by the computer. Agostinho et al. (2008, p. 381) suggest that the uptake of the use of high-quality ICT-based learning designs in higher education has been slow. Factors include: low levels of dissemination of ICT-based learning projects, lack of ICT-based learning examples to model, lack of time, support and training. Sawyer (2006, p. 8) argues that the impact of the significant investment in computers in schools has been disappointing. There are few studies that show that computer use is correlated with improved student performance. Similarly, Koedinger and Corbett (2008, p. 61) write that as new technologies have emerged many hoped that they would have a radically transformative effect on education, but in reality the impact has been much less than expected.

A key issue is that teachers do not know how to design, mainly adopting an implicit approach based around prior experiences and practices. Falconer and Littlejohn (2008) explored practitioners’ design practices through a series of workshops. As a result they identified the following challenges with representing models of practice:

- Ownership of representations - different representations are effective for different communities, and there are a number of different purposes a representation needs to fulfil.
- There are issues around the purpose of representations – in terms of being generic or a detailed sequence used for orchestration or offering inspiration to teachers in terms of implementing them and hence changing practice.
- Designs are both a product and a process, both aspects are important
- The degree of granularity of the design, they found the most common level of granularity is around a lesson plan for one – three hours of learning.

Practitioners’ approaches to design

The extensive range of data collected in the OULDI described earlier in this book provides a rich body of empirical evidence to inform our thinking and the development of appropriate tools for design. In summary we have conducted a series of interviews (Clark and Cross, 2010), workshops and focus groups with practitioners to elicit their approach to design and any associated challenges. A series of key questions were asked, including: the process of design - how do practitioners go about designing learning interventions?

The representations of design - what representations (textual and visual) do they use? Where do they get help and support? How do they share and discuss their designs with others? How do they evaluate the effectiveness of the designs? In addition, the workshops and focus groups enabled us to explore in more depth different aspects of the design process.

Participants were given the opportunity to use a range of representations to create, share and discuss design ideas. The workshops included detailed feedback and evaluation and the artefacts produced were shared on the social networking site, Cloudworks,[2] which is discussed in Chapter 15. Data was also analysed for 43 case studies of the use of the Moodle VLE course management tool. The case studies were derived from a series of interviews with OU course leaders[3] (Wilson, 2007). The focus was on the pedagogies used to achieve specific learning outcomes and the use of tools (blogs, wikis, e-assessment, etc.) to support learning activities. Interviews were semi-structured around four core themes: contextual data (level, subject, etc.), details about the learning activity being described and the sub-tasks involved, pedagogical approaches adopted, and barriers and enablers to the creation of the activity (both technical and organisational). Each interview lasted about an hour and was recorded and transcribed. Following this, the text was edited in a standard template form and a diagrammatic representation of the learning activity drawn. The content was checked for accuracy with the interviewees.

This section provides a summary of some of the key findings from the empirical data, a more detailed discussion of some of the findings from the interviews with teachers/designers in provided elsewhere (Cross et al., 2008; Clarke and Cross, 2010).

The empirical data provided a rich picture of the way in which teachers design. It was evident from the data that there was no one perfect tool for design and that individuals had different preferences of how they went about the design process - some sketching ideas out and linking them, others working systematically from learning outcomes, whilst others used the subject content as a baseline for development. Some used a combination of approaches at different stages of the design. The interviews and case studies provided valuable insights into the design process that cluster into five overarching themes: the process of design - how practitioners go about designing learning activities, support and guidance - where they get ideas and support from, barriers to innovation - what barriers or problems they encounter, representing designs - the ways in which they articulate and visualise designs, and evaluation mechanisms - the ways in which they assess the effectiveness of the designs they create (Figure 1).

[2] http://cloudworks.ac.uk

[3] OU courses as designed by teams of academics, associated lecturers then support the learning and mark assignments.

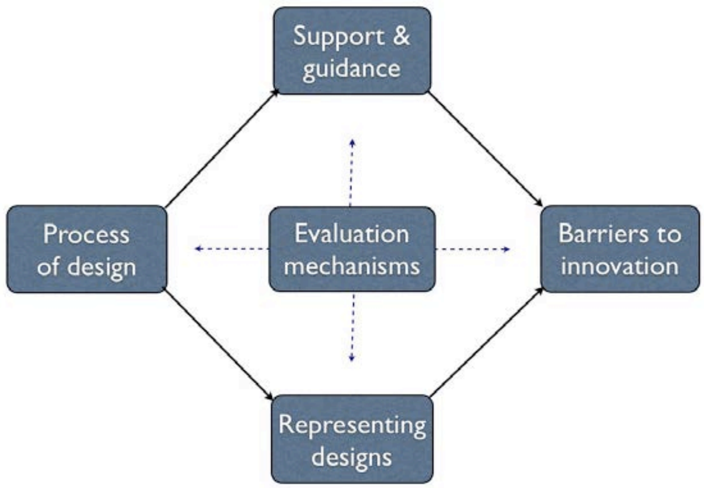

Figure 1: The five overarching themes on design approaches and methods

The most prominent finding from the interviews was that design is a messy, creative and interactive process, and that even when working in teams there is a large element of individuality in the design process. Teachers design at different levels of granularity and focus on different aspects of design over the design lifecycle. Both the interviews and the workshops gave us a clearer understanding of the design strategies that teachers adopt. Foci for design include: looking at learning outcomes and mapping these to assessment strategies, integrating the use of external resources with locally authored materials, designing activities to test understanding, integrating a range of tools and approaches, addressing different learner preferences and levels of competence, and mapping to externally prescribed professional requirements. The following quote, from one of the practitioners, is illustrative of this:

> It's not in one direction. Not sure if I always start with aims, sometimes I do! Broad aims, then thinking about the mix, go to the palette and look at existing resources, what will the budget allow us to do (chairs hat on), what additional resources do we need, which would be most effective to teach certain things. For example, we need this software to help teach linguistic analysis. We might want some video analysis, so think about how to bring in video sequences, what videoing needs to be done. Then start writing. It's chicken and egg. Sometimes start with study guide and then think about activities, and then think I need this bit of video. But you don't always have luxury of working in this direction or budget to do filming so start looking for other sequences and build activities around those. [Interview 160607]

The following quote gives an example of how a teacher iteratively develops their concept of the course over a period of time and how they kept an evolving record of relevant resources and materials for the course:

> I was building a sense of what the new course might be ... we must remember to do x, or a url of relevance. [Interview 160607]

It was also evident that design for a new course is very different to design when redeveloping a course based on interpretation of student feedback and evaluation. The interviews revealed that there was no simple route to teachers accessing support and guidance on the design process. Little use appeared to be made of online resources and networks - most adopted a serendipitous approach, relying on peer practitioners and close colleagues for ideas. One interviewee from the case studies conducted by Wilson (2007) said:

> This says more about me than it does about the stuff really but I preferred the corridor conversations. It was a way of ... I had invested quite a lot of money in coffee and so there were a whole set of people across the university who I took to coffee and pumped them for what I could really. [Case study interview, 210107]

Those interviewed recognised the value of sharing and reuse, but there was little evidence that they shared their designs with others or adapted and repurposed designs created by others. Different forms of representation of learning activities (textual, visual, etc.) all had different advantages and disadvantages and there was evidently a distinction between the process of producing a design and design as an artefact. When shown visual presentations of learning activities for example, many of those interviewed found it difficult to interpret them, to apply/adapt them to their own context. However, on further probing they could see a genuine benefit in using visual tools as a means of mapping their own practice, as is evident in the following quote from one of the interviews:

> [On the value of a visual representation] It always needs to be brought to life, to have some form of enactment... Would I want to see what someone else has done, yes I suppose so. [Interview, 141107]

The conflict between the process of the dynamic creation of an activity and the associated sense of ownership the designer has in the process, contrasts with design as a product, a static artefact. For example one interviewee struggled to see the benefit of a visual representation of someone else's design, even though it was an activity in her subject area. She continued later in the interview to argue for the need for a mediation role to help interpret designs and as she says 'make them come alive':

> [One being shown a visual representation of a learning activity] It's such a different context and level. This is language teaching rather than linguistic teaching. And there isn't the contextual information, even with you having just explained a little, which helped, without you there I'd be looking at this and thinking... I think there'd be too much work to look in to this plus the recontextualisation. I wouldn't spend the time to be honest.
>
> I really think you need someone who goes to the course team, although not necessarily staying with them. And sits down, not right at the start but a little way in, and asks what are you teaching and what resources are you going to use alone or in combination and that person would go away do some work and come back - have some insight into bringing together their knowledge of the technologies available and which would best fit your intention and provide you with a map - that's when a map would work, they'd be bringing it alive. [Interview, 141107]

The interactive and holistic nature of the design process came out strongly across the data:

> One of the difficulties is mapping the whole process I have tried to approach course design using a holistic approach. [Interview, 121107]

Teachers differed in the extent to which they worked visually or textually; some used software, others sketched or wrote out ideas, one teacher had a scrapbook which he used as he was developing his design ideas:

> It's in words, not diagrams a dumping ground for thoughts - [to] capture thoughts. [Interview, 121107]

Others used visualisation as a means of mapping different elements of the design process:

> List of words clustered into blocks, arrows...can you have clusters link to TMAs[4] [Assignments]. [Interview, 141107]

> Start from assessment strategies and learning outcomes and get an alignment. [Interview, 151007]

> I tend to sit and doodle a map - will draw the logic and flow of the course on paper and then go to Compendium. Then the problem is sharing it. [Interview, 291107]

The interviews also highlighted a number of contradictions about the process of design, forms of representation for design and the nature/type of support, which teachers wanted. Firstly, there was a tension between design as process and design as artefact; both were considered important. Secondly, there is the difficulty of capturing what is inherently an implicit process. Thirdly, teachers wanted subject-specific case studies and examples. Fourthly, there are a variety of influences on the different forms of representation and individuals interpretations of them. Fifthly, there is the desire for specific, just-in-time help and support. Finally, there is the issue of how to map the evolving, dynamic and changing nature of design.

Similarly, the Learning Management System (LMS) case studies (Wilson, 2007), highlighted a range of overarching themes:

- Designers/teachers relied extensively on their prior experience and the local context for development.
- There was uncertainty associated with the constantly changing functionality offered by available technologies.
- The willingness, access and ability to facilitate the transfer of good practice varied considerably.
- Existing online learning design resources (case studies, theoretical frameworks, toolkits) were used very little.
- The design process is messy, creative and iterative.
- Existing institutional systems did not adequately reflect new ways of working and effective use of new approaches and technologies.

[4] Tutor Marked Assignments

- The need to take account of the changing nature of the student and academic roles and associated skills set.
- The importance of motivating individuals (both learners and teachers) in driving forward innovative practice.
- The increase in the amount of online activities and materials used in courses has lead to the necessity for more frequent re-designs of courses.
- Issues emerged about the balance of resources and activities associated with the OU's Supported Open Learning (SOL)[5] two-stage process of production and presentation.

The interviews also gave us a better understanding of the nature of the design lifecycle. Figure 2 outlines the six main aspects of the design lifecycle. The cycle begins with the designer's vision and focus for the learning intervention. The second stage is the gathering of relevant resources and tools. The third is assembling these into a sequence. The fourth is running the learning intervention. The fifth is evaluating its effectiveness. The final stage is adaption in light of evaluation feedback, which may in turn lead to changes in the original vision. These six stages can be mapped from course conception, through delivery and finally evaluation. The cycle can operate at a number of levels: a learning activity (typically of the order of a few hours of learning), a block level (usually a semester's worth of work) and a course level (which might be a masters or degree level course programme).

[5] This is discussed in more detail in Chapter 11

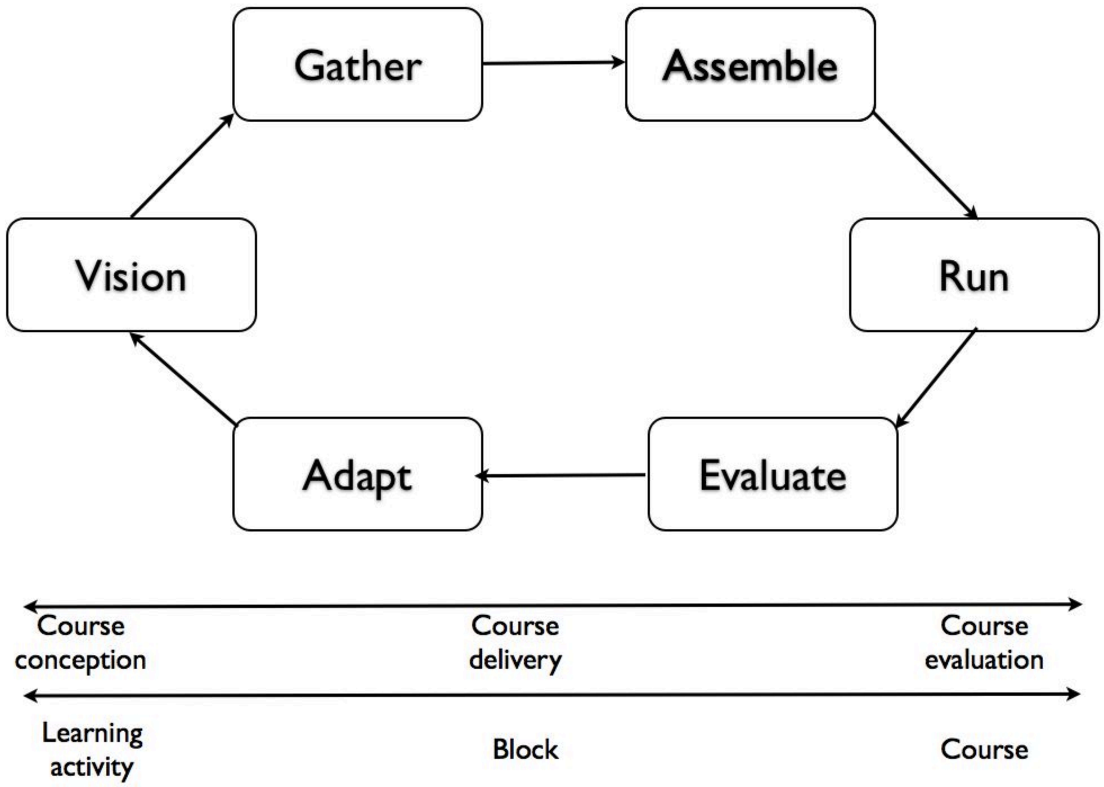

Figure 2: The five overarching themes on design approaches and methods

Repurposing an Open Education Resource

In related work, as discussed in Chapter 5, we explored teachers conceptions of design in terms of how they might repurpose stand-alone Open Educational Resources (OER) to support their used in collaborative learning activities (Conole et al., 2010). A series of workshops were run, in which participants explored existing OER and used a set of collaborative pedagogical patterns (Hernández-Leo et al., 2006) to redesign the OER for use in a collaborative learning context. The workshops were video recorded and the discussions transcribed. The findings from this work were similar to the findings from the interviews and case studies described earlier. Analysis of the data revealed a number of themes that are discussed here. Part of our approach is predicated on the notion that OER have inherent designs and that if we can make those designs more explicit this will aid repurposing. A number of themes emerged with respect to this, which are discussed in this section. In the following sections participants are represented as P1, P2, etc. while the workshop facilitators are indicated as F1, F2, etc.

It was evident that there were a number of ways in which textual representations could emphasise different aspects of the design – some were descriptive in nature, others were more metaphorical and others more operational – for example a bullet list articulating steps in a learning sequence. A common approach adopted by the participants was to have a temporal sequence. Another strategy was to focus mainly on the content and associated resources. Participants started from different perspectives; some began by considering the learning objectives, whilst others started with the content or activities:

> **P2:** My resource is a design by itself. So, it is the design of an activity, it is the representation of that, a few bullet points and then a graphical representation. …. So the resource basically represents arrows pointing into a sequence of the activities.

It was interesting to see the extent to which each of the representations was easily sharable with others. More often than not a dialogic engagement was necessary to help make sense of the design and to clarify misunderstandings. The exercise and subsequent discussion enabled us to tease out both the main facets of design and participants' different perspectives and approaches. In addition to articulating objectives, content and tasks, some of the participants evidenced a subtler level of design – associated with the inherent principles of the design:

> **P3**: My resource is task-driven, so that is the principle and also it integrates many pedagogies into the content, so, and also it is question based.

In terms of principles we explored whether or not they had articulated a principle around individuality/collaboration. A range of characteristics was identified as being associated with the design – the objectives, generic characteristics, sequence of tasks undertaken, and whether it had an individual or collaborative focus. Participants recognised that it was important to clarify what information was essential to communicate so that the activity could be subsequently taken up and adapted by others:

> **F1:** Just try to think again of what elements you wrote down and what elements you used when you tried to explain it to your neighbour and try to think whether they were mainly based on objectives, mainly based on the characteristics of the activities, of a temporal sequence or …

One of the participants suggested that it would be valuable to have multiple views of the same design each view representing a different aspect:

> **P7:** So probably having different layers of visualization of the same structure could help filter the relevant information if you are looking at the learning objectives, or if you are looking at interactions, something like that, so, another thing that we were thinking about it probably what is missing is a legend of the different items, because we understood that there is a mixing of two layers, one is devoted to the designer, for example, all the questions in blue are annotations for the designers while for example it is very clear that the sequence for students is talking to the student verbally, it is talking to him, so probably having the legends saying ok, question mark annotation for the designer and the red bits are feedbacks we had from one evaluation and then filtering visually this information according to the task you are following.

This participant also argued that visualisation potentially has additional power, particularly if a semantic dimension is included:

> **P7:** A semantic of visualizations, really we understood that some of the connection are more related to cognitive activities of the design where as others are tactical activities of the use (missing comment) and cause and some other connection are like database

connections with the resources and what they are looking, so probably having different semantic of the connections and representations.

Another aspect of importance, that participants mentioned, was identifying the quality and provenance of the resource; i.e. designs need to do more than display the sequence of activities, users need some indication of how effective and fit for purpose it is. There are two ways in which this can be achieved. Firstly, in the design representation itself, however the more detail that is included in the design the more complex it is. Secondly, an alternative is to have a wrap-around dialogue about the resource and its design, in a social networking site, such as the Cloudworks site[6] which is discussed in more detail in Chapter 15. The data revealed that deconstruction and subsequent reconstruction of OER is complex, indeed it is possible to identify four layers that need to be considered to make most effective repurposing of an OER. Conole et al. (2010) identified the following four aspects of this:

1. Visual representation of the design. How can the implicit OER design be made more explicit and hence shareable?
2. Opinion of goodness. How appropriate is the OER for use in different educational contexts?
3. Transferability through pedagogical patterns. How can generic patterns be applied to specific contexts?
4. Level of discussion, critique and contextualisation. How might social networking sites, like Cloudworks, act as a supporting structure to foster debate between those using the same OER?

In conclusion describing design was seen as a difficult and unfamiliar task. It is evident that there are multiple solutions to any one design problem. There are also many options for what can be included and it is hard to interpret designs in a consistent way. Finally, any one design representation is only able to capture partial details.

Design languages

It is worth beginning by comparing general language use with design language. Language is what people use for communicating information and ideas; design language is what designers use to communicate design plans, and intentions to each other. Cole et al. (1997) argue that “the languages used to a great extent shapes what can and cannot be thought and said” (cited in Gibbons and Brewer, 2005, p. 113).

Design languages can be used to both generate designs and as a mechanism for interpreting and discussing them. They are used in a range of professions, where there is a focus on developing a specific artefact of some kind. Examples include: architecture, music composition, writing, choreography, mathematics and computer programming. With reference to the design of software systems, Winograd (1996) argues that design is not a static noun, but refers to the activity of design. He identifies a number of important aspects: design as a conscious process, design as dialogue with materials, design as a

[6] http://cloudworks.ac.uk

creative process, design as a communicative process and design as social activity. He describes design languages as “visual and functional languages of communication with the people who use an artefact. A design language is like a natural language, both in its communicative function and in its structure as an evolving system of elements and relationships among those elements” (Winograd, 1996, p. 64).

Botturi and Stubbs (2008) demonstrate that there is a plethora of languages available to choose from; ranging from sketch-oriented languages that facilitate the creation and representation of the grand view of a design to more formal languages that enable detailed representations of specification and/or implementation details of a design. Botturi et al. (2006, pg. 1), citing Gibbson and Brewer, define a design language as “a set of concepts that support structuring a design task and conceiving solutions”. They go on to define a design language as a mental tool that can be expressed and hence communicated through a notation system (i.e. a set of signs and icons that allow representing a design problem or solution so that it is perceivable by our senses).

Design theory refers to identifying methods (or models, techniques, strategies and heuristics) and when to use them. Reiguluth and Carr-Chellman (2009, p. 7) argue that design theory is different from descriptive theory, in that it is goal oriented and normative. It identifies good methods for accomplishing goals, whereas descriptive theory describes cause-effect relationships. Arguably teachers need to develop both – design expertise through application of a design-based approach to the creation of learning interventions and descriptive expertise in terms of interpreting and understanding the learning that takes place. The Open Learning Design methodology described in this book aims to facilitate the development of both approaches.

Goodyear and Retalis (2010) describe the role of language generally in terms of supporting abstract thought and the ability to deal with complex conceptual change. They argue that it involves the creation and manipulation of symbolic representations of the world.

Gibbons et al. (2008) argue that design languages are an important aspect of instructional design. They define a design language as a “set of abstractions used to give structure, properties, and texture to solutions of design problems”. Hohanson et al. (2008, p. 19) suggest that a design language is “what designers use to communicate designs, plans and intentions to each other and to the producers of their artifacts”, citing Gibbons and Brewer (2005, p. 13). Rose (2001) argues that understanding visual representations is a learned skill. As I will discuss elsewhere in this book, there are a range of new digital literacies that teachers need to acquire in order to design effective learning interventions that make effective use of new technologies (Jenkins et al., 2006; Jenkins, 2009).

Visual languages serve several purposes: i) to communicate a message through a visual or functional language, ii) to provide a synthetic idea, image or metaphor of complex ideas and iii) to create a grammar or produce meaning for its use. Gibbons et al. (2008) argue that design languages: i) encourage disciplined design practice, ii) give organisation to the growth of design fields, iii) helps give historical context to evolving design fields and iv) connect practices of a design field to theoretical concepts.

Botturi et al. (2006) argue that educational modelling languages have emerged as conceptual tools to help designers deal with the increasing complexity of designing for learning making effective use of new technologies and pedagogies. They argue that they enable the development of reflective practice and potentially enhance a more thorough understanding and reuse of e-learning. Derntl et al. (2008, 2010) suggest that a shared design language is one mechanism for dealing with design complexity and the requirements of communication in interdisciplinary design teams. They argue that designing for learning needs both 'beauty' and 'precision'; and they show how different design languages can be used to present these. They state that "we are in no way suggesting that beauty and precision are in opposition to one another, nor even that they are mutually exclusive concerns. We make the distinction merely to further stress the competing demands on instructional designers for maintaining a grand view of the learning experience while also addressing the myriad details of an effective end product".

Stubbs and Gibbons (2008, p. 35) suggests that visual representations serve two purposes in design: i) they can be used during design as part of the design process to represent some aspect of instruction before it is produced or represented (this may be in the form of storyboards or flow charts) and ii) they can be part of the content that is being produced. They also argue that design drawing can aid the designer by reducing cognitive load during the design process and because a design sketched is an external representation, it can augment memory and support informational processing. They also suggest that another view of drawing is similar to Vygotsky's description of the relationship of language to thought (Vygotsky, 1978). Substituting drawing for words, Vygotsky said: "Thought is not merely expressed in (drawings), it comes into existence through them". Languages in general provide advantages that are particularly useful in design. Firstly, they allow thought to be communicated so that good ideas do not get lost. Secondly, they provide a focus of attention that permits higher-power processing and anchoring of thought. Thirdly, they provide the ability to question and judge the value of the thought – to construct thoughts about thought. Jackendoff (1996) suggests that there are two stages to the design process: sketches to try ideas out and, as the design progresses, the drawings become more formal, and more governed by rules and conventions.

McKim categorises abstract graphic languages into seven types: Venn diagrams, organisation charts, flow charts, link-node diagrams, bar charts and graphs, schematic diagrams and pattern languages, (McKim, 1980), whereas Laseau (1986) categorises them into four main types: bubble diagrams, area diagrams, matrices and networks.

Massironi (2002) has produced a taxonomy of graphic productions, which categorises design drawings by their form and purpose. He distinguishes between representational (physical reality) and non-representational (abstract concepts) drawings. Botturi (2008, p. 112) identifies two types of languages: i) finalist communicative languages, which serve the purpose of representing a complete instructional design for communicating it to others for implementation, reuse or archive and ii) representative, which help designers think about the instruction they are designing and support its creation. The ability to express an idea allows people to better analyse and conceptualise it and to make better design decisions.

Boling and Smith (2008) describe the range of Mediating Artefacts that are used to support design both as process and product. The way in which we are using the concept of Mediating Artefacts in the design process is described elsewhere (Conole, 2008) and was discussed in more detail in Chapter 5. Boling and Smith highlight the importance of sketching and consider the interplay between the two modes of mental representation required for sketching – propositional (largely symbolic) and analogue (quasi-pictorial, spatially depictive). They reference Goldschmidt (1991), who argues that there is an oscillation between propositional thinking and descriptive thinking during the process of design.

Botturi et al. (2006) described a number of commonly used design languages. A selection of these is provided here. The intention is not to be comprehensive, but to give an illustration of the different kinds of design languages that have been developed and to describe how they are used for different purposes and with different kinds of users; the examples described range from computer runnable formal languages through to more ‘fuzzy’ and less formal languages that are aimed at practitioners.

Gibbons and Brewer (2005, p. 121) argue that once a notational system is established it can become: i) a tool for remembering designs, ii) a structured problem-solving workspace in which designs can take form and be shared, and iii) a kind of laboratory tool for sharpening and multiplying abstract design language categories. Indeed it is evident that there is a complex evolution of design languages and associated notations and that this evolution is closely tied to the nature of the subject domain and what is of particular importance to foreground and emphasise. So for music it is ensuring the accurate representations of the sounds in time, for architecture it is seeing the ways in which the different components connect and how they look overall and in chemistry it is about foregrounding the associated chemical properties and patterns of behaviour of the atoms and molecules.

Gibbons and Brewer (2005, p. 115) list a set of dimensions of design languages. The first is complexity, namely that design are merely partial representation of much more complex, and multifaceted ideas in our minds. The second is precision, there is a tension between the natural, fuzzy nature of real practice and tightly defined specification. This tension is very evident in an educational context, in particular in the specification of formal technical learning designs that can be translated into machine-readable code as opposed to fuzzy, practice-based designs. The third is formality and standardisation, which refers to the importance of ensuring that terms used mean the same to all users. The fourth is the tension between personally created designs and those that are shared with others. Designs only become public or sharable through negotiation and interaction with others. Designs should never be seen as static artefacts and are always dynamic and co-constructed in context. The fifth is the tension between implicit, individual designs to those that are completely explicit with clearly defined terms and rules. Again this is a crucial issue in an educational context, where traditional teaching practice has been implicit and designs fuzzy. Shifting to more explicit and sharable designs requires a change of mindset and practice. Related to this are issues around standardisation verses non-standardisation. In terms of these points, there is a tension with designs in terms of how much they focus on precise presentation, specification and how much on the more aesthetic, visionary aspects of the design. Derntl et al. (2008) consider this in an instructional design context, arguing that:

> On the one hand, solutions should be creative, effective and flexible; on the other hand, developers and instructors need precise guidance and details on what to do during development and implementation. Communication of and about designs is supported by design languages, some of which are conceptual and textual, and others more formal and visual.

They present a case study where both a creative solution (‘beauty’) and clear-cut details (‘precision’) are sought. Finally there are issues around computability. Some languages are formalised and precise and hence can be converted into machine runnable code. Gibbons and Brewer (2005, p. 118) go on to argue that designs can be shared in two ways: i) by a description that relies on natural language or ii) through a specialised notation system that uses figures, drawings, models or other standard symbolic representations to express the elements and relationship of the design.

Designs have a number of components. Firstly, the context in which the design is created and used; i.e. a design carries with it a socio-cultural element, i.e. the background and context, both of the individuals involved and the educational setting. Secondly, the inherent beliefs of the designer; i.e. a design carries with it intentions, aspirations and beliefs. In a learning context this is the designer’s beliefs about what should be learnt and how it should be achieved. Donald et al. (2009) see this inherent belief basis of teaching practice as a vital tool for unlocking and shifting practice. They have developed a learning design system, HEART (HEaring And Realising Teaching-voice), which aims to support teachers learning design practice by eliciting and depicting the pedagogical beliefs underpinning a learning design or a resource. In an educational context our implicit designs are based on a mix of theoretical concepts, prior examples, personal ideals and idiosyncratic opinions. Finally, designs should encourage reflection and should support iterative redesign and reuse.

Design notation in music, architecture and chemistry

I now want to turn to some examples of how design languages are used in other professions. I will consider three examples: the development of musical notation, architectural designs and design in chemistry.

Musical notation

Daziel (2009) compares the development of a learning design notation to the emergence of a notation for music. Musical notation captures abstract musical designs in the form of graphical, textual and symbolic representations. It is precise enough that a piece of music written by a composer from 300 or 400 hundred years ago can be accurately replayed. Early musical notations can be traced back to 2 000 BC, but the standard notation used today is a relatively recent phenomenon, before its development, music had to be sung or played from memory. This severely limited the extent and reach of music, as well as resulting in a loss of fidelity of the original music as they were transferred from person to person memorising them. Musical notation went through a range of forms before settling on the notations we use today (Figure 1). The notation includes a complex set of instructions about not just the notes to be played and their sequence, but the timing, intonation and even some of the emotion embodied in the music.

Figure 1: Music notation[7]

Architectural notation

Architectural notation helps articulate and share an architect's origin vision behind the development of a building and make it explicit and sharable with others involved in the design and development of the building. For example, Figure 2 shows some modern architecture in Valencia. The building manages to convey both functionality with emotion and an element of organic form. The creation of this will have involved a complex range of design representations; from the initial vision/intent of the architect through to actual creation of the building. Buildings are complex and three-dimensional. Design decisions have to cover a range of factors; such as the layout of the building, the relationship between the different components, the types of materials, the nature of the site where the building will be located, etc.. Different designs are therefore needed to relate certain elements of the design to each other, while ignoring others, and these allow the designer to see their creation from different perspectives. Three-dimensional visual representations are often annotated with text and supplemented by tables of data. In recent years design representations in architecture have being computerised with the emergence of sophisticated Computer Assisted Design (CAD) tools. Arguably use of these CAD tools has influenced the practice of design, in addition to facilitating more effective sharing of designs.

[7] Source: http://www.flickr.com/photos/anyaka/21848267/ and http://www.flickr.com/photos/13519089@N03/1396447714/

Figure 2: An example of modern architecture in Valencia

Chemical notation

Chemists use a number of design representations, from chemical symbols for individual atoms, through various visual representations for displaying molecules and chemical equations for the design of chemical synthesis and for explanation of particular chemical properties (Figure 3). As with music and architecture, the design representations that have been developed closely mapped to the discipline itself and the key focus of interest. Chemistry is fundamentally concerned with the properties and chemical behaviours of individual atoms and how these can combine in different ways to create molecules with different properties. Two-dimensional representations are common (for example chemical equations), but three-dimensional representations are also useful and particularly valuable when looking at large molecules with complex typologies. As in architecture, a number of computer-based tools have now been developed to enable drawing and manipulation of molecules. These can in some instances be based on real data, such as the atomic coordinates of individual atoms and so are also powerful modelling tools as well.

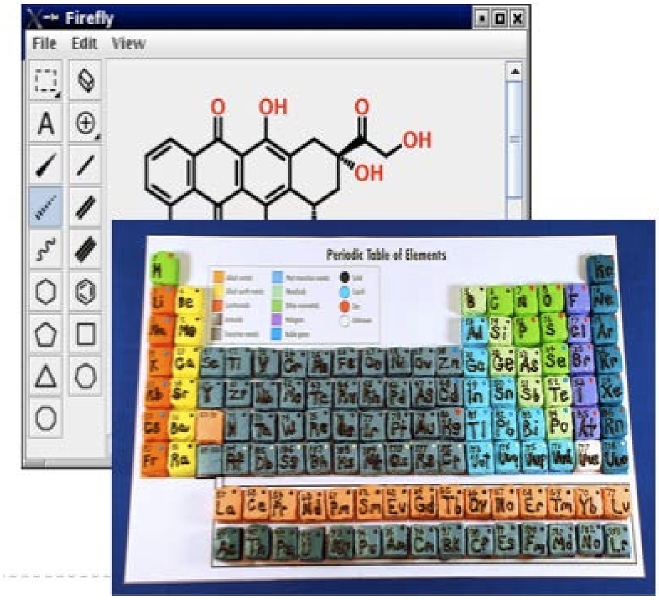

Figure 3: Chemistry notations[8]

Learning design

This section describes the emergence of learning design as a research field. This is an important and vibrant research field and there have been a number of edited collections in recent years (Beetham and Sharpe, 2007; Lockyer et al., 2008). One of the main drivers for the emergence of learning design as a research field is arguably that teachers are now presented with many choices in how they can design and deliver their courses (Agostinho, 2008). They are confused by the plethora of technologies and different pedagogical approaches they can adopt. Furthermore, teachers often struggle with implementing theory into practice (Fang, 1996). Kelly et al. argue that “modern educational interventions must respond to new scientific knowledge emerging from technology-infused, Internet-intensive, highly social, networked science” (Kelly, et al. 2008, p. 3).

Learning design as an approach aligns with a number of related research work, in particular research on pedagogical patterns (Goodyear and Retalis, 2010) and Open Educational Resources (Iiyoshi and Kumar, 2008). The Iiyoshi and Kumar book provides an overview of the open content and knowledge movement, of which Open Education Resources research is one aspect. I will provide an overview of these related fields and will attempt to show how these areas are related to, but also distinct from learning design. I intend to make a more explicit connection between the area of learning design, pedagogical patterns and Open Educational Resources. See Conole et al. (2010) for more on this. I discussed aspects of this work in more detail in Chapter 5. Goodyear and Retalis (2010) provide a useful edited collection of current research in the field of pedagogical patterns. This includes a chapter by Conole and Jones (2010), which begins to align the

[8] Sources: http://www.flickr.com/photos/8272941@N07/498827420/ and http://www.flickr.com/photos/chemheritage/3984920162/

learning design and pedagogical patterns research, through the description of a learning activity as both a visual learning design representation and as a pedagogical pattern. As discussed in Chapter 2, the work also aligns with related research in instructional design and learning sciences (Reigeluth and Carr-Chellman, 2009; Sawyer, 2006; Spector, al., et 2008).

Design is arguably *the* most important aspect of learning and teaching. However, design tends to be based on prior experience, practitioners make limited use of different pedagogical approaches; effective design enables teachers to make informed use of technologies and incorporation of innovative pedagogies approaches, which can meet the challenges of today's rapidly changing educational context. However, design is complex and teachers need support and guidance to effectively incorporate new technologies, to think differently, and to change their practice. This book outlines a means of achieving this, along with practical tools and methods. All of the tools and methods described are freely available.

Defining learning design

Learning design as a research field has emerged in the last ten years or so, primarily driven to date by researchers in Europe and Australia. Before describing the methodology we have developed at the Open University, I will provide a brief overview of the development of the field and some of the key features and milestones. The learning design research work has developed in response to a perceived gap between the potential of technologies in terms of their use to support learning and their actual use in practice (Bennett et al., 2007; Conole, 2004; Herrington et al., 2005). Much of the learning design research is concerned with mechanisms for articulating and sharing practice, and in particular the ways in which designs can be represented.

Learning design has developed as a means of helping teachers make informed choices in terms of creating pedagogically effective learning interventions that make effective use of new technologies. Learning design representations enable teachers to document, model and share teaching practice. Learning design also encompasses both the process of designing learning experiences, as well as the product, i.e. outcome or artefact of the design process.

A learning design can represent different levels of granularity – from a whole course down to an individual learning activity. In addition, it can be a formal representation, which is computer runnable or simply a semi-formal way of describing the learning intervention.

Goodyear and Yang (2008, p. 167) use the related term educational design, which they define as "the set of practices involved in constructing representations of how to support learning in particular cases or the set of practices involved in constructing representations of how people should be helped to learn specific circumstances". They argue that "educational design takes time, it rarely starts with a clear complete conception of what is desired". The process of iterative clarification of the nature of the problem and its solution involves complex thought. Goodyear (2005) also further elaborates on the definition of educational design as:

The set of practices involved in constructing representations of how to support learning in particular cases.

This distinguishes design from development - the practices of turning these representations into real support for learning (materials, task specifications, tools, etc). It distinguishes design for particular educational applications from the broad consideration of learning in general. It focuses on practice rather than theory, while recognising that practice embodies experiential and theoretical knowledge. Goodyear (2005) identifies three aspects of educational design. The first is the design of good learning tasks. The second is the design and management of the learning environment. The third focuses on the social aspects of learning. Goodyear and Retalis (2010) argue that good design is hard and takes time, it involves the design of good tasks, but also the design of supportive learning environments. Design works indirectly, learners have the ability to adapt, customise and invent. Design works at various levels, from the detailed functionality of a tool right up to institution-wide infrastructure.

Beetham and Sharpe prefer the term ‘designing for learning’, which they define as:

The process by which teachers – and others involved in the support of learning – arrive at a plan or structure or design for a learning situation (Beetham and Sharpe, 2007, p. 7).

Like Goodyear and Yang (2010), they believe that learning can never be wholly designed, only designed for (i.e. planned in advance) with an awareness of the contingent nature of learning as it actually takes place.

Beetham (2007, p. 28) defines a learning activity as:

A specific interaction of learner(s) with other(s) using specific tools and resources, orientated towards specific outcomes. See Figure 4.[9]

Within this context a learning outcome is intended to lead to some identifiable change that is anticipated in the learner. Beetham argues that because a learning activity emerges as the learner engages in a task, the elements identified are in practice highly interdependent and can only fully be defined when the activity is completed. As the figure shows, at the centre is the learning activity that the leaners work through. There are four aspects to achieving this. First, the characteristics of the learners. Second, the intended learning outcomes. Third, the environment and associated tools and resources. Fourth, the nature of the interactions with other learners and teachers.

[9] Derived from Beetham and Sharpe (2007, p. 29)

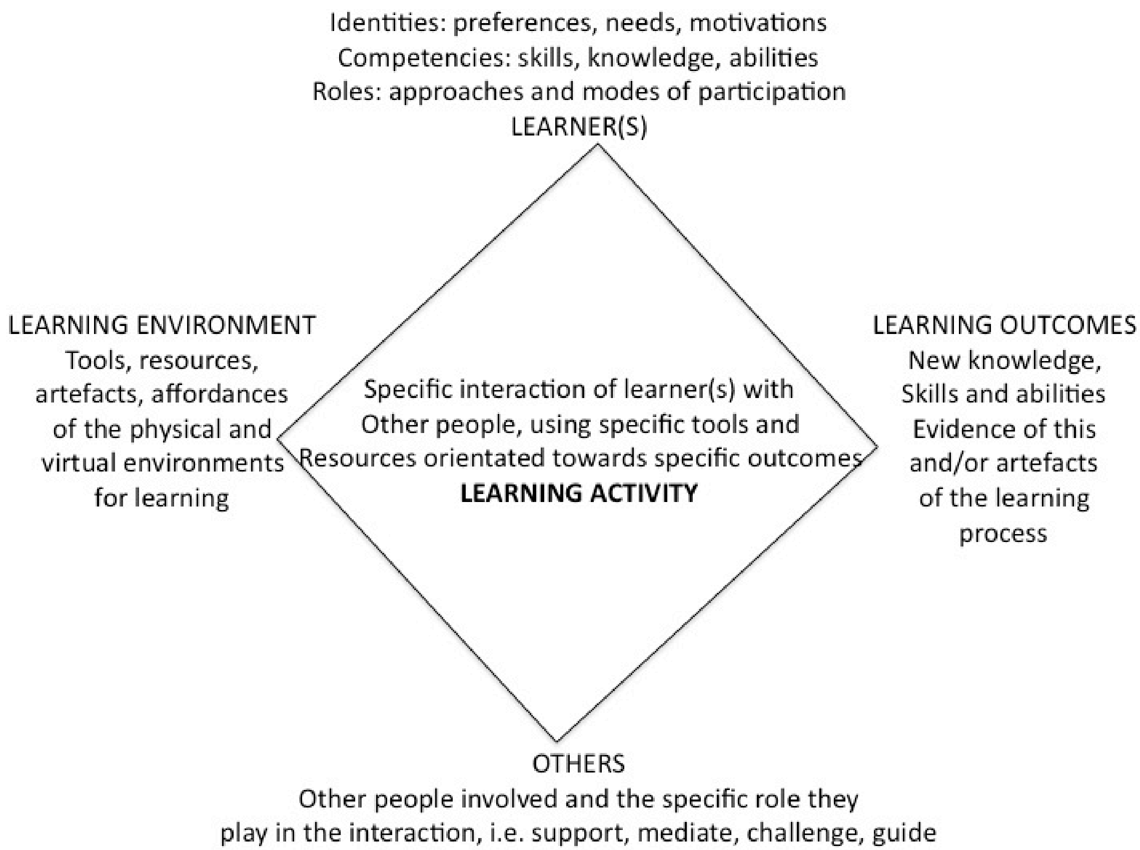

Figure 4: The components involved in a learning activity

Chatteur et al., quoting Neal and Miller (2005), argue that e-learning design is a careful balancing act between pedagogy and technology; often at the expense of pedagogy (Chatteur et al., 2010, p. 183). They go on to argue that designing e-learning is a particularly complex task and quote Rittel and Webber (1973) arguing that design can be described as a 'wicked' problem (Chatteur, et al., 2010, p. 184).

The origins of learning design

The origins of the term learning design can be traced back to work at the OUNL in the Netherlands in terms of the development of a Learning Design (LD) specification, which subsequently translated into the IMS LD specification.[10] From a review of learning theories an Educational Modelling Language (EML) was developed (Koper and Manderveld, 2004) and from this a Learning Design specification was derived (see for example Koper and Oliver, 2004 and Koper and Tattersall, 2005). Focusing very much at the technical level, it was claimed that the LD specification was pedagogically neutral and could be used to describe any learning intervention. The specification was based on a theatrical metaphor, describing the roles of those involved in the intervention (learners, teachers, etc.), the environment in which it occurred, and the tools and resources involved. Inherent in the approach was the assumption that educational practice can be represented in a design description, i.e. that underlying design ideas and principles can be

[10] http://www.imsglobal.org/learningdesign/

captured in an explicit representation. In addition, the design of a course is driven by 'pedagogical models' that capture the teacher's beliefs and is a set of rules that prescribe how leaning can be achieved in a particular context. Koper and Oliver (2004: 98) define Learning Design as:

An application of a pedagogical model for a specific learning objective, target group and a specific context or knowledge domain.

IMS/LD represents a learning design, referred to as a 'unit of learning', which is a sequence of activities described in the form of acts in a play. It is a formal computer language that both documents the final contextualised learning design and executes the learning design to the learner. It describes the roles and activity sequences within an environment of learning objects and services. Properties, conditions and notifications can also be defined to further fine tune and specify the design. It specifies the learning-teaching process. A number of tools have since been created to run IMS LD specifications, but the work has not had a fundamental impact on changing teacher practice, focusing more on the technical description and running of the designs. These include the RELOAD LD editor,[11] the CopperCore editor,[12] Collage,[13] and MOT+.[14] Botturi and Stubbs (2008) provide a more detailed description of these and other related learning design editing tools.

UML (Unified Modelling Language)[15] has also been adapted for use in e-learning contexts. Botturi et al. (2006) describe E2ML, which is based on UML, as a simple design language coupled with a visual notation system consisting of multiple interrelated diagrams. Agostinho (2008) lists three types of E2ML documents: goal definition, action diagram and overview diagram.

Since then others have appropriated the term learning design in a much broader sense, shifting to the notion of 'designing for learning'. Cross and Conole (2008) provide a simple overview of the field; see also Conole and Galley (2011). The focus of the research is both to better understand and represent design processes, along with developing tools and methods to help practitioners create better designs. A number of benefits of adopting a more formal and rigorous approach to design have been identified (Conole, 2009). In terms of the OULDI research work, we define learning design as:

> A methodology for enabling teachers/designers to make more informed decisions in how they go about designing, which is pedagogically informed and makes effective use of appropriate resources and technologies. This includes the design of resources and individual learning activities right up to whole curriculum level design. A key principle is to help make the design process more explicit and shareable. Learning design as an area of research and development includes both gathering empirical evidence to better

[11] http://www.reload.ac.uk/ldeditor.html
[12] http://coppercore.sourceforge.net/
[13] http://www.gsic.uva.es/collage/
[14] http://www.cogigraph.com/Produits/MOTetMOTplus/tabid/995/language/en-US/Default.aspx
[15] http://www.omg.org/spec/UML/2.0/

> understand the design process as well as the development of a range of resource, tools and activities.

In parallel, work in Australia embraced a broader notion of the term 'learning design', which was located more at the level of practice than technical specification. The AUTC Learning Design project[16] aimed to capture a range of pedagogical models as learning design case studies with the intention that these could then be used by teachers to guide their practice and enable greater sharing and reuse of designs (Agostinho, 2008; Oliver, et al., 2002).

The work was based on a framework for describing learning designs developed by Oliver and Harrington (Oliver, 1999, Oliver and Harrington, 2001). This was based on three critical elements: learning tasks, learning resources and learning support. The intention was that thinking about each of these elements helped to both guide the design process and make it explicit and shareable. The approach was used to represent a range of learning designs across different pedagogical models, such as: role play, problem-based learning, concept-based learning and collaboration. The AUTC LD project produced detailed guidelines on each of the design case studies they captured, representing these visually using an updated version of the design representation developed by Oliver and Harrington, along with detailed descriptions on how the design was produced and how it can be used. A number of studies have been conducted exploring how the AUTC designs are actually used by teachers.

Buzza et al. (2004) focussed on the 'Predict, Observe, Explain' AUTC design[17] with four teachers and two instructional designers. Overall the participants recognised the value of the designs and how they might be used, although the researchers concluded that widespread adoption of the IMS Learning Design specification would not be possible until a controlled vocabulary can be agreed upon for use in cataloguing and searching for learning designs. Agostinho et al. (2009) explored to what extent the AUTC designs were effective learning design descriptions, i.e. how they could provide adequate information that can be easily understood in terms of content and thus potentially reused by a teacher in their particular educational context. Their findings were that there are three important features of an effective learning design description: i) a clear description of the pedagogical design, ii) some form of 'quality' rating, and iii) guidance and advice on how the design could be reused.

In the UK the Joint Information Systems Committee (JISC) funded a series of projects under the 'Design for Learning programme' (see Beetham, 2008 for a review of the programme and the lessons learnt). The term 'design for learning' was used rather than learning design to indicate a broader scope and a more holistic approach, although I would argue that the way in which I define learning design in this book is synonymous with this broader perspective. Design for learning was defined as:

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[16] http://www.learningdesigns.uow.edu.au/

[17] http://www.learningdesigns.uow.edu.au/exemplars/info/LD44/index.html

A set of practices carried out by learning professionals… defined as designing, planning and orchestrating learning activities which involve the use of technology, as part of a learning session or programme (Beetham, 2008, p. 3).

The programme included a review of e-learning pedagogical models, which classified learning theories into three main types: associative, constructive and situative (Mayes and DeFreitas, 2005). The Mod4L project[18] explored what different types of design presentations were being used by practitioners and concluded that de-contextualised designs or patterns could not in practice form the basis of a generic design typology, in which a finite number of educationally meaningful intentions could be discerned (Falconer, et al. 2007).

The programme also supported the development of two pedagogical planner tools, Phoebe (Masterman, 2008b) and the London Pedagogical Planner (these are discussed in Chapter 10). The programme divided the design lifecycle into four parts: design, instantiation, realisation and review. The granularity of the designs ranged from the design of learning objects or short learning activities up to broader sessions or whole courses/curricula. Beethem (2008) described some of the key lessons derived from the programme included the following. Firstly, design practices are varied, depending on individuals, subject differences and local cultures. Secondly, design tools are rarely perceived as pedagogically neutral and most are not considered flexible enough to match real practice. Finally, there were mixed views from practitioners on what were the most appropriate ways of representing and sharing designs – some wanted rich, narrative representations, others wanted bite-sized representations that could be easily understood and reused.

A spectrum of learning design languages

Agostinho (2008, p. 14) reviewed commonly used learning design languages categorising them as follows:

1. Pedagogical patterns.
2. Generic learning designs – patterns and generic Learning Design Visualisation Sequences (LDVS).
3. Contextulaised learning design instantiations – LDVS, LDLite and E2ML.
4. Executable runnable versions – IMS LD, LAMS.

Agostinho et al. (2008) argue that the AUTC visual learning design representation can be used to facilitate dissemination and reuse of innovative pedagogical strategies in university teaching. Agostinho (2008) also refer to this as a Learning Design Visual Sequence (LDVS). It is intentionally aimed at teachers as an easy to understand representation. It can be used both to represent and share examples of good designs or help guide a teacher through the creation of a learning design.

Harper and Oliver (2008, p. 228) developed a taxonomy for learning designs arising out of the AUTC Learning Design project[19] which gathered over 50 exemplar learning

[18] http://www.academy.gcal.ac.uk/mod4l/
[19] http://www.learningdesigns.uow.edu.au/

designs. The AUTC designs were categorised into five types of design: collaborative designs, concept/procedure designs, problem-based learning designs, project/case study designs and role-play designs. As discussed earlier, the AUTC design language is much more practitioner orientated, than IMS LD. It is based on work by Oliver and Herrington (2001), who identified three elements associated with a learning design:

1. The tasks or activities learners are required to undertake.
2. The content resources provided to help learners complete the tasks.
3. The support mechanisms provided to assist learners to engage with the tasks and resources.

These three elements are used to describe a learning design, as a temporal sequence, with the tasks or activities being undertaken in the centre and the associated resources and support mechanism for each tasks or activity represented either side. These are represented by three symbols: squares (tasks), triangles (resources) and circles (support). Figure 5 shows an example, from the Mekong eSim role play design.[20] It shows the content or resources the learners interact with on the lefthand side, the tasks or activities that the learners are required to perform in the middle and the support mechanisms provided to assist learners in engaging with the tasks and resources on the righthand side. Harper and Oliver (2008) argue that there has been little work to provide a means to classify and categorise learning designs. The designs were evaluated using an adapted version of the framework developed by Boud and Prosser (2002), based on the following critieria: learner engagement, acknowledgement of the learning context, learner challenge and the provision of practice. They identified the following four types of learning design:

1. Rule focus – based on the application of rules.
2. Incident focus – based on incidents and events.
3. Strategy focus – that require strategic thinking, planning and activity.
4. Role focus – where the learning outcomes are based on learners' performance and personal experiences.

[20] http://www.learningdesigns.uow.edu.au/exemplars/info/LD42/more/03Context.html

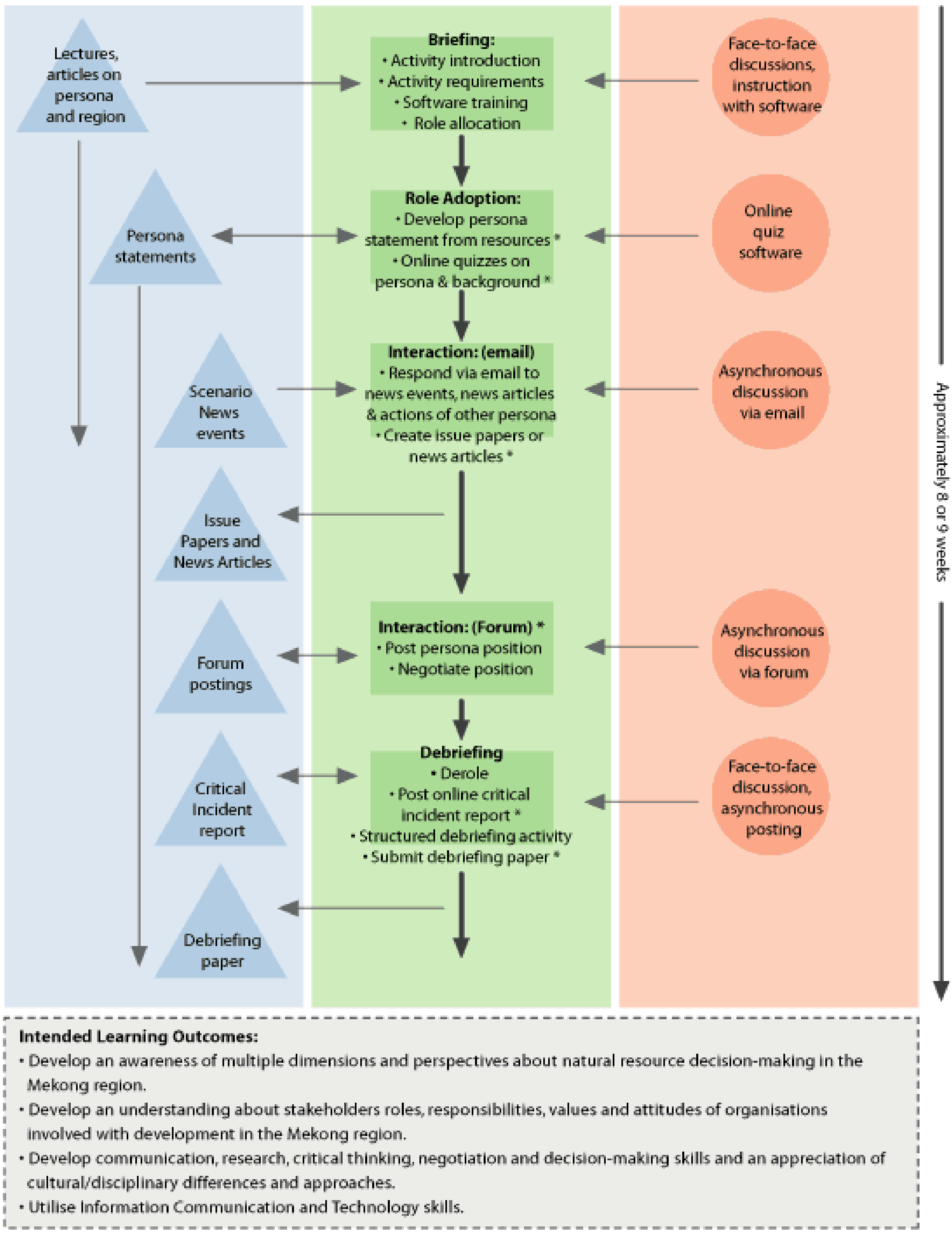

Figure 5: The Mekong eSim learning design - an example of the AUTC learning design visualisation

Another simple representation, also aimed at teachers, is LDLite (Oliver and Littlejohn, 2006), which shares many similarities with lesson plans that K-12 teachers are familiar with. It is based on five aspects of a design: tutor roles, learner roles, content resources, service resources and assessment feedback. It consists of a matrix which has the following as column headings: tutor role, student role, resources (content), resources (services) and assessment feedback. The rows describe each of these in terms of the online and offline elements of the learning intervention.[21]

The MOT+ design language is based on the MISA instructional design method (Paquette, 2004; Paquette et al., 2008). It starts from the premise that building a design is based on two fundamental questions. What knowledge do we want the learners to acquire? How should the activities and resources best be organised to achieve this? It is a graphical representation, which consists of three elements: concepts, procedures and principles.

The Learning Activity Management System (LAMS), like IMS/LD, is a computer runnable design language (Dalziel, 2003; Dalziel, 2007). The main strength of the LAMS tool is that it provides a simple visual representation of the design, based around the tools and activities that the learning design is comprised of. It is intentionally aimed as a tool for use by practitioners and has been used extensively by teachers across different educational sectors. The learning design is represented as a sequence of activities visually illustrated as a flowchart. In contrast to the AUTC temporal sequence, LAMS sequences are usually represented from left to right. Examples of LAMS tools include typical teaching activities such as chat, question and answer, and forum. However, because it is designed to be runnable one of the weaknesses of LAMS is that it focuses the design around tools, and doesn't take account of all the other aspects involved in a learning activity. LAMS is discussed in more detail in Chapter 9.

A closely related body of work to learning design is research into the development and use of pedagogical patterns. This is discussed in more detail in Chapter 2. Derived from Alexander's work in architecture (Alexander, 1977; Alexander et al., 1977), pedagogical patterns is an approach to developing structured case studies of good practice (see for example Goodyear, 2005 for an outline of the field). Although of a slightly different nature to the other design languages described above, pedagogical patterns (Goodyear, 2005; Goodyear and Retalis, 2010) can also be viewed as a form of design language. Patterns consist of the following elements: pattern name, context for the pattern, description of the problem to be solved, solution, examples and links to related patterns.

The Open Learning Design methodology

The OU Learning Design Initiative

The OU Learning Design Initiative (OULDI)[22] emerged from previous work on the development of a learning design toolkit, DialogPlus (Conole and Fill, 2005; Fill, Conole and Bailey, 2008). Like the Phoebe and the London Pedagogical Planner (LPP) tools, DialogPlus was intended to act as a step-by-step guide to enable teachers to create learning designs.[23] The tool was based on an underlying taxonomy, which defined the

[21] See Learning Design – ldlite
[22] http://ouldi.open.ac.uk
[23] These pedagogical planner tools are discussed in Chapter 10

components of a learning activity (Conole, 2008), which was derived through a series of interviews with teachers about their design practices. However, evaluation of the actual use of such design planner tools indicated that they did not match actual design practice closely enough. Their relatively linear and prescriptive structure did not match the creative, iterative and messy nature of actual teacher design practice.

The OU Learning Design Initiative was initiated in 2007, supported through strategic funding from the OU and later through funding from the EU and JISC. The intention was to derive a more practice-focussed approach to learning design, identified from empirical evidence of actual practice. This included gathering 43 case studies of the ways in which the then new Learning Management System (LMS), Moodle,[24] was being used at the Open University UK (Wilson, 2007) and a series of interviews with teachers to articulate their actual teaching practice (Clark and Cross, 2010). The key focus of the teacher interviews was to better understand existing practice. The authors note in their introduction that:

> Even experienced academics who have participated in a range of course production tasks find it difficult to articulate how they go about developing a 'learning design' that will be transformed into effective learning materials (Clark and Cross, 2010).

The interviews focussed on five main questions: i) process: how do teachers go about designing a course?, ii) support: how do they generate ideas?, iii) representation: how do they represent their designs?, iv) barriers: what barriers do they encounter?, v) evaluation: how do they evaluate the effectiveness of the design?

A range of approaches to design was evident from the interviews, including gathering of resources, brainstorming, listing concepts and skills, creating week-by-week plans, etc. On the whole these were paper-based and primarily text-based. There was little evidence of use of alternative, more visual representations or visual software tools. Interviewees wanted help with understanding how to integrate ICT-based activities into courses. Face-to-face workshops and meetings were favoured over online support as they were felt to be the most effective way of thinking about, and absorbing new ideas and ways of working. Case studies interestingly were considered to be too demanding in time and effort, interviewees wanted just-in-time support to specific queries. The most effective form of support was considered to be sharing of experience with peers.

Although text-based representations predominated, a variety of representations were mentioned from simple textual representations or lists through to more complex and connected mind maps. The interviewees listed a variety of purposes for the representations, including: communicating personal vision, capturing or sharing ideas, comparing with others, viewing the course at different levels, and mapping content to learning outcomes.

Barriers included: concerns about a lack of experience of creating online activities and a lack of successful examples to draw on. An OU-specific issue was mapping the

[24] http://moodle.org/

innovative (and often idiosyncratic) ideas of course creators, with the needs of a production system delivering the OU's size and range of learning materials and services.

A range of mechanisms was cited in terms of evaluation approaches. These included feedback from students and tutors, comments from critical readers, peer course team critiques and comments from external examiners.

This empirical work provided a sound basis for the development of our approach. Our initial focus centered on the following questions:

- How can we capture and represent practice (and in particular innovative practice)?
- How can we provide 'scaffolds' or support for staff in creating learning activities that draws on good practice, making effective use of tools and pedagogies? (Conole, 2009).

We identified six reasons why adopting a learning design approach might be beneficial:
1. It can act as a means of eliciting designs from academics in a format that can be tested and reviewed with developers, i.e. a common vocabulary and understanding of learning activities.
2. It provides a means by which designs can be reused, as opposed to just sharing content.
3. It can guide individuals through the process of creating learning interventions.
4. It creates an audit trail of academic design decisions.
5. It can highlight policy implications for staff development, resource allocation, quality, etc.
6. It aids learners in complex activities by guiding them through the activity sequence.

These map closely with the benefits of adopting a Design-Based Research (DBR) approach outlined by Gibbons and Brewer (2005). They argue that the benefits include: improving the rate of progress (in the creation of designs), influencing the designer conceptions through making the design process explicit, helping to improve design processes, improvements in design and development tools, and bringing design and production closed together. Fundamentally, I would agree with their assertion that it opens up new ways of thinking about designs and designing, and in particular helps practitioners to shift from a focus on content to the activities the students will undertake.

We see 'learning design' as an all encompassing term to cover the process, representation, sharing and evaluation of designs from lower level activities right up to whole curriculum level designs. In previous work (Conole and Jones, 2010) we identify three levels of design: micro, meso and macro, drawing on Bielaczyc (2006) and Jones (2007). In our terms, the micro-level refers to learning activities (typically a few hours worth of activity), the meso-level to aggregations of activities or blocks of activities (weeks or months worth of activity) and the macro-level to whole curriculum designs. As part of their Curriculum Design programme,[25] the Joint Information Systems Committee (JISC) provide the following definition in terms of curriculum (JISC, nd):

[25] http://www.jiscinfonet.ac.uk/curriculum

> Curriculum design' is generally understood as a high-level process defining the learning to take place within a specific programme of study, leading to specific unit(s) of credit or qualification. The curriculum design process leads to the production of core programme/module documents such as a course/module description, validation documents, prospectus entry, and course handbook. This process involves consideration of resource allocation, marketing of the course, and learners' final outcomes and destinations, as well as general learning and teaching approaches and requirements. It could be said to answer the questions 'What needs to be learned?', 'What resources will this require?', and 'How will this be assessed?

We were interested in a number of research questions in particular. Can we develop a range of tools and support mechanisms to help teachers design learning activities more effectively? Can we agree a shared language/vocabulary for learning design, which is consistent and rigorous, but not too time consuming to use? How can we provide support and guidance on the creation of learning interventions? What is the right balance of providing detailed, real, case studies, which specify the detail of the design; compared with more abstract design representations that simply highlight the main features of the design? How can we develop a sustainable, community of reflective practitioners who share and discuss their learning and teaching ideas and designs?

Design-Based Research (DBR)

The next section describes the OULDI methodology, which is based on Design-Based Research (DBR). This section provides a brief overview of Design-Based Research. This section draws in particular on Barab (2006) and Kelly et al. (2008).

Design-Based Research (DBR) has emerged in recent years as an approach for studying learning in context through systematic design and study of instructional strategies and tools (Brown, 1992; Collins, 1992 cited in Design-Based Research Collective, 2003). Wang and Hannafin (2005, p. 5-6) define it as "a systematic, but flexible methodology aimed to improve educational practice through iterative analysis, design, development and implementation, based on collaboration between researchers and practitioners in real-world settings, and leading to contextually-sensitive design principles and theories".

Barab provides a useful overview of Design-Based Research (Barab, 2006, p. 155). He argues that the value of Design-Based Research (DBR) is that it offers a methodology for dealing with the complexity of real learning contexts by "iteratively changing the learning environment over time – collecting evidence of the effect of these variations and feeding it recursively into future designs" (citing Brown, 1992; Collins, 1992). He argues that cognition, "rather than being a disembodied process occurring in the confines of the mind, is a distributed process spread out across the knower, the environment, and even the meaning of the activity" (citing Salomon, 1993). Barab suggest that DBR can yield rich insights into the complex dynamics whereby theories become contextualised. He lists the following as mechanisms for making DBR effective:

1. Make the assumptions and theoretical bases that underlie the work explicit.
2. Collect multiple types of theoretically relevant data.
3. Conduct ongoing data analysis in relation to theory.

4. Invite multiple voices to critique theory and design.
5. Have multiple accountability structures.
6. Engage in dialectic among theory, design and extant literature.

He argues that DBR has the following characteristics: design, theory, and a problem in the context of a naturalistic setting, involving multiple iterations or progressive refinement (Figure 6). The figure shows the relationship between the underlying theory, design and problem being investigated within a naturalistic context and how this iterates and evolves over time. Kelly et al. (2008, p. 5) suggests that DBR foregrounds "the fluid, empathetic, dynamic, environment-responsive, future-orientated and solution-focused nature of design".

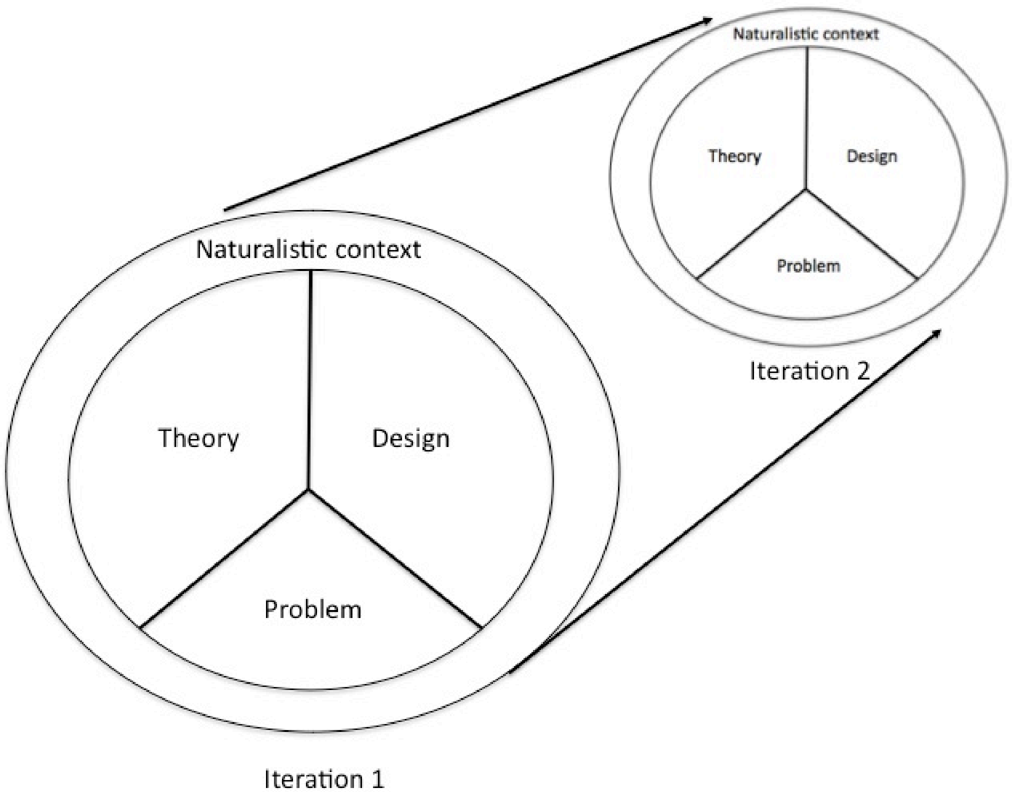

Figure 6: The interactive nature of Design-Based Research

The OULDI learning design methodology

We have adopted a Design-Based Research (DBR) approach; starting with a stated problem we were trying to address, a proposed solution and then an iterative cycle of developments and evaluation. Reigeluth and An (2009, p. 378-379) articulate a set of characteristics of DBR, which are listed below. The way in which the OULDI learning design methodology maps to these is described.

1. DBR is driven by theory and prior research. In our work, we are building on the substantive body of prior research on instructional design, the learning sciences, learning objects/Open Educational Resources, pedagogical patterns and more

recently learning design. As dicussed in Chapter 5, the approach we adopt is socio-cultural in nature, with a focus on the design and use of a range of Mediating Artefacts involved in the learning-teaching processes (see Conole, 2008 for a more detail account of this).

2. It is pragmatic. Our aim is to develop tools and resources which are useful to practitioners in actual practice, to address real educational challenges. Our intention is to be theory-driven, but pragmatic, recognising the complex, messy and often craft-based nature of teaching practice.
3. It is collaborative. We see working in close connection with end users as a vital part of our approach. Our initial interviews with teachers confirmed our view that teaching practice is complex and situated. Furthermore it is evident that design is not a linear process, it is creative, iterative and messy. Changing practice will only occur through close working with and understanding of practitioners' needs.
4. It is contextual. Our vision is to change actual practice, to achieve this it is important that the development activities occur in real, authentic contexts.
5. It is integrative. Wang and Hannifin (2005, p. 10) state that "DBR uses a variety of research methods that vary as new needs and issues emerge and the focus of the research evolves". We have adopted a mixed-method approach to evaluating our developments, matching the methods we use to the specific sub-research questions and the context that we are focusing on.
6. It is iterative. Our approach consists of an interactive cycle of identification of problems to be addressed, suggestion of proposed solutions, development, use, evaluation and refinement.
7. It is adaptive and flexible. Because our work is closely tied to actual practice, we need to ensure that the approach we are adopting is agile in nature, so that we can adapt based on evidence from changing practice.
8. It seeks generalisation. In addition to the practical, pragmatic nature of our work, we are also attempting to develop a coherent underlying learning design framework of concepts and approaches.

In essence, we are focusing on three aspects of design: i) the development of a range of conceptual tools to guide the design process and provide a means of representing (and hence sharing) designs, ii) the development of visual tools to render some of the conceptual tools and enable practitioners to manipulate their designs and share them digitally with others, and iii) the development of collaborative tools – both in terms of structures for face-to-face events, such as workshops and the use of digital tools, to foster communication and sharing.

For each aspect we have now developed a set of tools, resources and activities and over the last few years we have been trialling these in a range of settings, both with the OU and also externally with a number of partner institutions and through demonstrations and workshops at conferences. It would be impossible in the scope of this book to describe all the tools, resources and activities in detail; hence a selection will be described to give an overall view of the work to date. An evolving online learning design toolkit is being developed which includes our current set of tools, resources and activities.[26] In addition a

[26] http://cloudworks.ac.uk/cloudscape/view/1882

learning activity taxonomy has been developed (Conole, 2008) and more recently a Learning Design taxonomy which provides a map of the domain, the key concepts and where individual tools, resources and activities fit (Conole, 2010).

OULDI aims to bridge the gap between the potential and actual use of technologies outlined in the introduction, through the development of a set of tools, methods and approaches to learning design, which enables teachers to making better use of technologies that are pedagogically informed. Conole (2009) provides a reflection on the origins of OULDI and the benefits of adopting this approach. The aim is to provide a design-based approach to the creation and support of learning and teaching, and to encourage a shift away from the traditional implicit, belief-based approaches to design-based, explicit approaches. This will encourage sharing and reflection. The tools and resources are designed to help guide decision-making. The work is underpinned by an ongoing programme of empirical evidence, which aims to gain a better understanding of the design process and associated barriers and enablers, as well as an ongoing evaluation of the tools, methods and approaches we are developing and using and in particular to what extent they are effective.

There are three aspects to the OULDI: a set of visual design representations, a set of resource and activities, and mechanisms for fostering social interaction.
In terms of visual representations, we have created five views: a course view map (which provides an ‘at a glance’ overview of a course, a course dimensions view (which provides more details on the nature of the course - the degree to which it is collaborative, the level and forms of assessment, the amount of inclusion of user generated content or experience), a pedagogy profile view (which articulates the types of and amount of learner tasks), a learning outcomes map (which maps learning outcomes to activities and assessment) and a task swimlane view (which maps the tasks the learners undertake to the resources and tools they use). These are discussed in more detail in the next chapter.

In terms of resources and activities we have now created a rich set of these to support design practice. This includes use of the visual representations in a range of activities, as well as a number of other activities such as getting practitioners to think of the characteristics (affordances) of technologies in terms of how they might be used to support different pedagogical approaches.

Finally, to facilitate social interaction, we have created a range of workshops, as well as an online social networking site for learning and teaching, Cloudworks. The workshop include ‘Technology lite’ workshops where participants consider the characteristics of different technologies and how they might be used in their teaching, workshops on the use of the visualisation tools and a ‘Design Challenge’ workshop where participants work in teams to create a course in a day, assistance by a range of ‘expert stalls’ who provide advice on a range of topics (such as using web 2.0 tools, collaborative learning, assessment and the use of OER). The ‘Design Challenge’ workshop is similar in nature to the Carpe Diem workshop format (BDRA, 2011). Carpe Diem is described as a creative learning design process. At the end of the workshop, participants have a blueprint and a storyboard for the course, a set of peer-reviewed e-tivities, a model for further development and an action plan.

Cloudworks is a social networking site to facilitate the sharing and discussion of learning and teaching ideas and designs. It combines social and participatory functionality to enable multiple forms of communication, collaboration and cross-boundary interactions amongst different communities of users. The core object in the site is a Cloud, which can be anything to do with learning and teaching; such as a description of a learning intervention, a description of a tool or resource, a question, or a discussion point. Clouds can be grouped into Cloudscapes; a Cloud can belong to more than one Cloudscape. Clouds are a combination of social and participatory functionality. Firstly, they act like a multi-user blog; anyone can start a Cloud and others can sequential add content to it. Secondly, they have a space for discussion. Thirdly, users can enrich the Cloud by adding embedded content, tags, links and references. Finally they have additional Web 2.0 functionality, such as: an activity stream for the Cloud, the ability to tag, RSS feeds and Twitter-like follow and be followed options.

Conclusion

This chapter has focussed on the range of design languages that can be used to guide and represent learning designs. It has provided a rationale for the value of design languages and their uses. It has described a range of design languages as a means of illustrating their variety and the ways in which they can be used for different purposes. It has shown that some are available as computer tools, whilst others are simply conceptual in nature.

Design languages help make the design practice more explicit and hence shareable. They provide practitioners with scaffolded guidance on the design process and promote critical thinking and reflection. By externalising the design a teacher is better able to get an overview of the whole design and hence be able to see how the different elements of the design are connected and also to identify potential gaps or weaknesses in the design.

In the next chapter I will show how we have developed a range of design representations to foreground different aspects of the design process and will describe how these representations can be used. I will illustrate how these designs are being used by teachers and show how we have contextualised them in a range of different types of activities and workshops. In addition in Chapter 9 I will describe a range of design tools that have been developed, including a learning design tool that we have developed, CompendiumLD, that enables teachers to create and share designs. In Chapter 15, I will also describe the social networking tool, Cloudworks[27] that we have developed, which acts as a space for teachers to share and discuss learning and teaching ideas and also describe the types of user behaviour that are emerging in the site.

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Chapter 8 Design representations

Introduction

This chapter will describe the range of ways in which learning interventions can be visualised and represented, along with a discussion of the benefits of each of these and how they can be used as part of both the design process and as a means of making the inherent design of a learning activity explicit. The chapter builds on a paper presented at the Networked Learning 2010 conference (Conole, 2010).

Types of representation

Learning designs can be 'represented' or 'codified' in various ways; each representation will articulate particular aspects of the learning that the designer anticipates will take place. Each design representation foregrounds different aspects of the inherent 'master' design, as discussed in Chapter 5. These forms of representation range from rich contextually located examples of good practice (case studies, guidelines, etc.) to more abstract forms of representation that distil out the 'essence' of good practice (such as models or pedagogical patterns). This section describes what is meant by 'design representation'. It gives an overview of the different types of representations; the formats they can be presented in, the level of granularity of design they portray and an indication of the particular ‘lens’ each representation provides on the inherent ‘master design’.

Conole and Mulholland (2007) outlined a number of common representations. These included essentially practice-focussed representations (e.g. case studies, lesson plans and patterns), conceptual representations (e.g. mind maps and metaphorical representations), more abstract representations (e.g. models and vocabulary) and technically orientated representations (e.g. UML[1] diagrams). They also argued that there are a number of uses of these different presentations. For example, enabling educational researchers to analyse and develop educational innovations, supporting teachers in planning learning interventions, facilitating software designers to instantiate lesson designs in software or supporting learners in understanding what they are doing and why. The type of representation is crucially dependent on its purpose.

This chapter builds on this work and describes different types of representations and how they can be used. Figure 1 provides a more generic description of the types of representation. Four main types of representations are identified: verbal, textual, visual, or data-based. A range of tools is now available to help visualise designs and in some cases, actually implement designs. Four examples are shown. LAMS[2] uses a link and node visualisation, but because LAMS sequences are ‘runnable’ the basic components of the system are tool-focussed (Dalziel, 2003; Dalziel, 2007). CompendiumLD[3] is also link and node based, but can be used across a broader range of granularity of designs (Conole et al., 2008). CompendiumLD maps can be exported in a variety of formats, but are not directly runnable. MOT+ is a graphical language and editor, which helps define activity sequences, actors and tools (Paquette, 2004; Paquette et al., 2008). Finally WebCollage visualises pedagogical patterns taking a metaphorically based approach to visualise designs around their description, such as ‘pyramid’ or ‘jigsaw’ (Hernández et al. 2005, 2006). These visualisation tools are discussed in more detail in the next chapter.

[1] Unified Modeling Language - see for example http://www.ibm.com/developerworks/rational/library/769.html

[2] http://lams.org

[3] http://compendiumld.open.ac.uk

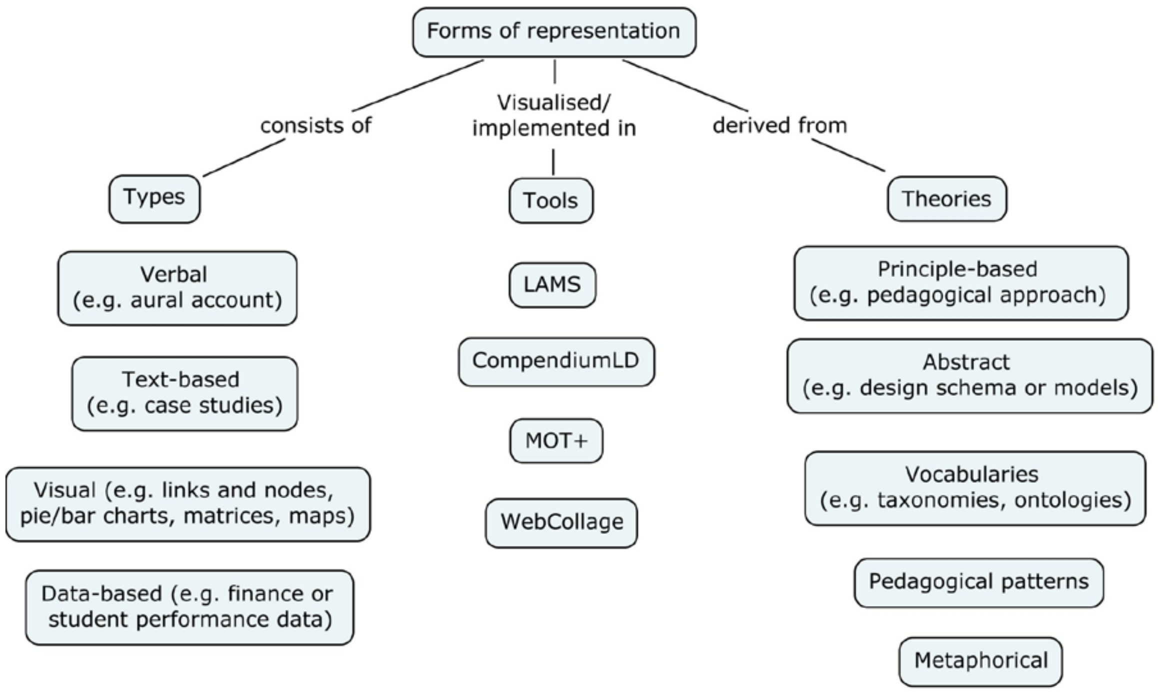


Figure 1: Forms of representation

Many representations are primarily practice-orientated in nature, however some have a particular theoretical basis. For example, designs which explicitly align with a particular pedagogical perspective such as constructivism or pedagogical patterns which have a prescribed format and are based on an underlying theoretical perspective based on the work of Alexander (see for example Alexander, 1977; Alexander et al., 1977; Goodyear, 2005; Goodyear and Retalis, 2010). Vocabularies (see for example Conole, 2008a) and abstract representations such as design schema and pedagogical models, such as Laurillard's conversational framework (Laurillard, 2002) are also examples of representations that are based on theoretical perspectives. Whilst clearly this is not a perfect classification it does give some indication of the breadth of types of representation that are possible.

Representations can have different formats, and can be used to describe different aspects of the design lifecycle and can provide different lenses on the inherent design, foregrounding specific aspects:

- Formats. These can include different types of text-based representations (e.g. case studies or narratives), visualisation representations (e.g. node-link types representations, design schema or metaphorical), numerically focussed (e.g. pie or bar charts based on underlying numerical data), representations based on other forms of media (e.g. audio or video) or representations can be a combination of the above.
- Levels. Designs can describe small-scale learning activities (which might describe a few hours worth of learning) or scale up to a description of a whole curriculum (across for example a three-year undergraduate degree course or a one-year masters course)
- Lenses. The focus might be on the nature of the tasks being undertaken and associated tool and resources, on the overarching pedagogical principles, in terms of

> mapping different components of the design together or exploration of data on the course performance and student evaluations (such as financial or student performance data).

Conole and Mulholland (2007) further classified representations into three levels.

> At a simplistic level this has an educational component (the pedagogical intention and aspiration) and a technological component (what technologies will be used, how and their associated affordances). A meditational layer, which describes the process or operational dimension, provides the link between these.

They go on to suggest that the educational view provides the underlying pedagogical model (such as the learning outcomes and pedagogical approach). The process-based/operational view focuses on enactment of the design. Examples include representations that are essentially stage-based (where the focus is on what is happening in a temporal sequence), or schema-based (which not only outlines the sequential set of tasks, but also the associated roles, resources, tools and outputs). The final technical view, they argue, provides the 'technical implementation blueprint' and the rule-based/runtime of the data flow.

Examples of different types of representation

This section describes a set of representations that we have developed as part of our learning design research. It will describe each representation, provide an illustrative example and suggest how each representation can be used. The representations presented here are not intended to be comprehensive, but to give a flavour of the variety of representations and an indication of their uses. They cover the spectrum of different types of format, level and lenses described earlier (Table 1). They include: textual summaries, content maps, a course view map, a pedagogy profile, a task swimlane view, a learning outcomes map, a course dimensions view and a principles/pedagogy matrix.

Table 1: Summary of the different types of representation

Representation	Format	Level	Lens
Textual summary	Text	Macro	Descriptive overview
Content map	Node-link	Meso, macro	Content hierarchy and structure
Course map	Boxes	Macro	Pedagogy overview
Task swimlane	Node-link	Micro	Tasks breakdown: roles, tasks, associated tools/resources
Pedagogy profile	Bar chart	Macro	Overview of learner tasks
Learning outcomes	Node-link	Macro	Mapping of outcomes to tasks and assessment
Course dimensions	Spider diagram	Macro	Details of the format of the course
Principles matrix	Matrix	Macro	A map of course principles to pedagogy overview

Textual

This is the most common way in which courses are represented. It can range from a brief textual overview plus descriptive keywords through to a more detailed breakdown of the curriculum covered and the associated learning, teaching and assessment strategy for the course. Such textual representations are common and form the basis of most course descriptions. Textual descriptions can also be used to indicate the pedagogical intent of the course or can be aligned to a particular theoretical basis, as is the case with pedagogical patterns, which follow a particular style and format. One of the drawbacks of textual descriptions of a course is that they tend to focus on the content and do not give enough of an indication of the nature of the learning activities that the students will do nor an overall picture of the learning experience.

Content map

Another common way of representing designs is in terms of content (Figure 2). Content can be organised in a number of ways, but a particularly helpful one is to organise it into a series of themes and sub-themes, although alternatives are possible that can be temporally based or metaphorically based for example. Buckingham Shum and Okada (2007; 2008) show how the Compendium software tool[4] can be used to represent content.

For example Figure 2[5] shows an example of a mapping of content related to the topic of literature analysis mapped in the Compendium tool. It shows not only the sub-topics but the relationships between them. Compendium can include a range of media, such as images, video and word documents.

[4] http://compendium.open.ac.uk/institute/
[5] http://compendium.open.ac.uk/institute/images/PhDDatabase.jpg

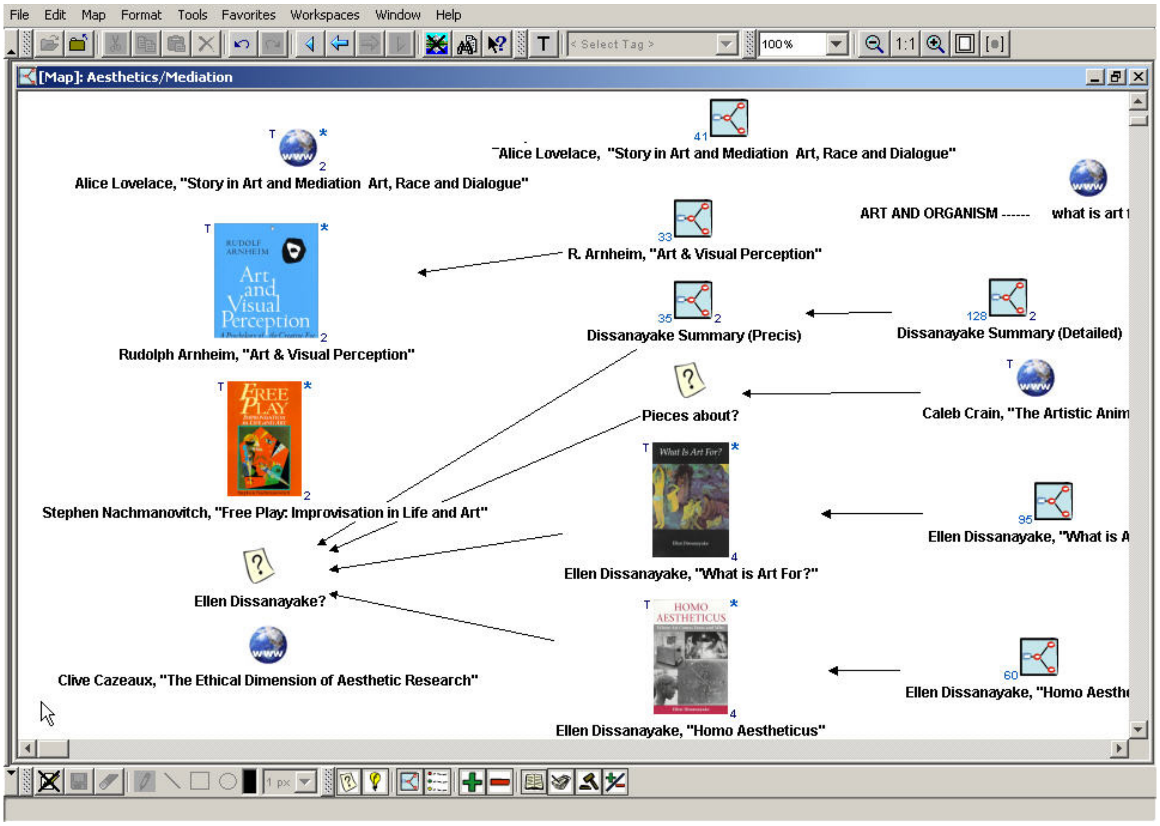


Figure 2: Compendium map of the concepts on a course on literature analysis

Similarly Figure 3[6] is an example of a mapping of a course on strategy. In this instance the map starts with a central topic/question, namely what is the meant by strategy, linked to a series of sub themes addressing the question.

[6] http://projects.kmi.open.ac.uk/osc/compendium/ou_cmap/

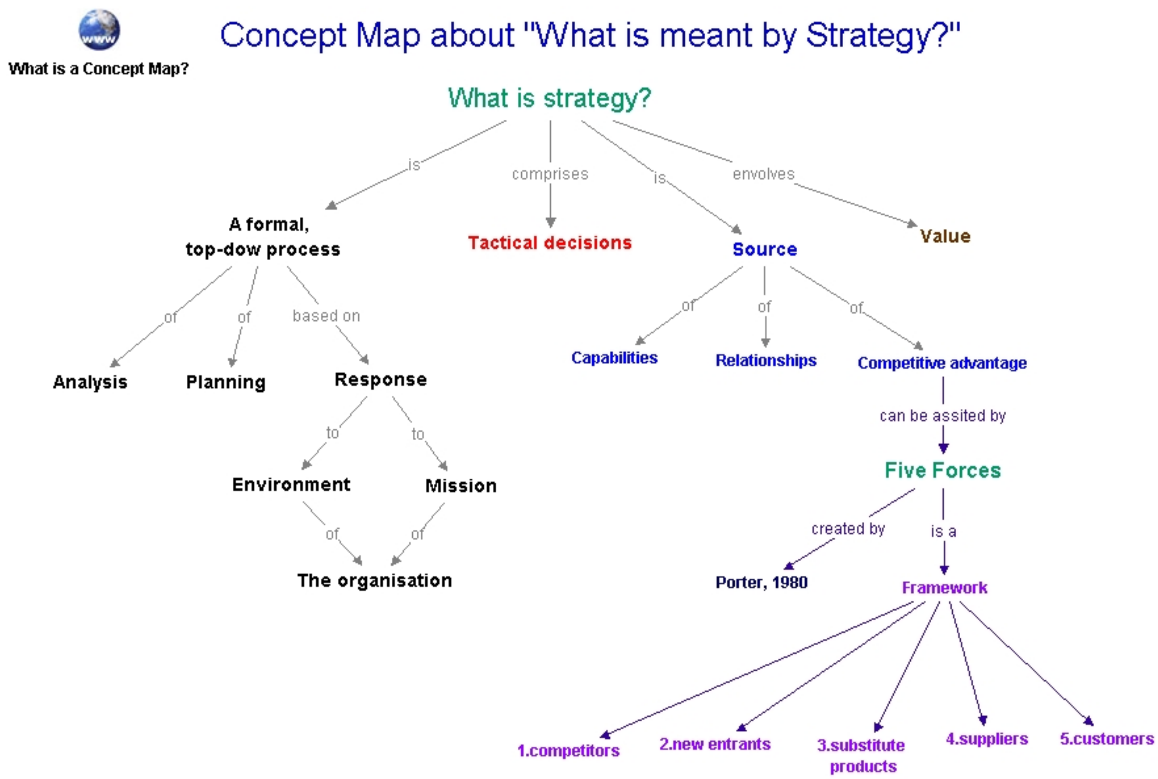


Figure 3: A concept map in Compendium on a course on strategy

The textual and content mapping representations are probably the most common ways in which teachers think about their designs. However, taking a more activity-focussed approach about using different tools/resources requires other representations.

Sherborne (2008) argues that:

Concept mapping could help curriculum developers and teachers at various stages of the [design] process. The ability of maps to focus on key ideas and their connections may help curriculum designers to survive better the translation into classroom experience and promote collaborative working methods.

The course map view

The course map view (Figure 4) provides an overview of a course at a glance and enables teachers to think about the design of the course from four meta aspects; namely:

- Guidance and support. This is essentially the learning pathway and includes details on the course structure and timetable. It can include aspects such as the course calendar, any study guides, information on tutorials and other forms of support.
- Content and activities. The includes information on the course materials and activities, ways in which the course builds on the learners' prior experiences and inclusion of any learner-generated content. Examples of materials might include: course texts and readings, DVDs and podcasts, whilst activities might include: laboratory or fieldwork, work-based placements or student project work.
- Communication and collaboration. This is essentially the dialogic element of the course. It is the social dimension of the course and describes the ways in which

learners are expected to interact with each other and their tutors. It might include the use of course forums, email or social networking tools.

- Reflection and demonstration. This is the assessment component of the course. It can include information on any diagnostic, formative and summative assessment. These might be achieved through multiple choice quizzes, assignment or formal examinations. In addition, there might be specific instruction at key points for the students to reflect on their learning and understanding to date.

In addition to these there are two boxes which provide a brief course summary and a list of key words.

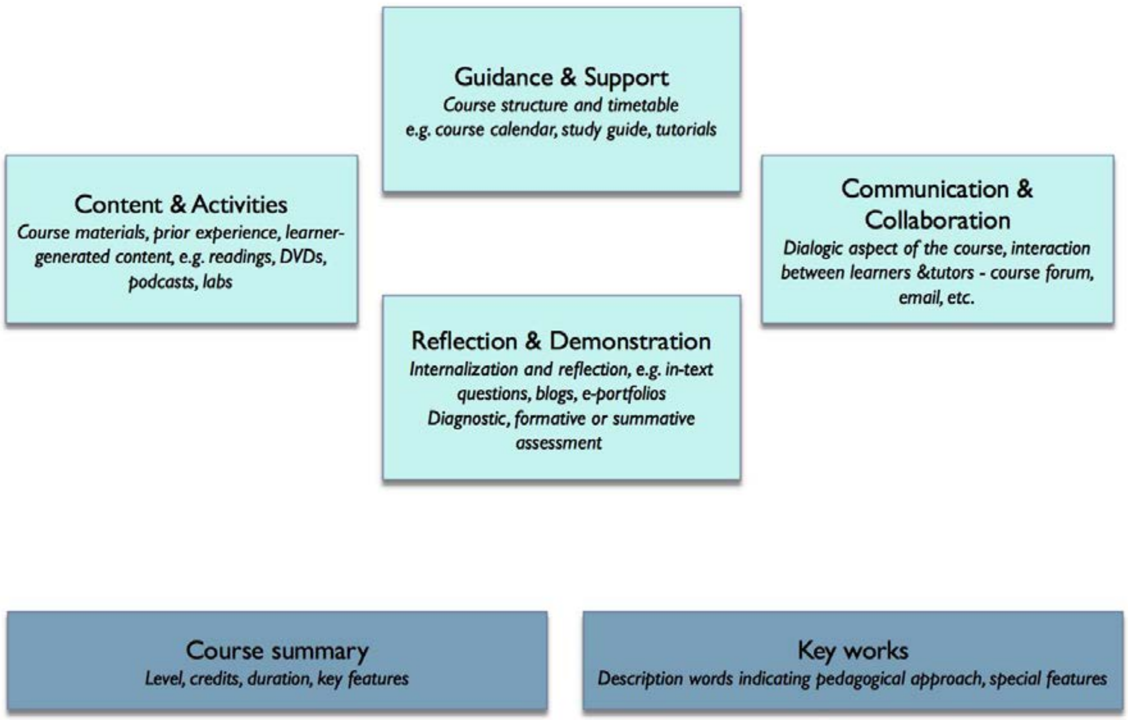


Figure 4: The course map view

The course map representation gives an 'at a glance' overview of the course. The representation is based on articulation of the gross-level aspects of what the learner is doing and how they are learning (information/experience, communication/interaction and thinking/reflection), the guidance/support they receive and the way in which they are expected to evidence/demonstrate their learning. A 3D-representation of the course map nicely illustrates the relationship between the different aspects of student learning and the overall guidance/support and the evidence/demonstration of their understanding (Figure 5).

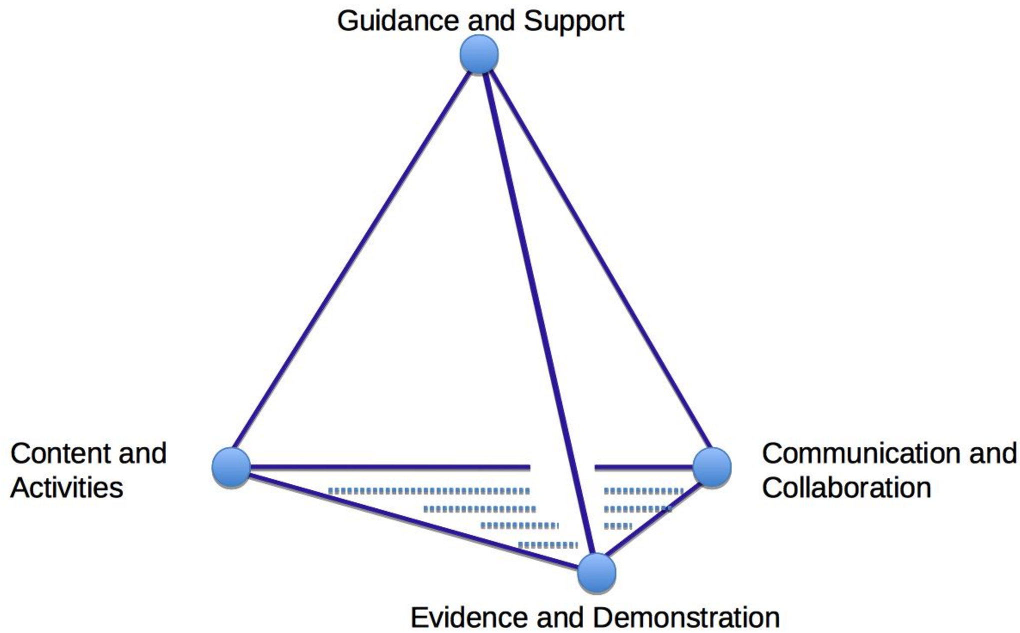


Figure 5: A 3-D representation of the course map view

The representation enables the designer to describe the course in terms of the types of learning activities the learner is undertaking, as well as the guidance and support provided and the nature of any assessment.

The course map is derived from an underlying theoretical perspective developed by Conole et al. (2004). Figure 6 shows that the different facets of learning can be mapped to three dimensions, i.e. the extent to which learning is achieved through: i) information or experience, ii) individually or in a social context, and iii) non-reflective or reflective. Guidance and support can be considered to sit within the centre of this representation. Contents and activities map to the information and experience dimension, communication and collaboration to the individual and social dimension, and reflection and demonstration to the non-reflective and reflective dimension. Interesting this 3D representation can also be used as a means of assessing how different tools are used in particular contexts and the extent to which these support the different facets of learning (See Conole, 2008a for more on this).

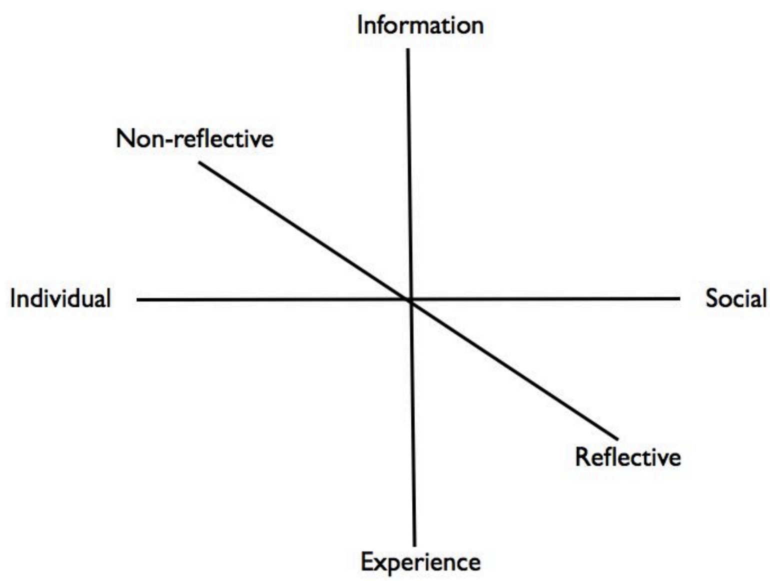


Figure 6: The three dimensions of the facets of learning

The pedagogy profile

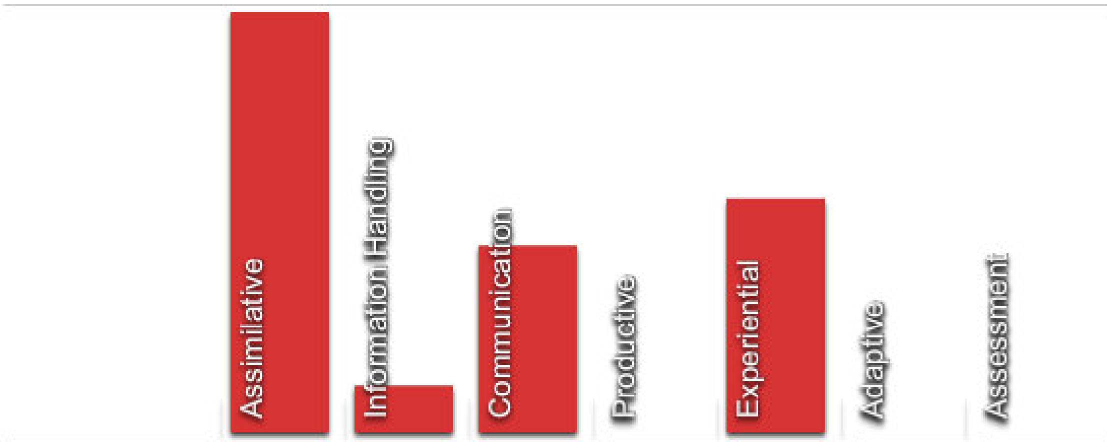
The pedagogy profile is a worked up version of the media advisor toolkit developed some years ago (Media Advisor, nd; Conole and Oliver, 1998), modernised against task types developed as part of a recently developed learning activity taxonomy (Conole, 2008a). In essence there are six types of tasks learners can do:

- Assimilative – reading, listening, viewing.
- Information handling – manipulating data or text.
- Communicative – discussing, critiquing, etc.
- Productive – producing an artefact such as an essay, architectural model, etc.
- Experiential – practising, mimicking, applying, etc.
- Adaptive – modelling or simulation.

In addition, learners undertake some form of assessment activities. The user indicates the amount of each type of task and the amount of assessment to create a pedagogy profile for a course – indicating the proportion of each type of tasks. An interactive pedagogy widget is now also available in the Cloudworks site.[7] Figure 7 shows an example of the use of the pedagogy profile to map four weeks of a course. In this example, the students spend 18 hours doing assimilative activities, four hours of information handling, eight hours of communication in the course forum and ten hours of experiential activities in the

[7] http://cloudworks.ac.uk/index.php/cloud/view/2459

form of a work-based placement. The advantage of this view is that it enables the designer to see the types and spread of learning tasks that the learners are engaged with. Often the assimilative and assessment activities are high, which may prompt the designer to rethink the nature of the tasks the learners are undertaking. In addition, this view is useful in that it can also be used by learners to profile the kinds of tasks they are engaged with. It would be interesting to compare the profile of a course from both the learner and teacher perspectives, to see how well they are aligned.



Item	Assim.	Info H.	Comm.	Prod.	Exper.	Adapt.	Assess.
Week 1	10	0	2	0	0	0	0
Week 2	4	0	2	0	0	0	0
Week 3	4	2	2	0	0	0	0
Week 4	0	0	2	0	10	0	0
TOTALS	18	2	8	0	10	0	0

Figure 7: The pedagogy profile

The task swimlane representation

The task swimlane representation describes the level of a learning activity typically a few hours in duration. It is derived from an underlying learning activity taxonomy (Conole, 2008b), which describes the components that need to be addressed when designing at this level (such as the tools and resources involved in the activity, the kinds of tasks the students will do, the roles of those involved in the learning intervention, etc.). This representation enables the designer to think about the relationships between the different components and any associated interdependencies.

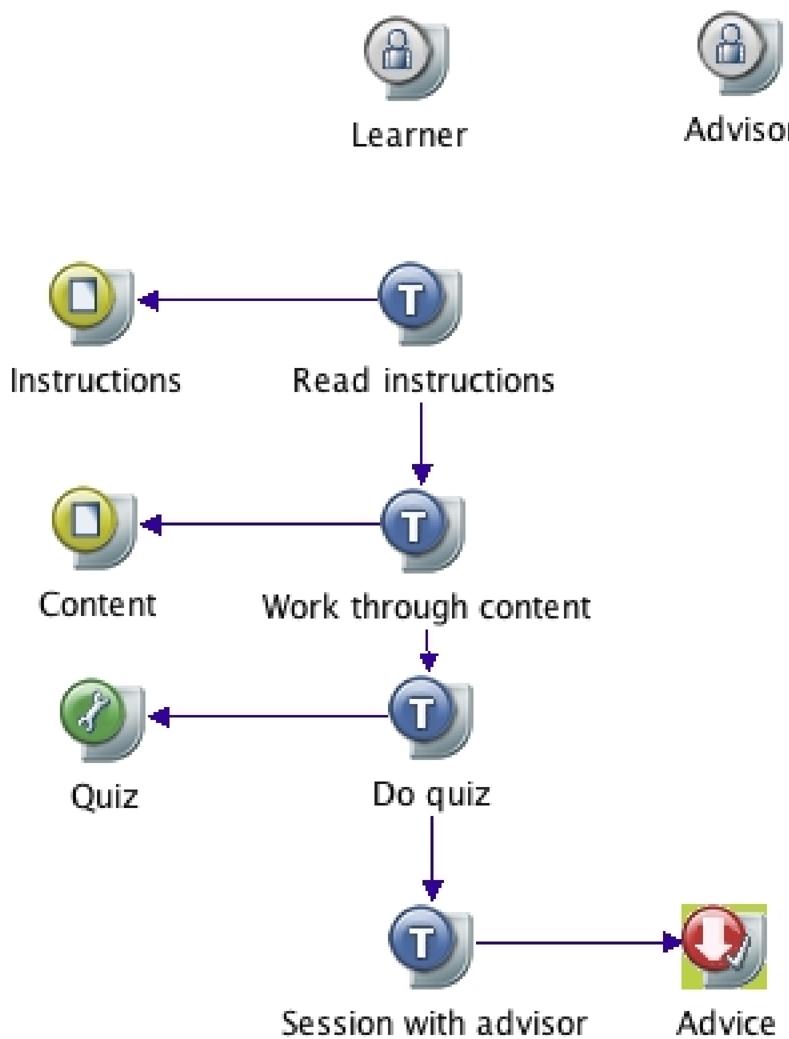


Figure 8: The task swimlane view

Figure 8 illustrates an example of the task swimlane view. It shows a simple learning activity, which consists of the learner reading some instructions, working through a set of content, doing a quiz to test their understanding and then having a feedback session with an advisor. The associated resources and tools for each task are linked to the relevant task node with arrows. This example was created using the CompendiumLD tool, which is discussed in Chapter 9

This is an example of what McKim (1980) categorises as a link-node diagram, where concepts/entities are represented as nodes and where the connections between the nodes have meaning. In our work so far nodes and links have been given equal weight, but it is also possible to use size or boldness as a means of conveying relative importance. The core learning design icon set in the tool are derived from an underlying learning activity taxonomy (Conole, 2008b). The tool also includes embedded help features and can be exported in a number of formats (see Conole et al. 2008 for more on CompendiumLD). Task swimlines can also be used to describe activities based on specific design types. For example the ‘Think-pair-share’ pedagogical pattern represented by Hernández et al. (2005) as a metaphorical visualisation, can also be represented as a task swimline.[8]

Learning outcomes map

In addition to mapping at the level of individual activities it is also important to be able to map at the meso- and macro-level in terms of mapping different components of the course; such as learning outcomes, content, activities and assessment. Standard mind mapping and concept mapping tools can be really helpful in laying out and making these kinds of connections explicit. A number of different configurations and layouts can be envisaged. The learning outcomes view enables the teacher to judge to what extent there is constructive alignment (Biggs, 1999) with the course, i.e. it looks at how the learning outcomes map to the student activities and to the assessment tasks. There are two aspects of constructive alignment. Firstly learners construct meaning from what they do to learn. Secondly, the teacher aligns the planned learning activities with the learning outcomes. So the learning intervention is designed so that the learning activities and assessment tasks are aligned with the intended learning outcomes.

The value of this view is that it enables the designer to check if all the intended learning outcomes are mapped to tasks and assessement activities. For example, Figure 9 shows a simple learning activity where one of the learning outcomes, concerned with collaboration, is not mapped to any tasks or assessment activities. The designer can then decide whether to include some activities to ensure this learning outcome is met or remove this as a learning outcome.

[8] http://cloudworks.ac.uk/cloud/view/1800

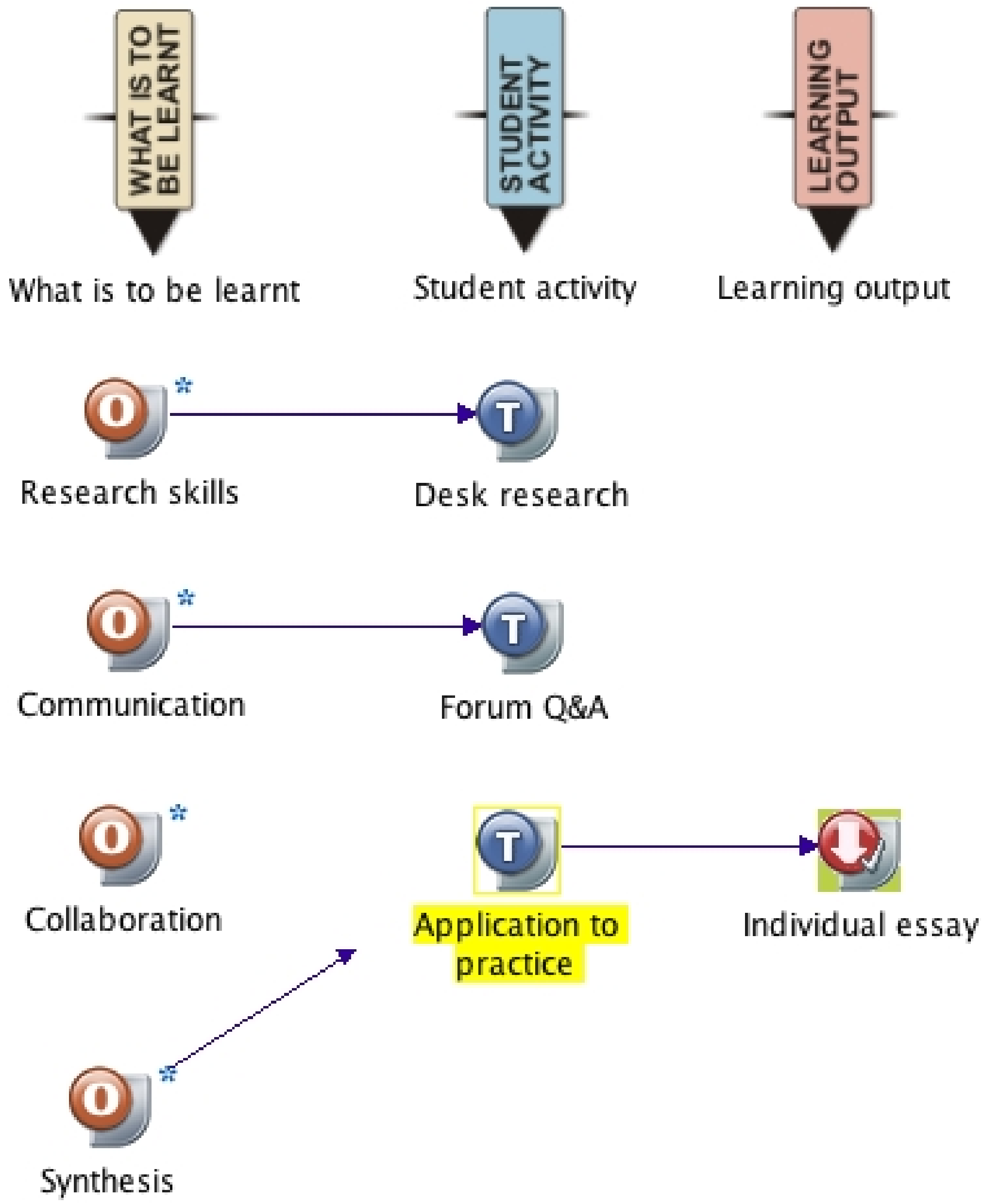


Figure 9: The learning outcomes map in CompendiumLD

The course dimensions view

The course dimensions view gives a more detailed indication of the nature of the course and how it is supported. It consists of four quadrants related to the four aspects of the course map view, namely: guidance and support, content and activities, communication and collaboration, and reflection and demonstration. In the example shown (Figure 10), there is a high degree of tutor guidance and peer support. In terms of content and activities the course is rich in terms of the amount of interactivity and the use of multimedia. However there is little in the way of communication and collaboration. The course has a high degree of both formative and summative assessment. The resultant spider diagrams provides a nice way of giving an illustrative view of what the course is like.

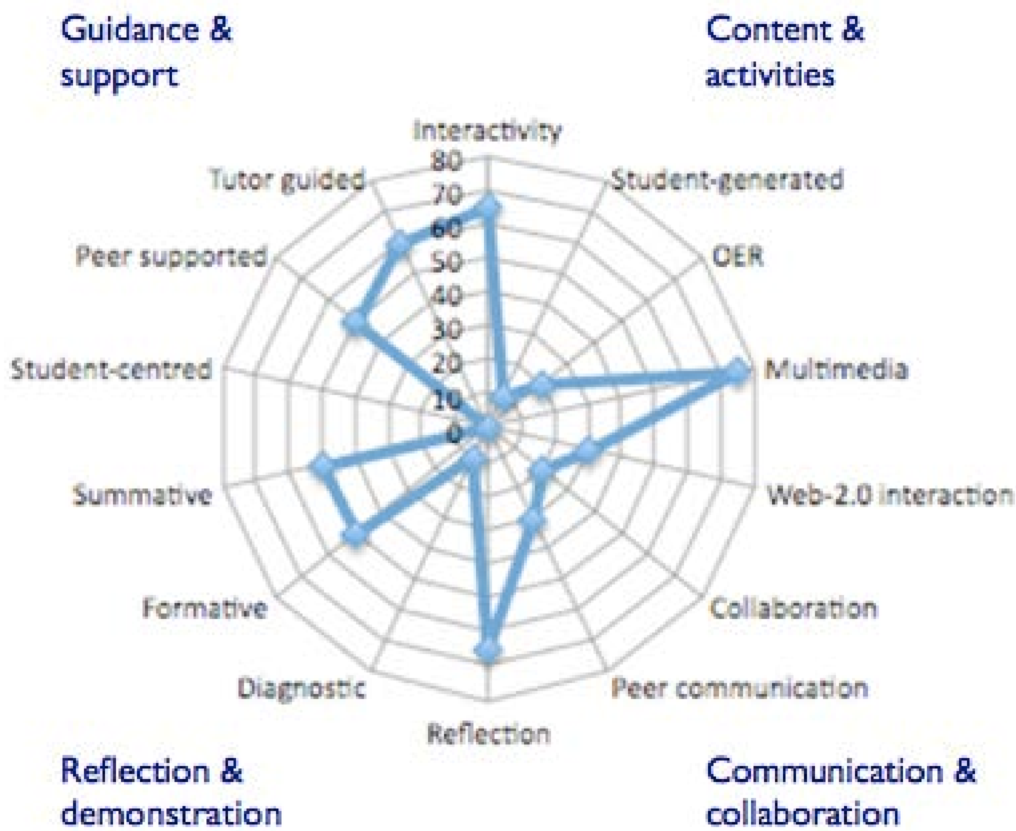


Figure 10: The course dimensions spider view

The principles/pedagogy matrix

This representation articulates the pedagogical approach being adopted by the course and the overarching principles (See Conole, 2008a for more details). It provides a matrix that maps the principles of the course against four macro-level aspects of pedagogy (Figure 11). Principles might be generated/articulated by the course team (for example getting the students to reflect on experience and show understanding or incorporating frequent interactive exercises and feedback across the course) or might be derived from theory or empirical evidence.

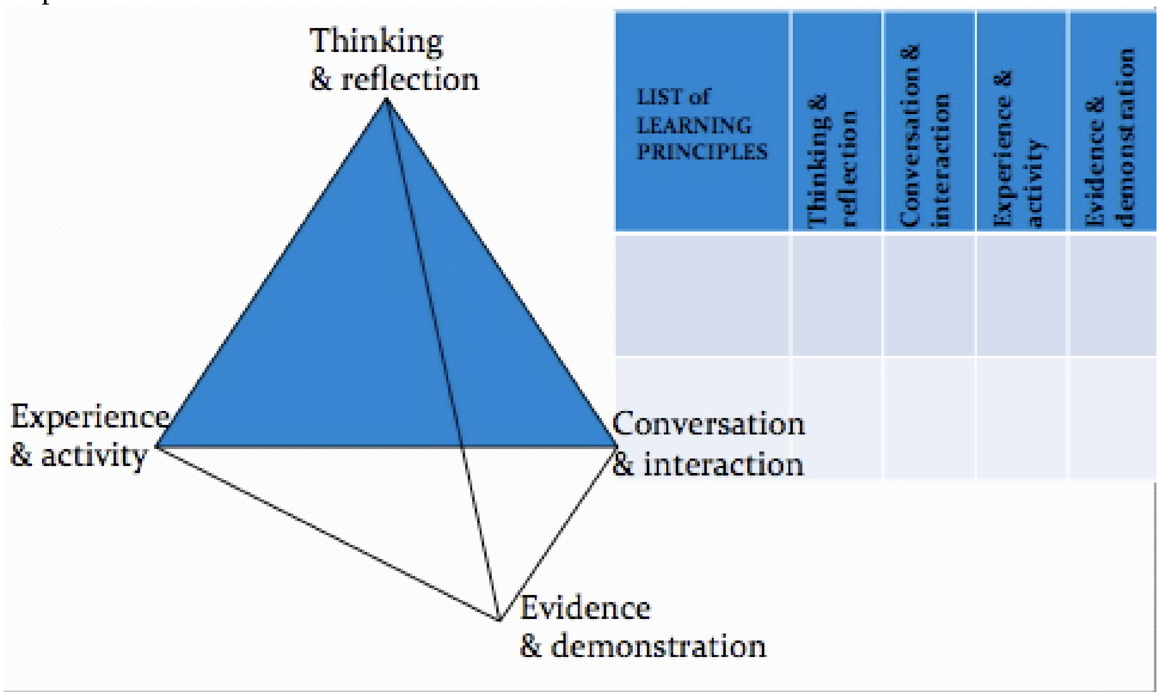


Figure 11: The principles/pedagogy matrix

Variants on the matrix are also possible. For example mapping principles to course activities, or mapping the principles to a different set of pedagogical characteristics (for example Bloom's educational taxonomy, the REAP principles (Nicols, 2009) or Laurillard's conversational framework (Laurillard, 2002).

Evaluation of the views

The representations presented here have been trialled in a number of venues and appear to provide robust and useful representations. These visualisations are enabling practitioners to be more creative in their design practice, thinking beyond subject content to a focus on what the learners will be doing. The task swimlane representation for example has been used extensively and is built into our visualisation tool CompendiumLD (Conole et al. 2008). The pedagogy planner and the course map representations were used at a Blended Design Challenge workshop, to help guide teams to design.[9] A 3D 'task-in-context to pedagogy' map has been produced, based on earlier work (see Conole et al., 2004 and Conole, 2008a).We have also being exploring data-derived representations such as views based on financial data for a course or student performance data.[10] We have also evaluated a series of workshops exploring the use of these design representations with pedagogical patterns work (Dimitriadis et al. 2009; Conole et al. 2010).

[9] http://cloudworks.ac.uk/cloud/view/2640
[10] See http://cloudworks.ac.uk/index.php/cloudscape/view/1907 for more details.

The emotional regulation learning intervention

The previous section described the general nature of the views, this section describes these applied to a particular learning intervention. The learning intervention was designed as part of the X-Delia project.[11] which is exploring the use of gaming and sensor technologies with traders and investors. The focus of the learning intervention is on developing emotional regulation in financial investors. The learning intervention consists of a series of interactive games. In terms of timescales the learning pathway is intended to extend over six months, different individuals will do different aspects and some may take forward into their work practice, therefore the following are intended as an indicative average amount of time on different aspects of the learning intervention; in reality different learners will spend a different amount of time working on this.

Figure 12 shows the course view map. The guidance and support consists of a self-directed learning pathway (up to six months). Content and activities are made up of a series of games, relevant didactic material and some real-world practice. There are no collaborative activities, but learners are able to communicate with peers in a discussion forum. There are no formal assessment activities, but the reflection and demonstration consists of diagnostic feedback and critical reflection.

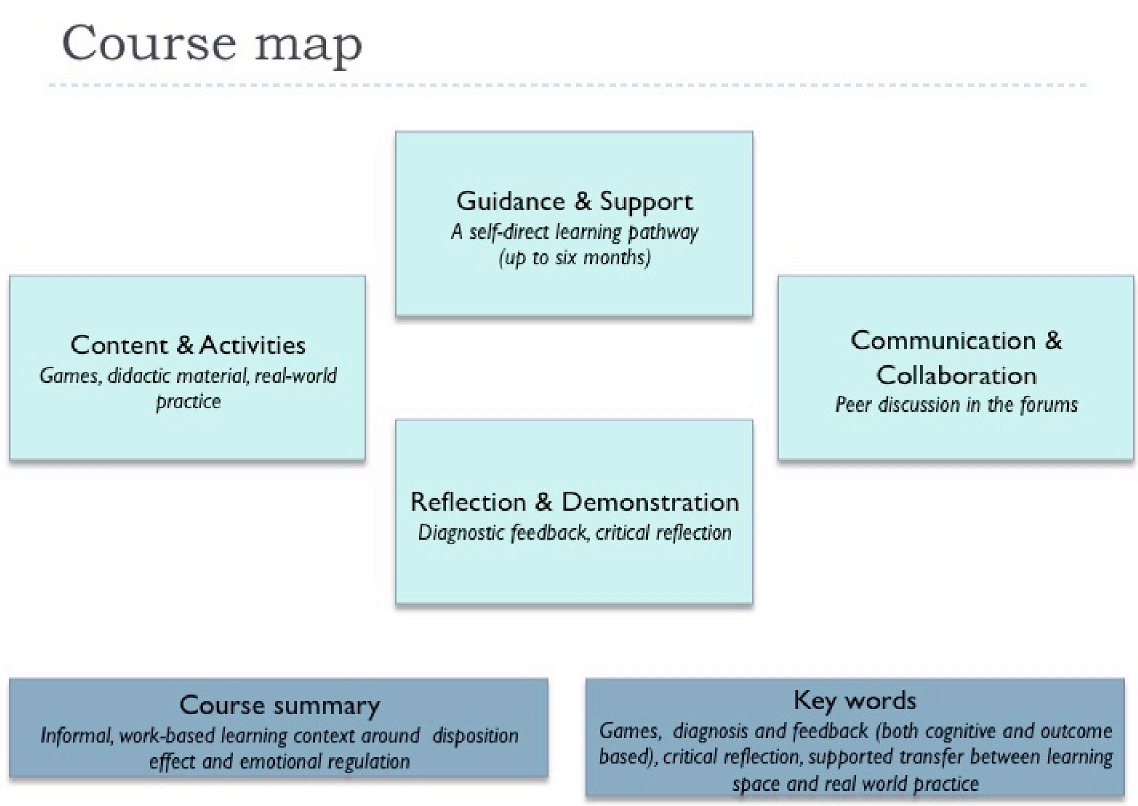


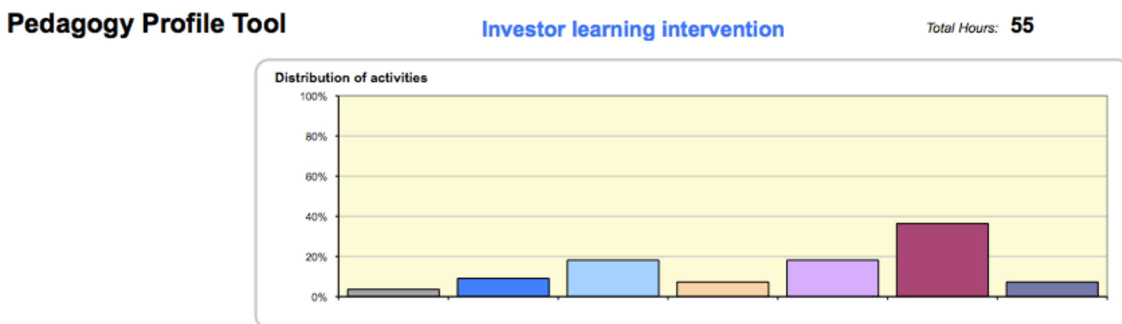
Figure 12: The X-Delia learning intervention course map

[11] http://www.xdelia.org/

Pedagogy profile

The pedagogy profile is shown in Figure 13, the learner activities break down as follows:

- Assimilative: didactic content (10 mins to 1 hr depending on choices made by the individuals).
- Information handing: the index game (for each iteration 30 mins – 1 hr) and aiming game (for each iteration 30 mins to 1 hr).
- Communication: peer discussion (zero to several times a week 1hr).
- Productive: none.
- Experiential: trading practice (1 hr per week to review the feedback).
- Adaptive: none.
- Assessment: diagnostic feedback (1 hr), critical reflection (10 mins at the end of every trading session).



	Assimilative	Info. Handling	Adaptive	Communicative	Productive	Experimental	Assessment
Percentage	4%	9%	18%	7%	18%	36%	7%
Total hours	2	5	10	4	10	20	4
Diagnostic activity	2						4
Disposition effect games		1	5			5	
Emotion regulation games			5			5	
Deliberative trading practice						10	
Structured diary and template work					4		
Critical reflection		4			6		
Asynchonous peer disc				4			

Figure 13: The X-Delia learning intervention pedagogy profile

Course dimensions

The course dimensions view for the intervention is shown in Figure 14. It indicates that the learning intervention is very activity-based, with little in the way of tutor support. Reflection and demonstration of learning is mainly through self-reflection.

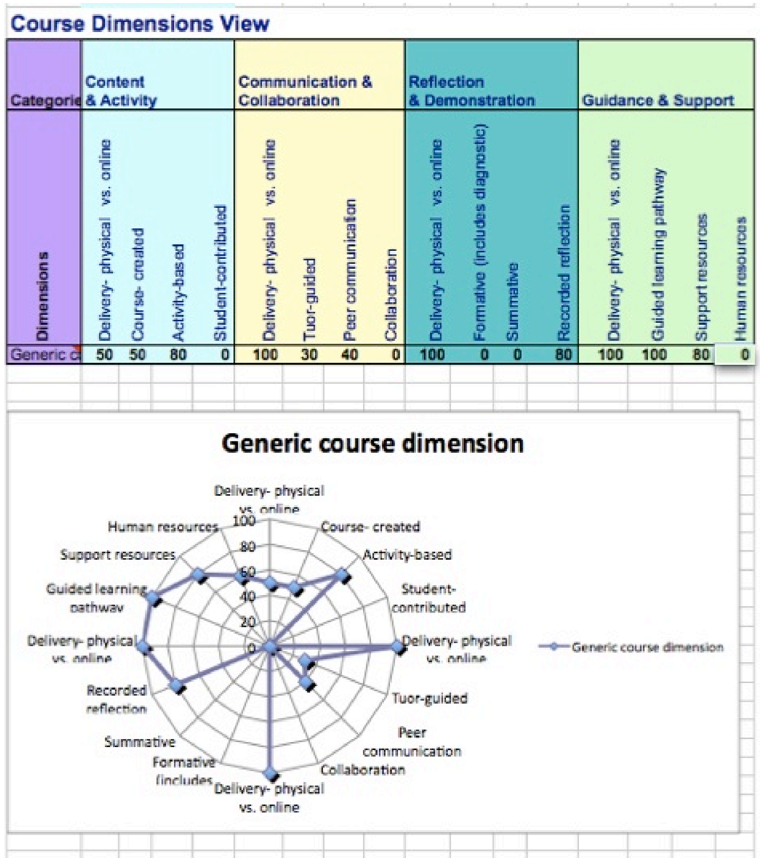


Figure 14: The X-Delia learning intervention course dimensions view

Learning outcomes

There are four learning outcomes associated with the intervention:

- Understand the disposition effect[12] and emotional regulation.
- Improved awareness of own profile in relation to the disposition effect and emotional regulation.
- Develop skills in relation to the disposition effect and emotional regulation in a learning environment.
- Support a transfer of skills into practice.

Figure 15 shows how these map to the various learning activities, all four are covered and indeed in all instances the learning outcomes map to two or more of the tasks.

[12] http://en.wikipedia.org/wiki/Disposition_effect

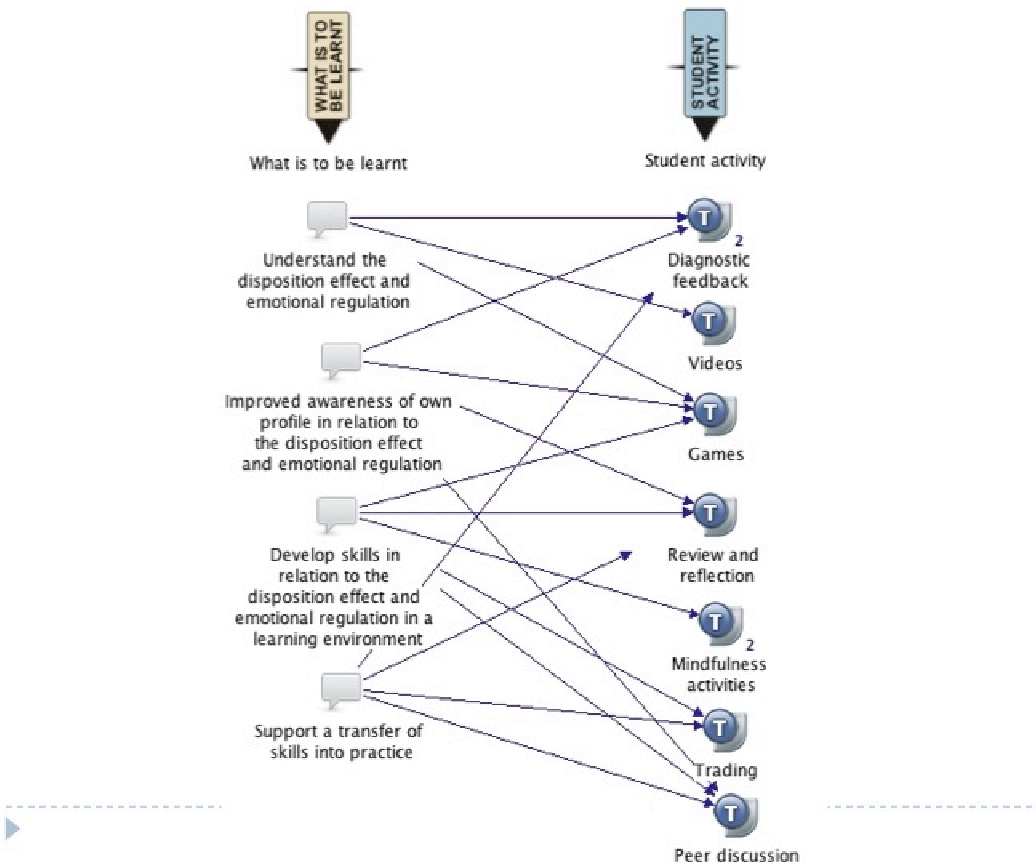


Figure 15: The X-Delia learning intervention learning outcomes map

Task swimlane

The following learning activities make up the learning intervention (Figure 16):

- Diagnostic feedback through an e-assessment tool, a questionnaire and calculations based on their existing trading history if they have one, and the two-index game.
- Some propositional knowledge through a series of videos, whereby different video segments are delivered based on the learners' response to the survey and calculations. Feedback becomes a vehicle for individualised didactic delivery of content.
- Engaging with two games iteratively: i) the two index game (disposition effect) in which the learner gets feedback each time on the extent to which they are displaying a dispositional effect and ii) access to a play environment where they can manage their emotional arousal in the aiming game. Each game has a number of levels of difficulty.
- Learning interventions about developing mindfulness, which is delivered online, this includes a tool on paced breathing meditation.
- Using sensors to review their emotional status in a trading context in a day trading centre (optional).
- Access to a peer discussion space so that the learners can come together in peer learning groups in discussion forums.

- Writing down and reviewing real world trading practices, and engaging in critical reflection. This includes recording and reviewing emotional state (for example rating themselves on the extent to which they have experience particular emotional states). Also make notes on what causes the emotions and what impact they think that has had on how they behave.

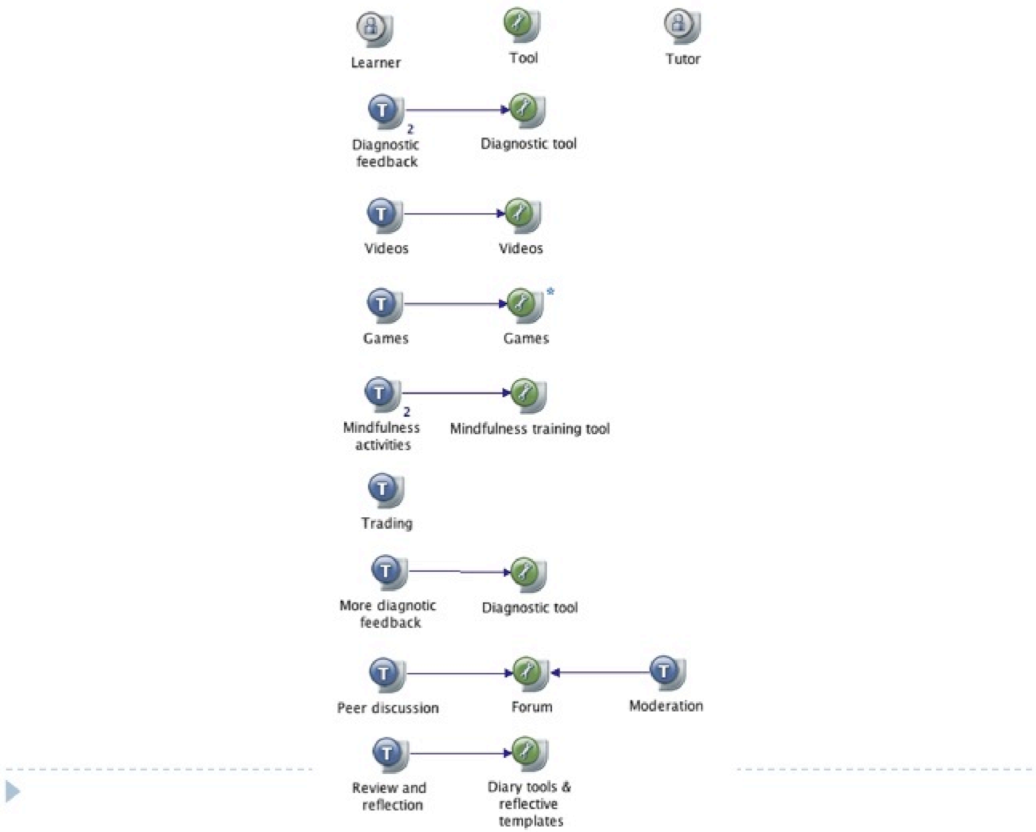


Figure 16: The X-Delia learning intervention task swimlane view

Conclusion

Representing design in a range of formats, beyond simple text, can help practitioners to think more creatively about their designs and can lead to new insights and understandings about the design process. There are parallels with Vygotsky's (1962; 1978) notions of language as a Mediating Artefact, "thought is not merely expressed in [drawings], it comes into existence through them" (quoted in Stubbs and Gibbons, 2008, pg.37). This chapter has attempted to categorise and outline a number of representations and their purposes. The selection chosen attempts to cover the full spectrum of designs: from learning activities to whole curriculum designs. But as Stubbs and Gibbons (2008, pg.46) point out "As important as drawing may be to the design process, it rarely stands alone. Design drawings are nearly always accompanied by narrative, which supplements and adds meaning". They quote Bruner (2003):

We organise our experiences and our memory of human happenings mainly in the form of narrative – stories, excuses, myths, reasons for doing and not doing and so on.' whereas visual representations, on the other hand, 'can render phenomena, relationships and ideas visible, allowing patterns to emerge from apparent disorder to become detectable and available to our senses and intellect.'

This chapter has described some of the work we have been doing in terms of describing designs. It has contextualised this in broader work in the field. It is evident that there is currently a lot of interest in this area and that we are moving towards a clearer understanding of different types of representations and how they can be used.

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